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Household context and operationalizing urban resiliency objectives. A case study of autonomous household response in Cagayan de Oro City, Philippines.

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Summary

Rapid urbanization and extreme weather patterns bring permanent threats and put a lot of stress in urban systems around the world. In 2011, the seemingly innocuous tropical storm Washi and its destructive aftermath signaled a new norm for Mindanao. In retrospect, the disaster is triggered by an abnormal natural disturbance and interplay between unmanaged rapid urbanization, better economic prospect, and degraded environmental systems.

This study aims to provide empirical data on how narratives of severely affected households dialogued with land-use plan objectives to pursue urban resiliency in CDO post-Washi. New knowledge acquired directly contributes to the knowledge gap of understanding complex process of ideation, translation, and realization of resilience-building measures at household scale. It also potentially provides baseline information towards formulating a collaborative decision-making approach to urban governance. The study is designed to extract special learning by examining unique case scenarios where absence of essential mechanisms resulted to catastrophic impact to life, property, and economy, and presence of underlying factors afterwards that shapes autonomous household response.

Autonomous household response draws from household's own context in relation to various and diverse resilience narratives. Furthermore, households independently pursue resilience building because of perceived notions that interventions of national and local governments addressing issues of risks and vulnerabilities do not respond effectively and in a timely manner.

Meanwhile, land-use plan objectives were key policy response in providing institutional and financial arrangements that seek to integrate socio-economic development and environmental integrity. However, objectives do not directly influence resilience decisions at household level.

Interestingly, autonomous household response concretely contributes to realizing land-use plan objectives in pursuing resiliency. Pivotal is the capacity of households to integrate learning, find sources of shared meaning, and clarity of desired change. This was reinforced by policy instruments that allow flexible modes of resilience by putting more centrally localized response. Equally important is the active role of CSOs in facilitating household narratives from individual interest to a collective meaning of diverse experience, and bringing these learnings to platforms of government interventions that allowed collective action.

Autonomous household response transitioning to a more collective level challenges distribution of decision-making process in framing urban resiliency measures, and can possibly move towards a more collaborative approach. The study only traces households' perspective and only provides a glimpse of the complex process of building urban resiliency. It would be best to compare results with how other stakeholders ideate and realize own notions of resiliency.

Keywords

Resiliency, urban governance, disaster risk reduction and management, public policy, autonomous household response

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Foreword

The intention to write a thesis about urban governance and resiliency springs from my personal and professional experiences of working with and for the grassroots communities and marginalized sectors. I come from a country, or maybe it is a generational thing, where often hidden in figures and statistics about poverty, development, and whatnot are people that struggles to make meaning out of their situation. We see the news, the facts, the details, but we sometimes fail to see that faces, the humanity behind developmental goals we so want to achieve. We talk about their situation but not of their stories. Often, we tend to get caught up with our own interest that dialoguing, not with resiliency objectives but with people, become daunting. Also, I am really interested in policy advocacy and integrating narratives of people into governance structures to render programs more responsive. It is about time to bring back humanity into development initiatives.

Recording and drawing lessons from the disaster experience of Washi survivors has been emotional to say the least. There were household respondents who sarcastically would make comments about not moving on from a tragedy that has happened 8 years ago. Some, actually wept while recounting their stories. Most just shrugs and have moved forward. For me, the experience was memorable since not everyone, and certainly not every day that you chronicle people's experiences of disaster and rewrite it into narratives of resilience.

Abbreviations

BUB	Bottom-up Budgeting program
BDRRMC	Barangay Disaster Risk Reduction and Management Council
BUB	Bottom-up Budgeting
BWDC	Balulang Women's Development Council
CCA	Climate Change Adaptation
CDO	Cagayan de Oro City
CDRRMO	City Disaster Risk Reduction and Management Office
CHUDD	City Housing and Urban Development Department
CLENRO	City Local Environment and Natural Resources Office
CLUP	Comprehensive Land Use Plan
CMCI	Cities and Municipalities Competitive Index
CPDO	City Planning and Development Office
CSO	Civil Society Organizations
DRRM	Disaster Risk Reduction and Management
EO	Executive Order
ISF	Informal Settler Families
KII	Key Informant Interview

