

## **How does flooding influence life satisfaction of residents in the Metro-Iloilo region, Philippines?**

Cheryl Joy Fernandez<sup>ab\*</sup>, Riccardo Welters<sup>a</sup> and Natalie Stoeckl<sup>a</sup>

<sup>a</sup>School of Business, James Cook University,  
Townsville, Queensland, Australia

<sup>b</sup>College of Management, University of the Philippines Visayas  
Iloilo City, Philippines

\*Corresponding Author: [cheryljoy.fernandez@my.jcu.edu.au](mailto:cheryljoy.fernandez@my.jcu.edu.au)

### **ABSTRACT**

As a result of climate change, scientists predict that the Philippines will experience fewer but stronger tropical cyclones. In addition to wind, tropical cyclones trigger floods that disrupt economic activities and livelihoods, cause emotional stress, and increase public health risks. But without knowing who is most adversely flood affected and where they reside, it is difficult for local governments to determine whether they should prioritise adaptation or mitigation initiatives in their region. We help fill that information deficit, investigating the relationship between individuals' flooding experiences (e.g. personal property damages, loss of employment opportunities and/or opportunities to grow/catch food, stress from flooding experience and perceived effectiveness of flood disaster management) and self-reported life satisfaction. We use data collected via interviews with six hundred (600) residents in thirty-three (33) locations during July and August 2013. Amongst other things, our analysis shows that monetary damages are a function of floodwater depth. There is also a negative and significant relationship between trauma and life satisfaction. Evidently, policies, such as floodway installations and relief operations should not be the only priority of governments; they should also consider mental health responses so as to improve the overall well-being of residents.

**Keywords:** Flooding, Life satisfaction, Climate change, Philippines

### **1. Introduction**

#### **1.1 Flood affects communities and individuals**

The Philippines is a low-middle-income economy located west of the Pacific Ocean and is comprised of around 7,100 islands that are divided into three major island groups, Luzon, Visayas and Mindanao. The 2010 census estimated that the population was around 94 million; expected to increase by 1.82% annually until 2015 (National Statistics and Coordination Board, 2014).

The Philippines is not exempt from the worldwide, serious and ongoing consequences of climate change. In fact, partly due to its archipelagic nature, the country is one of

the most vulnerable countries to this threat. Annually, around 20 typhoons enter the Philippine territory and about 8-9 of these make landfall, usually during the southwest monsoon season in July to August (Lasco *et al.*, 2009; Yumul Jr. *et al.*, 2012). The 2013 intergovernmental panel on climate change reports that typhoons are likely to become stronger in this region (Intergovernmental Panel on Climate Change, 2013). Flood, a consequence of heavy rains, may be aggravated as a result of climate change. Hence, affecting communities and individuals through damage of property, interruption of employment and livelihood generating activities, and spread of diseases such as typhoid and diarrhea (Zoleta-Nantes, 2002). In the September 2006 typhoon Xangsane (local name: *Milenyo*) caused damage valued around \$US134 million and \$US83 million to property and agriculture, respectively (Lasco *et al.*, 2009). More recently, initial estimates from typhoon Haiyan (local name: *Yolanda*), which struck in November 2013, are around \$US417 million for infrastructure and another \$US417 million for agriculture damage (National Disaster Risk Reduction and Management Council, 2014).

However, floods also affect people at a more personal level (Gelbach, 2008; Dodman, *et al.*, 2010). Human well-being, which can be measured through individual life satisfaction (Parfit, 1984), depends on various factors such as income, quality of environment, life events and other relevant factors (Welsch, 2002; Dolan & White, 2007; Fujiwara & Campbell, 2011; Ambrey & Fleming, 2011). The pioneering work of Tom Smith (1992) on American well-being, looked at the way in which significant life events such as floods and other disasters affected different social groups, finding evidence that they have an adverse impact on individual well-being. Luechinger & Raschky (2009) found evidence of a negative relationship between floods and life satisfaction using data collected in 16 European countries between 1973 and 1998. Zoleta-Nantes (2002) surveyed the urban poor and rich residents in Metro Manila in terms of their vulnerabilities to flood disasters. She found that in a less-developed country, vulnerability is partly dependent on individual characteristics (e.g. income) and political position (e.g. lack attention from local government). The study highlights the dependence of poor residents to flood assistance (e.g. rescue, relief and evacuation support) as opposed to residents in richer neighbourhoods, making them more vulnerable to the impacts of flooding disasters. In this context, our paper presents a case study in the Philippines, which, specifically explores people's flood experiences that may contribute to their overall life satisfaction.

## 1.2 Research focus

This paper examines the link between flooding experiences and life satisfaction. Particularly, it looks at monetary, non-monetary cost (e.g. trauma) and the severity of

the flooding event (measured by the depth of floodwater in the house). It also explores (1) how these flooding experiences relate to life satisfaction (2) how the link between flooding experience and life satisfaction varies across different communities (locally called '*barangays*') and (3) how households perceive the level of effectiveness of flood and flood-related assistance from government and other institutions.

The Metro-Iloilo (MI) region in the Philippines is the case study area and Table 1 shows the towns that comprise the region and their socio-demographic profile. Given the focus of this paper, the MI region is an appropriate case study site. First, because diverse consumption and production activities in the region, particularly infrastructure and residential development, have adversely affected forests/watersheds, rivers and other ecosystems, which has increased the region's vulnerability to flood damage. For example, improper waste disposal from squatter settlements and businesses along the river result in a continual decline of water quality of the Iloilo River (Hechanova, 2010). The sewerage system in the region is non-existent and waterways are silting. As a result, high-valued fish such as, '*bulgan*' (sea bass) and '*alimusan*' (mudfish) can no longer be found here (Bayanihan, 2011). As flood hazards become worse due to these activities, hundreds of families near rivers were continuously affected and evacuated because of non-stop rains and floods during heavy rains for the last years (National Disaster Risk Reduction and Management Council, 2014; Office of the Civil Defence Region VI, not dated). Next, the region consists of both urban and rural towns (or municipalities) – making it possible to compare and contrast responses from these locations. Further, towns in the region display variation in terms of income levels. The municipalities are classified into income classes, where a first class municipality has an annual town income of more than \$US1,229,057 (₱55 million) and a sixth class municipality less than \$US335,389 (₱15 million). Finally, landslides and typhoons have regularly hit the Panay Island in the Visayas, where the MI region is located; two of the worst to date were the June 2008 typhoon Fengshen (local name: *Frank*) (Yumul Jr. *et al.*, 2012) and the November 2013 typhoon Haiyan (local name: *Yolanda*). Typhoon Haiyan made landfall in northeastern Panay and caused damages around \$US34 million (₱1.5 billion) (The Panay News, 2013). Though, compared to the towns east of the Iloilo province, the MI towns incurred less damage, but a considerable number of households who were nonetheless displaced (e.g. 841 in Pavia and 223 in San Miguel) (Rappler, 2013).