LDRRMF	Local Disaster Risk Reduction Management Fund
MGB	Department of Environment and Natural Resources-Mines and Geosciences Bureau
NDRRMC	National Disaster Risk Reduction and Management Council
NEDA	National Economic Development Authority
NGO	Non-governmental organizations
OCD	Office of the Civil Defense
PAR	Philippine Area of Responsibility
PDRRMO	Provincial Disaster Risk Reduction and Management Office
RA 10121	The Philippine Disaster Risk Reduction and Management Act of 2010
RDC	Regional Development Council
SAP	Strategic Action Plan
SHFC	Social Housing Finance Corporation
TS	Tropical Storm
UNISDR	United Nations International Strategy for Disaster Reduction
XEHA	Xavier Ecoville Homeowners' Association
XU	Xavier University

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Chapter 1: Introduction

1.1 Background

1.1.1 New Norm for Mindanao and Cagayan de Oro City

The Mindanao Development Corridors Strategy is the spatial translation of the Mindanao Peace and Development Framework 2010-2030. It identifies Northern Mindanao as the logistics and industrial trade cluster. At the center of this business and industrial hub is the highly urbanized city of Cagayan de Oro (CDO).

In 2011, tropical storm Washi (local name: Sendong) ravaged the city resulting to an overall damage of approximately US$ 104M in all sectors of affected areas, 674 fatalities and about 1,000 people missing. The unprecedented destruction affected 41 of the city's 80 barangays[1], totally destroying 5,801 houses and partially damaging 12,635 which caused displacement of approximately 40%, or about 228,576 households of city's total population. (Carrasco, Ochiai, et al., 2016a, Gera, 2018, RDC-Northern Mindanao, 2012) Despite being categorized as typical of a tropical storm that hit Philippines, Washi was 2011's most destructive tropical cyclone in the Philippines and second most deadly worldwide. However, Washi's path was unusual considering that Mindanao is largely regarded as typhoon-free island. (Rasquinho, Liu, et al., 2013)

The extent of losses and damages caused by Washi points out following crucial factors which are linked to rapid urbanization and environmental impact. The increasing population due to in-migration resulted in settlements locating in low-lying areas and along the riversides and floodplains. About 85% of households affected have informal tenure and is located in high-risk areas including floodplains, former mangrove areas, dried-up riverbed, and sandbars. (Carrasco, Ochiai, et al., 2016a)

Additionally, watershed degradation and rapid urbanization impaired river systems and its water storage capacity. Erosion and sedimentation in the rivers are caused by logging operations, mining, and short-term crop production. It is noteworthy that local government permitted commercial and industrial sand and gravel quarrying in the river mouth without concurrence of the Department of Environment and Natural Resources-Mines and Geosciences Bureau (MGB). Soil infiltration capacity was overwhelmed by the relatively abnormal heavy downpour. Furthermore, lacklustre urban management contributed to inadvertent construction of concrete roads, buildings and other structures which interfered with natural flow of water. There is also deterioration of critical infrastructures or lack thereof. Built drainages and natural waterways have been clogged with garbage and other debris. Moreover, flood warning system were inexistent even in frequently flooded communities, and communities became complacent due to unfamiliarity with major flood disaster. For so long a time Mindanao have not experienced flooding disaster which created a false sense of security. (Carrasco, Ochiai, et al.,

[1] Barangay is the smallest political unit in the Philippines

2016a, Espinueva, Cayanan, et al., 2012, OCDRRMC-Northern Mindanao, 2012, RDC-Northern Mindanao, 2012, see also Gera, 2018)

In the recent years, climate change altered Mindanao's natural comparative advantage. Mindanao is no longer typhoon-free. Washi signals a new era wherein extreme weather patterns become the new norm for Mindanao. And with it, increasing exposure to risks and hazards. (WWF and BPI Foundation, 2014)

1.1.2 Resiliency building and land-use planning

Evolution in the concept of resiliency points to the understanding that it is interlinked between being a descriptive concept and normative agenda. It bridges the gap between disaster risk reduction and management (DRRM), and climate change adaptation (CCA). Cities exhibit resiliency when lessons from past experiences of disasters are integrated to newly formed and/or redeveloped network of actors and systems, alternatives and versatility to adopt alternate strategies that enable effective and efficient responses in times of crisis, and good governance is inculcated which ushers-in conducive environment for synergy, appropriateness of interventions, and a collective vision of a resilient city for everyone. (Weichselgartner and Kelman, 2015, ARUP and Rockefeller Foundation, 2015) Although, Matyas and Pelling (2015) point out that resiliency is undermined by the vastness of its conceptual notion and lack of further empirical reflection.