**Table 1:** Socio-demographic profile of Metro-Iloilo region in the Philippines

City/ Towns	Area (hectares)	Headcount	Households	No. barangays/ communities	Major Industries	Income Class	Annual City/Town Income (ALID)	% population share to the Metro-Iloilo Region	% area share to the Metro-Iloilo Region
Iloilo City	7,834	450,741	93,844	180	Commercial and Service Centres; Industrial	1 <sup>st</sup> class city	408,698,972	60.7	15.6
Leganes	3,220	30,092	6,225	18	Agricultural; Commercial and Service Centres	4 <sup>th</sup> class	1,387,796	4.1	6.4
Oton	8,644	82,525	16,807	37	Agricultural; Fishery	1 <sup>st</sup> class	3,188,055	11.1	17.3
Pavia	2,703	41,638	9,000	18	Industrial; Commercial and Service Centres	1 <sup>st</sup> class	1,964,751	5.6	5.4
San Miguel	3,197	25,561	5,306	24	Agricultural; Commercial and Service Centres	5 <sup>th</sup> class	1,316,923	3.4	6.4
Sta. Barbara	13,196	54,998	13,111	60	Agricultural; Commercial and Service Centres	3 <sup>rd</sup> class	2,129,572	7.4	26.3
Cabatuan	11,290	56,922	11,816	68	Agricultural; Commercial and Service Centres	2 <sup>nd</sup> class	2,042,185	7.7	22.5
<i>Total</i>	<i>50,084</i>	<i>742,477</i>	<i>156,109</i>	<i>405</i>	-	-	-	<i>100%</i>	<i>100%</i>

Source: Department of the Interior and Local Government (2014)

## 2. Methodology

This study is part of a bigger research project, in which a household questionnaire was designed to capture respondents' flood experiences and life satisfaction as well as their perceptions towards flood assistance in the Metro-Iloilo (MI) region, Philippines. Between December 2012 and March 2013, we conducted eight focus group discussions, which enabled us to identify the most relevant environmental problem in the region – flooding. We were also able to use insights from the focus group discussions to develop and then test a questionnaire. The pre-test questionnaire enabled us to (1) identify questions which respondents had difficulty understanding and to also identify an appropriate data collection method (either personal interviews or self-complete). We contacted fifty (50) people from urban and rural communities, interviewing half, and leaving questionnaires with the others (returning the following day to collect them). Personal interviews proved to be logistically easier and have also yielded better response rates.

Insights from the pre-test were used to improve the clarity and wording of questions, and the final household questionnaire was used to collect data from 600 residents of the Metro-Iloilo region.<sup>1</sup> Since this paper pays special attention to the link between flooding experience, life satisfaction and residential location, the paper focuses on households who are living in their current location since 2007 (hereafter '*long-term residing households*' or '*long-term residents*',  $n=518$ ). We sampled the region in 33 communities, 4 from an urban location and 29 from a rural location. In Iloilo City, an urban location, we interviewed thirty-four (34) respondents in each four communities. While in twenty-nine rural communities, we interviewed eighteen (18) residents per community. Interviews were carried out in July and August 2013, with help from eight hired enumerators.<sup>2</sup>

Amongst other things, respondents were asked to recall and list all flooding event(s) they had experienced since 2007, together with the corresponding level of the floodwater through their house and the monetary damages (costs to personal property, employment/livelihood losses and additional damages) incurred. Additionally, respondents were asked to rate (on a scale from 1 [not threatened] to 5 [very threatened]) the perceived threat, which each flood event posed to the safety of their family, friends and close relatives. The rating represents the trauma from flooding. Finally, respondents were asked to rate their '*overall life satisfaction*' (on a scale from 0 [not satisfied] to 100 [very satisfied]).

---

<sup>1</sup> Based on the Krejcie & Morgan (1970) formula in determining minimum required sample size, at least 348 residents should be surveyed to represent a total household regional population of about 156,000.

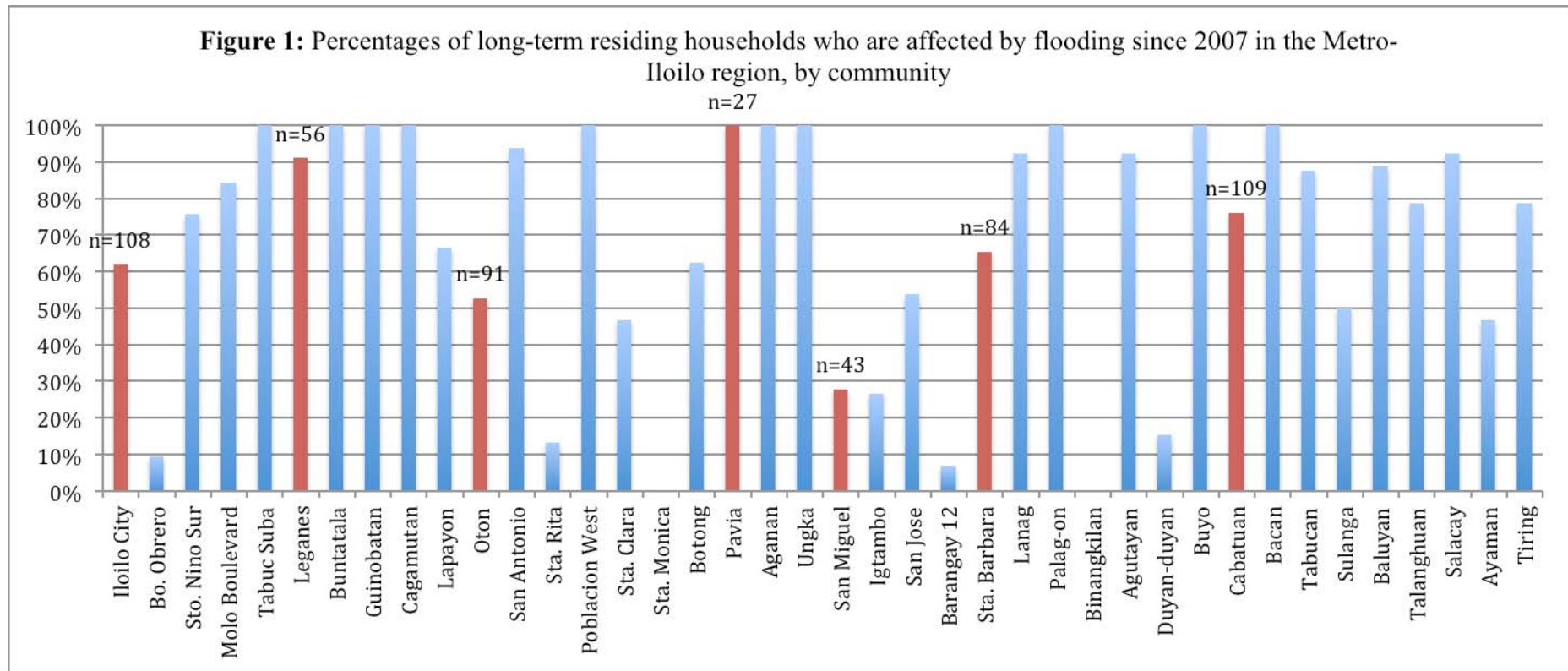
<sup>2</sup> This implies that Typhoon Haiyan that hit the study area in November 2013, struck after the data collection was completed. Hence its effects on households in the study region are not incorporated in our analysis.

### 3. Results and Discussions

#### 3.1 Monetary damages, depth of floodwater and trauma from flooding

##### *Flooding experience*

We define a household as flood affected if it has experienced at least one flood event since 2007. Figure 1 presents the distribution of affected households within communities. More than 65% of the long-term residing households (in Pavia (100%), Leganes (91%), Cabatuan (76%) and Sta. Barbara (65%)) reported at least one flood event since 2007.



Two possible reasons for this are the communities' elevation from sea level and flashflood susceptibility. In particular, the sampled communities in Leganes, Pavia and Sta. Barbara have elevation levels that range from 10-30, 25-35, and 30-38 meters, respectively. In contrast to least-flooded communities in San Miguel, elevation are higher at 27-49 metres. A report from the Office of the Civil Defense Region VI (not dated) describes Aganan and Ungka in Pavia as areas with high flashflood susceptibilities and that the locations were near the Aganan River, which is vulnerable to erosion and bank scouring. Similarly, three sampled communities in Leganes, Buntatala, Cagamutan Norte and Guinobatan, were classified as *'flooding-seasonally high and moderate'* by the same report.

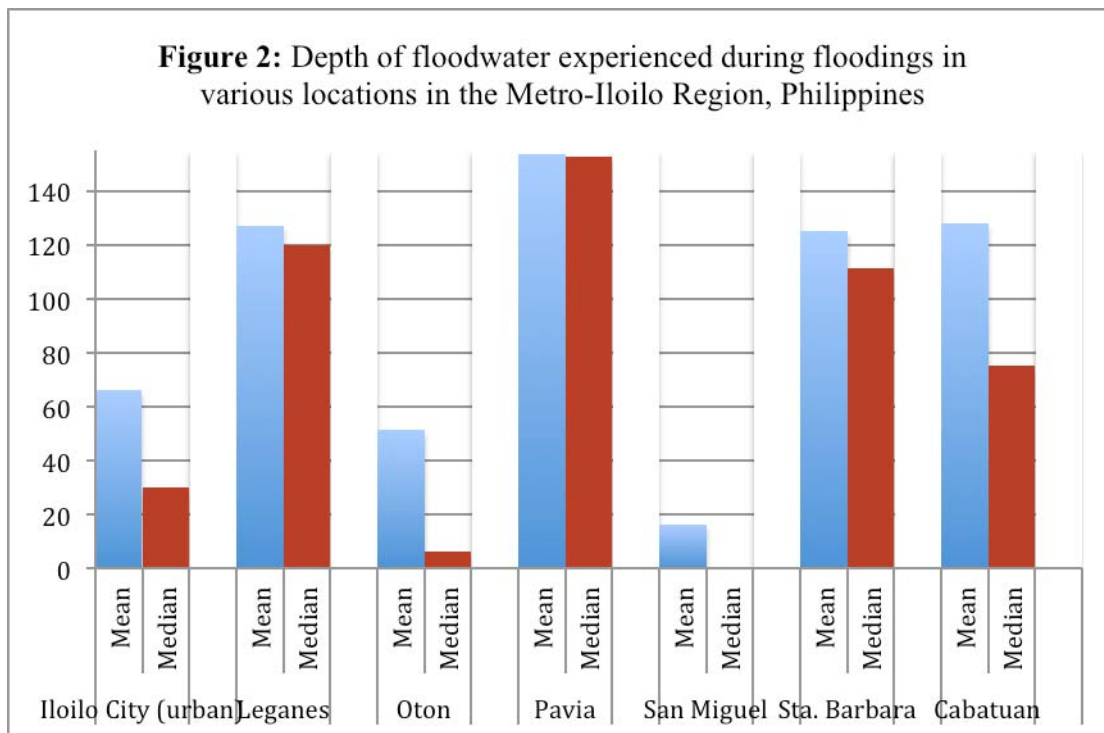
Irrespective, the majority of the sampled respondents from all communities Pavia, Leganes, Cabatuan and Sta. Barbara experienced flooding, except for three communities. Small proportion of residents from Ayaman in Cabatuan (47%) and Duyan-duyan (15%) and Binangkilan (0%) in Sta. Barbara reported flooding. In Binangkilan, for example, no flooding has been reported in the community and only areas near the Tagum River experienced flooding (Office of the Civil Defense Region VI, not dated). In some less flood-affected communities, such as the city of Iloilo and the towns of Oton and San Miguel, a similar trend can be observed. For instance, Bo. Obrero (9%) has low flood susceptibility and Barangay 12 (7%) has no recorded flood incidence and low flashflood vulnerability. Likewise, Sta. Rita (13%) in Oton rarely experienced flashfloods, but residents near the creek (Anhawan creek) are more prone to erosion at the bank especially during heavy and continuous downpours (Office of the Civil Defence Region VI, not dated).

#### *Flooding intensity*

Respondents were asked to indicate the depth (in centimetres) of floodwater in their house for every flooding event. To calculate floodwater depth at the community level, we first calculated mean floodwater depth experienced at the household level, where residents who were not affected by flood were assigned a value of zero for floodwater depth. Then we calculated mean and median floodwater depth at the community level using mean floodwater depth experienced for all households in a particular community. We report median next to mean values of floodwater depth, to limit the impact of a small number of respondents who report large values of depths. Hence, Figure 2 shows the depth of floodwater in the communities in the MI region.