As a result, city managers and urban planners muddle through comprehending risk factors - minimizing exposure, mitigating impact of hazards, and managing vulnerabilities. In addition, they are in a conundrum of operationalizing characteristics of resiliency, and consequently urban resiliency, in a complex configuration where authority is devolved but not relegated. (Béné, Mehta, et al., 2018, Meerow, Newell, et al., 2016, Normandin and Therrien, 2016, Chelleri, Waters, et al., 2015)

Fortunately, literatures highlight land-use planning and collective action as possible solutions to this gaffe. Coherent, comprehensive and stringent land-use planning process may concretely contribute to resiliency by potentially reducing exposure if there is mapping of risks and vulnerabilities in a spatial and socio-economic context, reconceptualizing urban governance to accommodate uncertainties and complexities of future risks and vulnerabilities, incorporating preventive measures relating to exposure and hazards, and adapting by working with future hazards and risks. (Jabareen, 2013, Coaffee, 2013, Sudmeier-Rieux, Paleo, et al., 2015)

There are ample literatures that attempt to resolve ambiguity pertinent to building resiliency, operationalizing city resiliency and maximizing potential benefits. Furthermore, there are existing frameworks that are derived from empirical evidence gathered from different cities and what makes city systems resilient. (ARUP and Rockefeller Foundation, 2015, Jabareen, 2013, Meerow, Newell, et al., 2016) Unfortunately, these fall short in brevity regarding what needs to be done to achieve responsive systems of resiliency. Most especially in the field of constantly improving planning and design techniques, a constant challenge intrinsic in

contemporary approach to planning. (Leitner, Sheppard, et al., 2018, Coaffee, 2013, Lipper, 2016, van Veelen, 2016)

1.2 Problem statement

Philippines is experiencing exceptional economic growth resulting to rapid urbanization and development of urban areas. People and economies are subjected to more risks as these developments locate in cities. Urbanization-related problems such as increase of informal sector, improper waste management, deterioration of natural resources, flooding, and increasing carbon emissions have become the new norm. (Regmi, 2017) Unchecked urbanization and regularity of extreme weather represent permanent threats and pressures to the urban areas of Mindanao. Occurrence of these disturbances results to economic, financial, environmental, and social destruction (Carrasco, Ochiai, et al., 2016a) which necessitate building urban resiliency.

CDO in particular have four climate change hazards – Flooding, drought, rain-induced landslide, and typhoon. Flooding is the significant hazard with more than half of its barangays considered as flood-prone areas. Typhoon is also considered a significant hazard but only so because it induces flooding. (CDO city government, 2015)
In the case of this research, urban flood resiliency in CDO after Washi in 2011.

Existing knowledge outlines several indicators framed in various resiliency notions. (Leitner, Sheppard, et al., 2018, Weichselgartner and Kelman, 2015, Béné, Mehta, et al., 2018) Despite these, resilience remains a largely theoretical concept with recent evidence worldwide concluding that operationalizing resilience in a more holistic and integrated approach remains a challenge. Imperative to this is a new approach to governance that facilitates incorporation of local voice, and provision of platforms for practical implementation. (Meerow, Newell, et al., 2016, Murphy, Pelling, et al., 2018) A step towards this is to "clarify expectations about how specific actors behave and the context in which their decisions play out." (Coaffee, Therrien, et al., 2018, p.407)

Among key actors, resilience context from household's perspective merits unequivocal special interest. Literatures advocate for co-creation with diverse actors to promote collective action and yet existing knowledge on what goes on the process of resilience-building at household-scale, especially in developing countries, is sparse. (Duží, Vikhrov, et al., 2017, Elrick-Barr, Smith, et al., 2016)

1.3 Research objective

Explain to what extent autonomous household response dialogue with land-use plan objectives in pursuing urban resiliency in CDO, Philippines post-Washi. It aims to probe causal mechanisms relating to household-scale responses, and its relation to operationalizing resiliency objectives in land-use plan. Specifically, it expounds on how have households translated their context in resilience-building, how are land-use plan objectives communicated and adapted by households, and the extent the two causalities contribute to CDO's urban resiliency outcomes.

The objective of the study resonates from existing literature's research agenda of the need for a detailed case study expounding on how resilience from the perspective of household transitions from idea to action to output and outcome. The findings of this study shall contribute scientifically to better understanding households' context in the complex processes in pursuing resilience building objectives. (see Coaffee, Therrien, et al., 2018)

1.5 Provisional research questions

Main question: To what extent autonomous household responses dialogue with land-use plan objectives in pursuing urban resiliency in Cagayan de Oro City, Philippines after TS Washi in 2011?