The top four flood-experienced locations, Pavia, Leganes, Sta. Barbara and Cabatuan, have the deepest floodwater. This is not surprising as these towns were frequently flooded. In median and in average terms, San Miguel has lowest reported floodwater depth. This is because the sampled communities in San Miguel have relatively higher elevation from sea level, around 27-49 meters, thus lower flood depth, compared to other sampled communities. There are differences between the mean and median

values in Iloilo City, Oton, San Miguel and Cabatuan which is absent in Leganes, Pavia and Sta. Barbara. This implies that reported depths in Leganes, Pavia and Sta. Barbara are evenly distributed within the sampled communities, unlike Iloilo City and especially Cabatuan.



*Monetary damage of flooding*

Reported monetary losses of long-term residing households from flooding were segregated into three damage categories (costs to personal property, employment/livelihood losses and additional damages). To calculate monetary damage of flooding at the community level, we first calculated the sum of all monetary damage as a result of flooding since 2007 at the household level, where long-term residents who reported to have never experienced flooding since 2007 were assumed to have incurred no monetary damages. Then we computed the mean and median values of monetary damage as a result of flooding at the community level, using the monetary damage of all households in a particular community. We also report median next to mean values of losses, to limit the impact of a small number of households who report large values of losses – see Figure 3.

The corresponding losses were large for all three damage categories in the towns of Pavia, Cabatuan and Sta. Barbara. This is not surprising as a large proportion of households experienced flooding in these locations. Households in Leganes, a town with a high incidence of flooding, indicated low damage levels. This is perhaps due to the fact that the town is adjacent to Iloilo City, where a floodway (4.8 kilometers long, 82 metres wide) was built under the Iloilo Flood Control program financed by the Japan International Cooperation Agency (JICA) through the Department of Public