Sub-question:

1. How do households comprehend urban flood resiliency post-Washi?
2. What have households done, or doing to pursue resiliency to flooding post-Washi?
3. What are the urban resiliency objectives in CDO's land-use plan post-Washi?
4. What are causalities that influence autonomous household response relating to becoming more resilient to flooding post-Washi?
5. How has the land-use plan objectives been communicated to and adopted by households in CDO post-Washi?

1.4 Significance of the Study

The new pattern where flooding has become an imminent threat to cities in Mindanao like CDO necessitates building urban resiliency to enable communities and households to withstand, recover, or bounce-forward from calamities. While climate change is considered a main cause of natural disaster, a core issue often put in the peripheries is that disaster is a by-product of underlying risk factors such as unmanaged urbanization processes, lack of regulations and enforcement (UNISDR, 2018) and exclusion of disaster survivors in bouncing-forward from disasters. (Murphy, Pelling, et al., 2018)

Literatures have pointed-out that there is growing interest in developing countries to address hazards and risks through convergence of strategic actions at the policy and resource mobilization level. (Mycoo, 2014) The study aims to understand a complex problem – urban resiliency – by zeroing-in on multiplicity of underlying important factors that allows systems, structures, and people in CDO to be robust in the event that natural hazards occur and in the aftermath of disaster, specially flooding, after TS Washi in 2011.

Specifically, it examines causalities and contextual conditions that activate translation of household context to actual response, and the level autonomous household response concretely facilitates or hinders in achieving desired urban resiliency outcomes as outlined in the land-use plan. Ultimately, lessons obtained from the study contribute to better understanding of interactions between urban development, flood risk management, and stakeholder convergence in building resiliency at household-scale. (van Veelen, 2016)

The study is also practical and relevant in planning and policy-decision on areas of urban resiliency, DRRM and CCA. It focuses on a subnational scope where most of urban managers and other decision makers face the challenge of pursuing urban development agenda in a setup where identification, prioritization, and allocation of budget for public investment is heavily top-laden. Intrinsically, a subnational (city) level study could better capture context-specific interests thus generating knowledge that have greater practical use. Furthermore, results of the study provide a scientific learning on the argument that on top of the characteristics of the pending risk is a system of interlinked socio-economic factors that build capacity to resist adverse impacts of hazards, and to recover and adapt from a disaster. In the process increasing resiliency and adaptive capacity.

In summary, the study delves into aspects of urban governance at a subnational level with emphasis on household response and the degree it relates to land-use plan objectives. This facilitates deeper understanding and better comprehension on what impacts ability of cities and communities to adapt to tougher changing times. Upon these premises that the paper will explore on how households in CDO are building urban resiliency especially to flood, and what worked and did not work post-Washi. It attempts to explain how awareness and understanding, outlined resiliency strategies and the extent these are resonated at the household-level affect fruition of urban flood resiliency objective of land-use plan.

Results of the study contribute in the knowledge gap by providing actual cases and explanation regarding what happens in building resiliency at household-scale. Hopefully, this serves as baseline in formulating a collaborative decision-making approach to governance.

1.5 Scope and limitation

The study is limited in terms of the theory, methodology, and scale of data. The study subscribes to the definition of urban flood resiliency as the ability of a system, community or household that is exposed to hydrometeorological hazards "to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions". It means the ability to "bounce" back or "spring" forward from a shock. (UNISDR, 2018, p.85). In addition, it is theoretically limited to definition of resiliency as the capacity of systems, structures, and processes to tolerate, undergo gradual change or fundamental modification in the face of future hazards and risk. (Matyas and Pelling, 2015) It must be noted that that this study ascribes to the school of though that fundamental resilience is more practical than against a specific hazard because it considers possibility of multiple trade-offs observable in various scales. (Chelleri, Waters, et al., 2015, Coaffee, 2013) With these premises, it will only focus on the context of household and how it plays out in the subsequent city's resiliency level by looking into resiliency outcomes pertaining to flooding, and materialization of land-use plan resiliency objectives.

It is limited in terms of methodology. While the study recognizes the complexity of how land-use planning is a political process, the study does not dwell, albeit attempts to explore, on socio-political factors that influences ability of managers, programs, and projects to fully function.

In addition, period of data gathering happens in June 2019 to July 2019 just after the local elections and during the transition of newly elected local government officials in the Philippines. This will have repercussion on institutional knowledge wherein incumbent key interviewees from local government units have limited or no knowledge on processes transpired from the onset of recovery post-Washi.