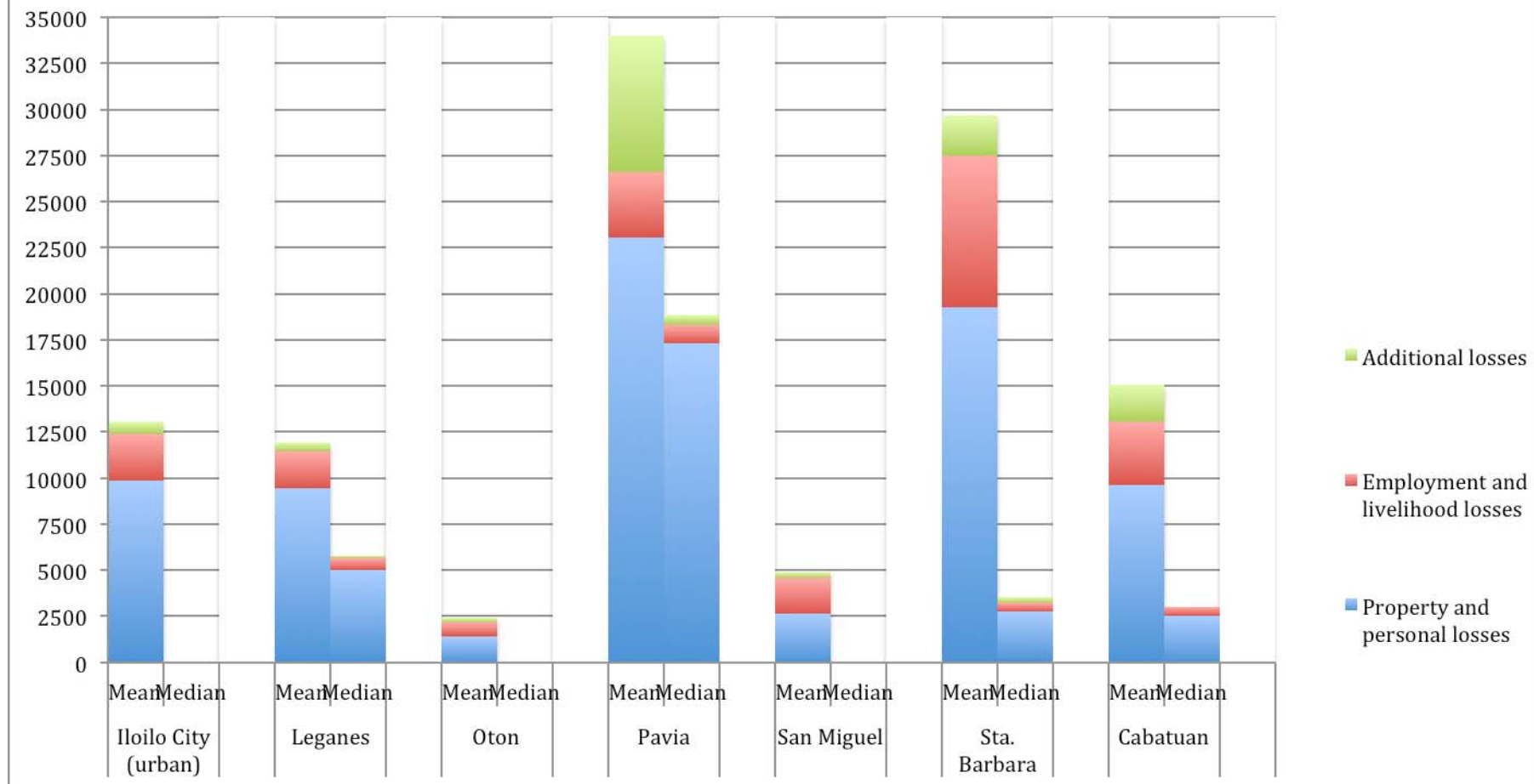


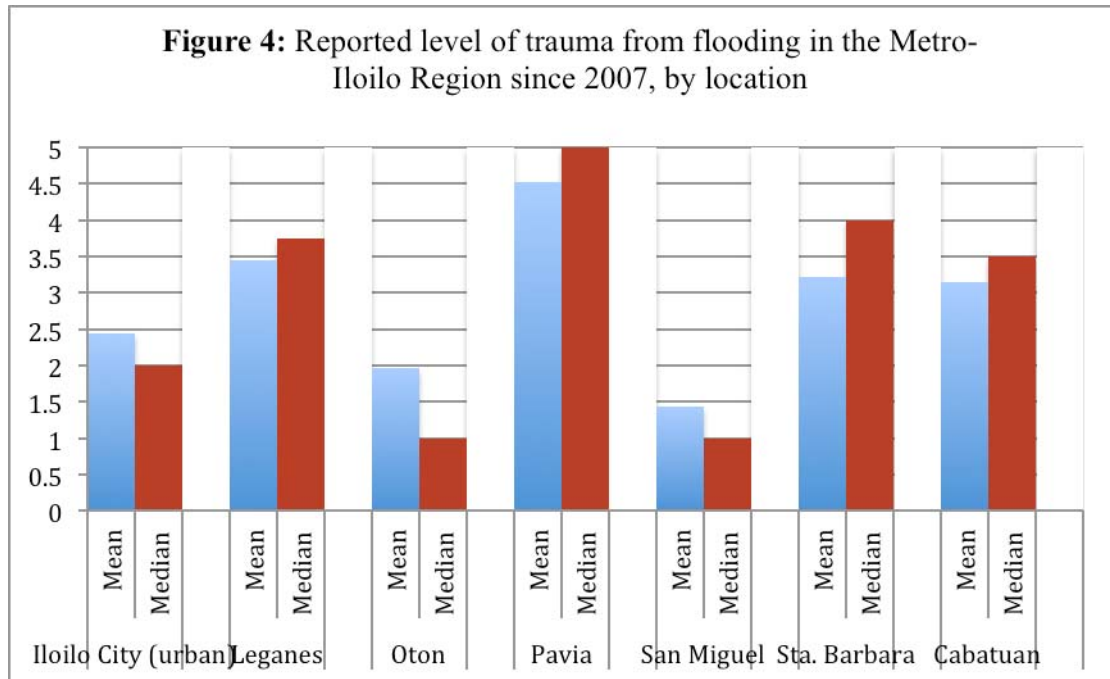
Works and Highways (DPWH) (Dodman *et al.*, 2010; Iloilo City Government, 2011). Dodman *et al.* (2010) examined the Iloilo Flood Control Project and concluded that it is one of the programs that advocates successful partnerships between governments, other institutions and communities. Interestingly, San Miguel has one of the lowest flood incidences (from Figure 1) but incurred higher monetary losses (from Figure 3) than relatively high-flooded towns such as Iloilo City, Oton and Leganes. There are a few explanations for this finding. First, the residents are mainly farmers and businessmen as the town is mainly agricultural and commercial, with large factories and logistics services. Second, together with Pavia and Sta. Barbara, the town is also a booming residential area, where big real estate projects have been completed such as by the Camella Homes of Vista Land (Baleta & League, 2007). Third, there is a gap between the mean and median damages in San Miguel, suggesting a few residents reported higher damages; thus not representative of the overall flood damage in the municipality. Fourth, there is no existing forest (Municipality of San Miguel, Iloilo, 2014). As a consequence of heavy and continuous rainfall and of no (or denuded) forest to hold soil (especially at the riverbanks), rivers and other water bodies may widen and deepen thus worsen flood hazard. And finally, San Miguel is not part of the Iloilo Flood Control Program (Iloilo City Government, 2011). There is a new flood control project that includes San Miguel, called the Iloilo-Batiano river project by the Department of Environment and Natural Resources (DENR) (Department of Environment and Natural Resources Region 6, 2014).

#### *Non-monetary damage of flooding*

Respondents were also asked to rate the level of threat from flooding to any of their family members, relatives and/or close friends for every flooding event they experienced. A score of one indicates low threat while five specifies most threatened. To calculate trauma levels as a consequence of flooding at the community level, we first calculated the mean trauma level at the household level, where long-term residents who did not experience flooding since 2007 were allocated a trauma score of 'one'. Then we computed mean and median trauma levels at the community level, using the household trauma scores for a particular community. As expected, Pavia, Leganes, Cabatuan and Sta. Barbara have high reported trauma levels because these areas have high floodwater depth. Interestingly, Iloilo City has low floodwater depth but high trauma levels. One possible explanation is the fact that residents may have relatives or family members in frequently flooded areas such as in Pavia, Leganes, Cabatuan and Sta. Barbara. Though, it is still unclear how much stress or what types of disorder develop, residents may develop traumatic stress disorders from disasters (Dodman *et al.*, 2010).

**Figure 3:** Reported monetary damages incurred in various locations in the Metro-Iloilo Region, Philippines, in Philippine pesos and by location



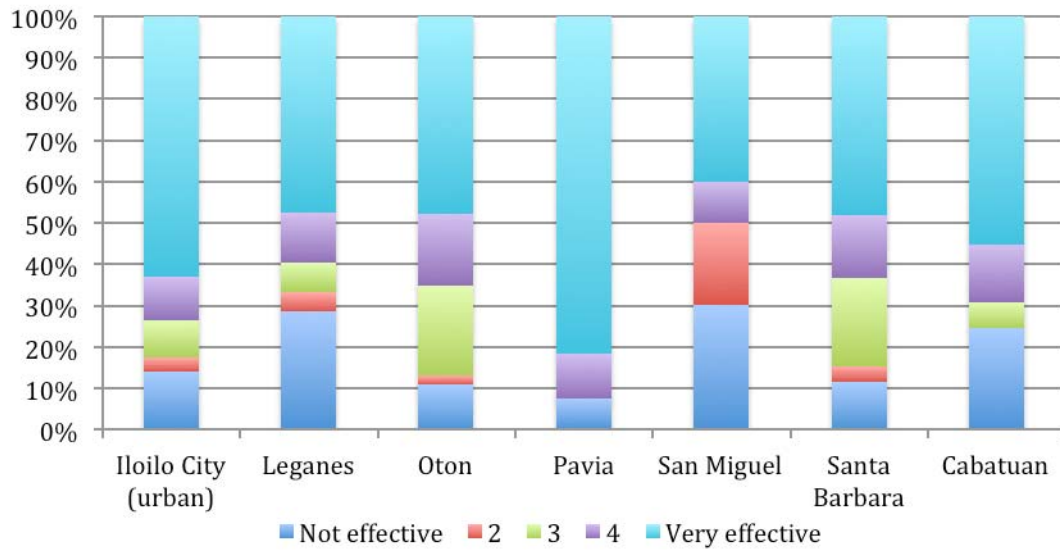


### 3.2 Flood-related assistance

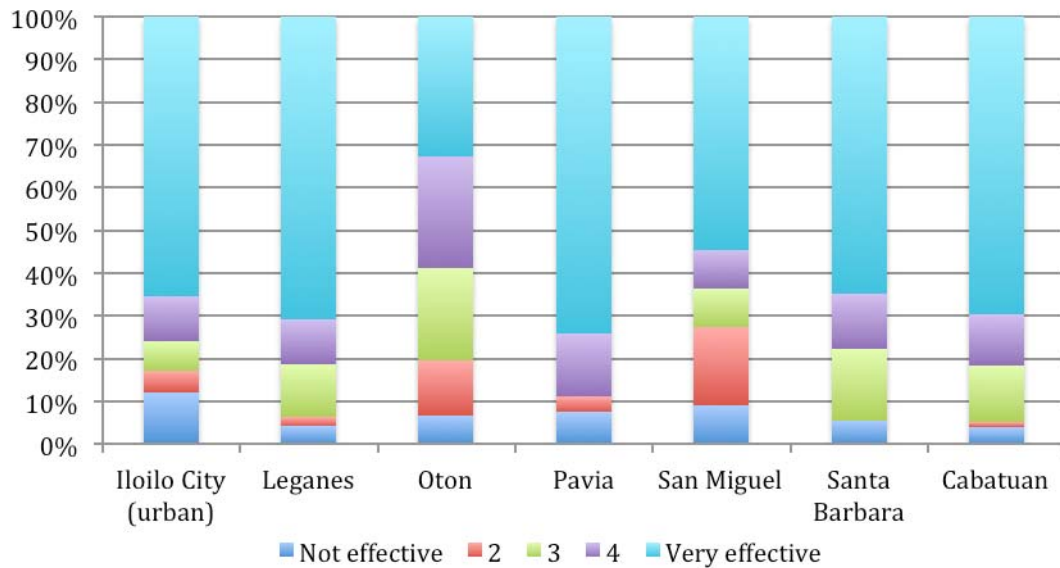
The effectiveness of flood-related assistance from the local government and other organisations contributes in minimising the potential damages from flooding. In the Philippines, there are various climate change mitigation policies under the Medium Term Development Plan 2004-2010 such as the Iloilo Flood Control (\$US86.5 million) and the Panay River Flood projects (\$US80.6 million) (Lasco *et al.*, 2009). At the local level, Iloilo City has the Iloilo City Disaster Management Plan, an instrument that allows emergency response measures to communities. Post-disaster (flood) measures such as relief operations are also institutionalised in the region (Iloilo City Government, 2011).

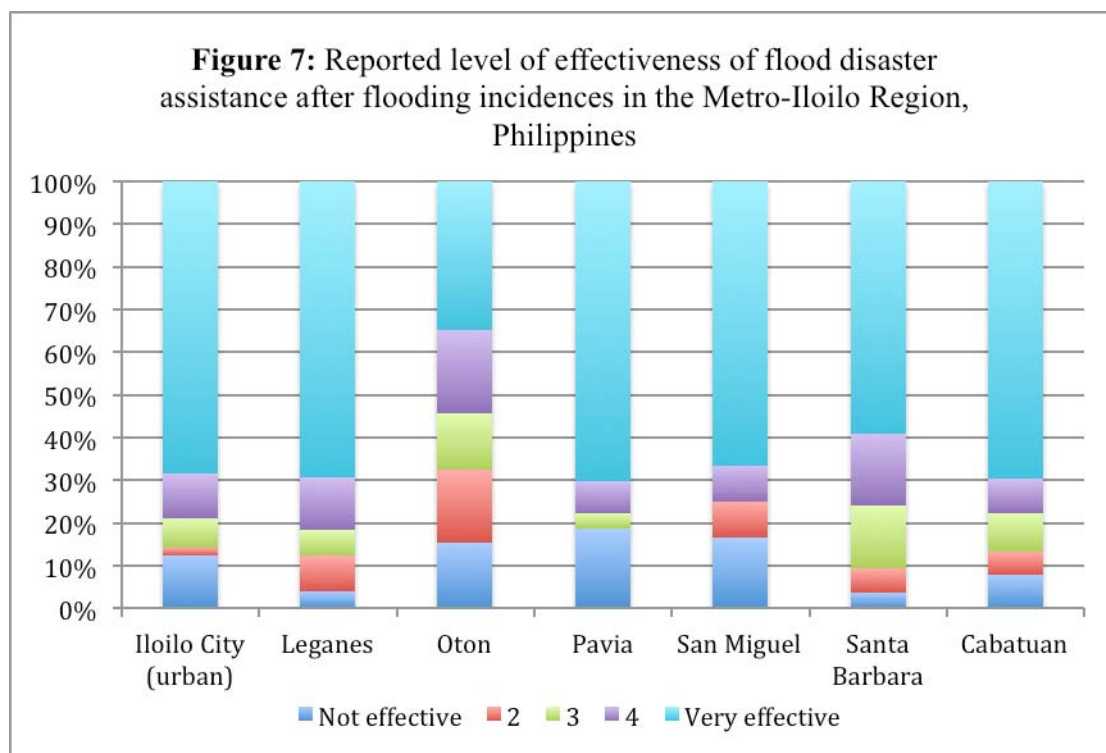
Figures 5 to 7 illustrate the effectiveness by assistance before, during and after flooding. The level of effectiveness ranges from 1 to 5, where 5 is 'most effective' while 1 is 'not effective.' On closer examination of the figures, almost 70% of the responses from all assistance categories were '5' and '4.' This indicates that overall, the flood assistance activities are effective.

**Figure 5: Reported level of effectiveness of flood disaster assistance before flooding incidences in the Metro-Iloilo Region, Philippines**



**Figure 6: Reported level of effectiveness of flood disaster assistance during flooding incidences in the Metro-Iloilo Region, Philippines**

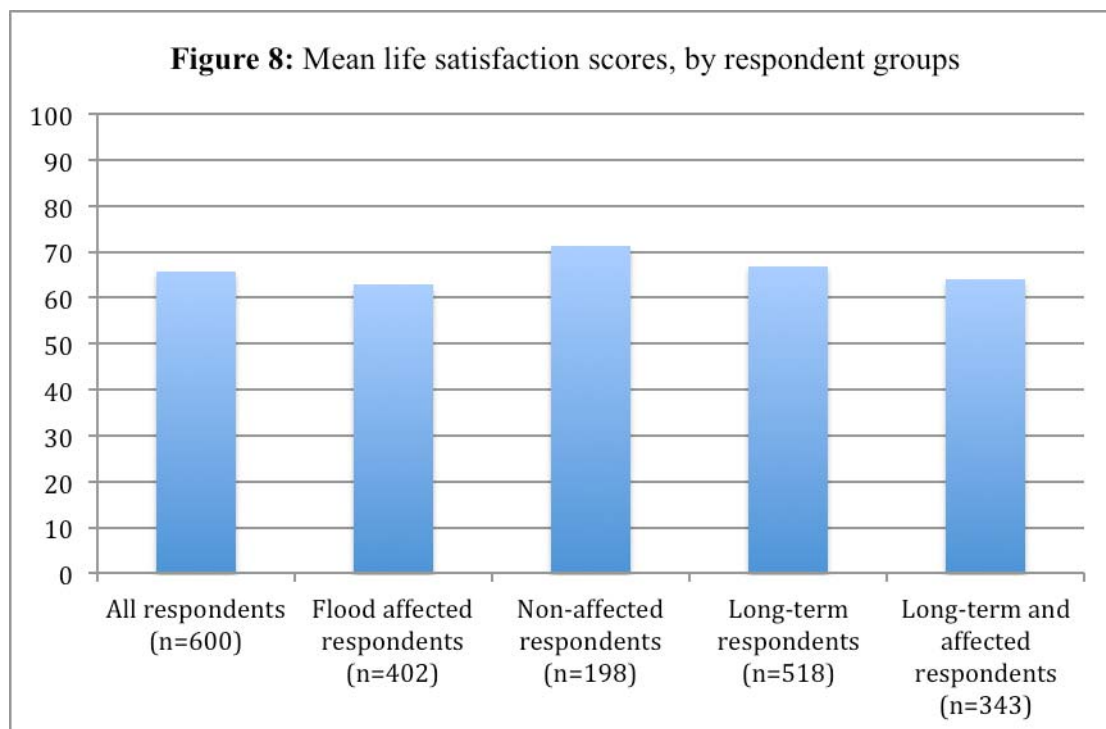




Though, high damages were recorded in almost all communities in Leganes, Cabatuan and Pavia, residents did not attribute this to ineffective assistance. Equally important, this may also reflect an improvement in the level of trust in the government, in assisting them in case flooding occurs. Cabatuan, for example is not covered in the flood control project, but the residents rated government and other institutions' effectiveness highly. In contrast, residents of San Miguel rated the government and other institutions' effectiveness of pre-disaster assistance as poor. This may also explain why in spite of fewer severe flood incidences, San Miguel residents incurred larger damages. Zoleta-Nantes (2002) noted a similar case with street children in Metro Manila. She said, the homeless minors were not prioritised by the local government, even though the flood programs are present. Also, the progress in mainstreaming adaptation strategies in the Philippines is slow (Zoleta-Nantes, 2002; Lasco *et al.*, 2009) and disaster awareness, preparedness and response measures at the local (and community) level in Panay Island are premature (Yumul Jr. *et al.*, 2012).

### 3.3 Self-reported life satisfaction and its relationship to flooding experience

Figure 8 shows the life satisfaction scores of residents in the region. Only the mean values are reported as there is a (near) normal distribution of the scores. The scores are respondents' answer to the question, '*Overall, how satisfied are you with your life?*' This is one of the standard life satisfaction questions used by many life satisfaction surveys all over the world. The life satisfaction rating goes from 0 to 100, where 100 is most satisfied and 0 is not satisfied at all.



Life satisfaction scores in Pavia and Leganes are relatively low compared to less severe flood-affected locations such as Iloilo City, Oton and San Miguel This is not surprising as floods are undesirable life events and they cause both monetary and non-monetary damage (Smith, 1992).

Flooding experience (monetary losses, floodwater depth and trauma scores) and life satisfaction scores were correlated and Spearman Rho coefficients were calculated. There was strong evidence ( $p > 0.01$ ) of a negative relationship between trauma scores and life satisfaction. The other variables, monetary damage and floodwater depth are not significantly related to life satisfaction. Hence, non-monetary losses from flooding are related to life satisfaction scores. The negative correlation shows that the higher the trauma scores of residents, the lower are their reported life satisfaction scores. The relationship is evidently showed in Table 2. Zoleta-Nantes (2002) documented the flood experiences of street children and urban poor in Metro Manila. One male child, Junjun, quipped:

*“I think that all of Manila is flooded whenever our house is submerged under water. I think that there is no solution to flooding. My family needs food during the flood season. I do not think that my life will improve if the problem of flooding is solved – I will still beg on the streets.”*

Likewise, mental health responses are of less priority than temporary shelter and relief and water provision (Dodman, *et al.*, 2010). The finding, then, highlights the importance of non-monetary damages and the long-term effect of flooding disasters to

those who are affected.

**Table 2:** Correlation matrix between life satisfaction, monetary flood damage, trauma from flooding and depth of flood waters

	Life satisfaction scores	Monetary damages from flooding	Trauma scores	Depth of flood water
Life satisfaction scores	-	-0.023	- 0.173**	0.085
Monetary damages from flooding	- 0.023	-	0.295**	0.298**
Trauma scores	- 0.173**	0.295**	-	0.373**
Depth of flood water	0.085	0.298**	0.373**	-

\*\**. Correlation is significant at the 0.01 level (2-tailed).*

#### 4. Conclusion

Based on the data from residents in the Metro-Iloilo (MI) region, Philippines, flooding experiences differ across locations due to both bio-physical and non-biophysical features of communities. Elevation from the sea level plays an important role in the frequency of flood events and the monetary damages incurred during these events. Findings from the municipalities of Pavia, Leganes, and Sta. Barbara support this. However, the availability of infrastructure, such as levees, that minimise flood losses also play a pivotal role in residents' flood experiences. Cabatuan, for example, has higher elevation but incurred high losses, because the town is not covered in the Iloilo Flood Control program. Unlike Leganes, Cabatuan is not adjacent to the towns covered in the program. Furthermore, the effectiveness of the assistance takes credit to residents' vulnerability to flood. In Leganes, flood is frequent but damages are low, possibly a result of the effectiveness of assistance received before, during and after flooding, which residents rate highly. This paper highlights the value of non-monetary losses from flooding. There is a negative and strong relationship between the level of threat of family members and those close to them and their reported life satisfaction. Policies and any assistance related to flooding, should not only focus on infrastructure and financial assistance but also on assistance at the individual level such as counseling to help recover the personal stress/trauma from flooding.

Clearly, there is still some work needed to fully understand flood experiences and life satisfaction. Important variables missing are individual characteristics, including age, income, family profile. Because the life satisfaction score is asked at the personal level, the answer greatly depends on one's personal characteristics and interest. In

economic inquiry, one is particularly interested in the relationship between income and flood disaster and how the losses from flooding depend on income (or level of urbanization/development) of the individual (or community). As a consequence, concepts such as preventive expenditure (e.g. constructing a second floor or own dike) and precautionary measures will be explored. In sociological inquiry, one is particularly interested in the characteristics of communities and how tight the households / individual relationships within these communities are. Residents may have rated high trauma scores, because they did not have any support (either temporary shelter or sharing provisions) from their neighbours or family members. Further research therefore, is urgently needed.

### 5. Acknowledgement

This study would not have been possible without financial support received from the Skyrail Rainforest Foundation, the School of Business in James Cook University, the University of the Philippines Dissertation Grant, and the AusAID Australia Awards – Australian Leadership Award.

### REFERENCES

- Ambrey, C., & Fleming, C. (2011). Valuing scenic amenity using life satisfaction data. *Ecological Economics*, 106-115.
- Bayanihan. (2011, March 21). *EMB-6 monitors water quality of Iloilo and Batiano rivers*. Retrieved January 17, 2014, from <http://bayanihan.org/2011/03/21/emb-6-monitors-water-quality-of-iloilo-and-batiano-rivers/>
- Baleta, I., & League, J. (2007). *Urban driving force: The case of Metro Iloilo-Guimaras, Philippines*. (S. S. Cambodia, Producer, & ForUm for Urban Future in Southeast Asia) Retrieved January 7, 2014, from <http://www.forum-urban-futures.net/activities/papers/urban-driving-force-case-metro-iloiloguimaras-phlippines>
- Best, C., Cummins, R., & Lo, S. (2010). The quality of rural and metropolitan life. *Australian Journal of Psychology*, 52 (1), 69-74.
- Department of Environment and Natural Resources Region 6. (2014). *Master plan for the Iloilo-Batiano river basin to address flooding and sustainable water supply*. Retrieved January 7, 2014, from <http://r6.denr.gov.ph/index.php/86-region-news-items/273-masterplaniloilobatiano>
- Department of the Interior and Local Government. (2014). *LGU Profile*. Retrieved January 17, 2014, from Local Governance Performance Management System: <http://www.blgs.gov.ph/lgpmsv2/cmshome/index.php?pageID=23>



Dodman, D., Mitlin, D., & Co, J. (2010). Victims to victors, disasters to opportunities. *International Development Planning Review* , 32 (2), 1-26.

Dolan, P., & White, M. (2007). How can measures of subjective well-being be used to inform public policy? *Perspectives on Psychological Science* , 71 (2), 71-85.

Fujiwara, D., & Campbell, R. (2011). *Valuation techniques for social cost-benefit analysis: Stated preference, revealed preference and subjective well-being approaches*. United Kingdom: HM Treasury.

Gelbach, R. (2008). Trauma, research, and EMDR: A disaster responder's wish list. *Journal of EMDR Practice and Research* , 2 (2), 146-155.

Iloilo City Government. (2011). *2011-2020 Iloilo City comprehensive land use plan Volume 1: Comprehensive land use plan*. Palafox Consultancy, Iloilo City.

Intergovernmental Panel on Climate Change . (2013). *Climate Change 2013: The Physical Science Basis*. Retrieved January 9, 2014, from <http://www.ipcc.ch/report/ar5/wg1/>

Hechanova, N. (2010, September 27). *Preserving the water quality of Iloilo River*. Retrieved January 17, 2014, from <http://rowfoundation.org/content/row/WQ-Iloilo-River.pdf>

Krejcie, R., & Morgan, D. (1970). Determining sample size for research activities. *Educational and Psychological Measurements* , 30, 607-610.

Luechinger, S., & Raschky, P. (2009). Valuing flood disasters using the life satisfaction approach. *Journal of Public Economics* , 93, 620-633.

Lasco, R., Pulhin, F., Jaranilla-Sanchez, P., Delfino, R., Gerpacio, R., & Garcia, K. (2009). Maintreaming adaptation in developing countries: The case of the Philippines. *Climate and development* , 1, 130-146.

Li, G., & Weng, Q. (2007). Measuring the quality of life in city of Indianapolis by integration of remote sensing and census data . *International Journal of Remote Sensing* , 28 (2), 249-267.

National Disaster Risk Reduction and Management Council. (2014). *SitRep No.85 re Effects of Typhoon "YOLANDA"*. Retrieved January 2014, 8, from National Disaster Risk Reduction and Management Council:

[http://www.ndrrmc.gov.ph/attachments/article/1125/UPD%20re%20SitRep%2085%20Effects%20of%20Ty%20YOLANDA%20\(07JAN2014\).pdf](http://www.ndrrmc.gov.ph/attachments/article/1125/UPD%20re%20SitRep%2085%20Effects%20of%20Ty%20YOLANDA%20(07JAN2014).pdf)

National Statistics and Coordination Board. (2014). *Statistics - Population Projections*. Retrieved January 8, 2014, from National Statistics and Coordination Board: [http://www.nscb.gov.ph/secstat/d\\_popnProj.asp](http://www.nscb.gov.ph/secstat/d_popnProj.asp)

Municipality of San Miguel, Iloilo. (2014). **Profile**. Retrieved January 7, 2014, from <http://www.sanmiguel-iloilo.gov.ph/for-business/municipal-profile/general-features/soil.html>

- Office of the Civil Defence Region VI. (not dated). *Summary of the results of the MGB-6 rapid geo-hazard assessment - Province of Iloilo*. Iloilo City: Office of the Civil Defence.
- Opping, J., Ironside, R., & Kennedy, L. (1988). Perceived quality of life in a centre-periphery framework. *Social Indicators Research* , 20 (6), 605-620.
- Parfit, D. (1984). *Reasons and persons*. Oxford, England: Clarendon Press.
- Shucksmith, M., Cameron, S., Merridew, T., & Pichler, F. (2009). Urban-rural differences in quality of life across the European Union. *Regional Studies* , 43 (10), 1275-1289.
- Sharpe, A., Ghanghro, A., & Johnson, E. (2010). Does money matter? Determining the happiness of Canadians. *CSLS Research Report No. 2010-09* .
- Smith, T. (1992). A life events approach to developing an index of societal well-being. *Social Science Research* , 21, 353-379.
- Rappler. (2013, November 10). *Iloilo under state of calamity*. Retrieved January 16, 2014, from <http://www.rappler.com/move-ph/issues/disasters/typhoon-yolanda/43335-iloilo-state-of-calamity>
- The Panay News. (2013). *Yolanda' pummels N. Iloilo*. Retrieved January 15, 2014, from <http://www.panaynewsphilippines.com/top-stories/10835-yolanda-agri-damage-climb-s-to-p15-billion.html?tmpl=component>
- Welsch, H. (2002). Preferences over prosperity and pollution: Environmental valuation on happiness surveys. *Kyklos* , 55, 473-494.
- Yumul Jr., G., Servando, N., Suerte, L., Magarzo, M., Juguan, L., & Dimalanta, C. (2012). Tropical cyclones-southwest monsoon interaction and the 2008 floods and landslides in Panay Island, central Philippines: meteorological and geological factors. *Natural Hazards* , 62, 827-840.
- Zoleta-Nantes, D. (2002). Differential impacts of flood hazards among the street children, the urban poor and residents of wealthy neighborhoods in Metro Manila, Philippines. *Mitigation and Adaptation Strategies* , 7, 239-266.