There are a lot of areas within Northern Mindanao that were significantly affected by Washi. Limitation on scale of data covers only households coming from Cagayan de Oro and were most badly hit by Washi. After narrowing down areas based on (1) magnitude of destruction to life and property, and (2) extent of affected individuals, barangays Balulang, and Macasandig are prioritized as case areas. Also included is Xavier Ecoville where most Washi survivors from affected areas are resettled.

Chapter 2: Theory Review

2.1 Introduction

The core concepts discussed throughout the research are resiliency, the different notions of it and its implementation gap; the advocacy for collection action towards resiliency and autonomous household response; urban flood resiliency in relation to the Washi phenomenon; and role of land use plan processes in linking resilience as an ambitious objective to urban governance as the case maybe in CDO post-Washi.

2.2 Resiliency and implementation gap.

At the onset, resiliency can be defined as ability of social system to effectively resist or adapt, and efficiently recover from perturbations caused by unusual and unexpected disturbances. (Coaffee, Therrien, et al., 2018, Matyas and Pelling, 2015, Meerow, Newell, et al., 2016) The definition better suits the research study since it puts into perspective the underlying dynamics of translating resiliency from ideation to action, individually or collectively, at the systemic level (Boin, Comfort, et al., 2010).

Resilience, as a concept and an approach, is a key policy response to vague and ever dynamic, often unpredictable, future hazards and risks. However, experts and practitioners in the resiliency field are caught in the vastness of its conceptual notion which, while provides versatility in its interpretation, undermines enforceability and relevance of resilience objectives. (Jabareen, 2013, Matyas and Pelling, 2015, Weichselgartner and Kelman, 2015) Conceptualizing resilience and applying it in different practices and approaches structure how it should be operationalized. (Coaffee, Therrien, et al., 2018)

City managers muddle through improving resiliency by dealing with underlying risk factors[2], and minimizing people's and assets' exposure and vulnerability to a set of chronic shocks and stresses. This is despite abundance of literature on characterizing urban resiliency, availability of tools in reducing risks faced by cities and communities, and capacitating population and systems to manage impact ensuring essential logistics and minimize economic losses. (Béné, Mehta, et al., 2018, Leitner, Sheppard, et al., 2018, Lipper, 2016, Meerow, Newell, et al., 2016)

This is more pronounced in cases where practitioners have to deal with relevant actors who are traditionally excluded in disaster risk management and therefore has relatively limited awareness and understanding of the importance of resilience. Local leaders contest traditional public administration values and process by challenging adaptive plans and strategies which often do not reflect realities of those in the grassroots. (Bourgon, 2009, Duit, 2016, Stark, 2014) Although, urban planners and managers, and resiliency practitioners fully acknowledge the importance of collaborating with individuals and organizations from very diverse discipline and working in different sectors. However, they gripe with the challenge of formalizing and institutionalizing flexible, diverse, and dynamic systems that minimize technical, bureaucratic and short-term compartmentalized working arrangements. (Coaffee, Therrien, et al., 2018)

[2] Associated with increased urbanization

This operationalization gaffe stands between realizing resilience as an arduous objective and a proven ability to direct resilience concretely at the urban level. (Coaffee, Therrien, et al., 2018, Wagenaar and Wilkinson, 2015) Duit (2016), as supported by other academic literatures (Anguelovski, Shi, et al., 2016, Bourgon, 2009, Jabareen, 2013, Leitner, Sheppard, et al., 2018, Ziervogel, Pelling, et al., 2017), posits that the gap in operationalizing resilience calls for a thorough review of approaches in public administration and governance. The rising popularity of resilience in governance framework sets in motion resiliency process that are often captured by prevalent paradigms where patronage politics and silo-mentality constrain transformation towards holistic working. This predicament is better understood in the context of capacity building and organizational development across levels in configuration where authority is devolved but not relinquished. (Stark, 2014)

These problems underpin urgency of governance model that gives meaning to collective experience and inclusiveness of decision-making that involves especially of the disaster survivors. Requisites are longitudinal evidence to understand temporal implementation challenges, comparative information on best practices, and guidelines in examining possible trade-offs corresponding to different resilience-building measures. (Normandin and Therrien, 2016, Chelleri, Schuetze, et al., 2015, Chelleri, Waters, et al., 2015) Pioneer approach to urban disaster risk reduction and climate change adaptation heavily focuses on the physical built and operates with only a handful of actors. A contemporary and proactive urban resilience ideally incorporates technical aspects of resiliency to both multidimensional and multi-scalar, posits a fundamental resilience rather than absolute, and rallies wide range of stakeholders into an optimal synergy of resource mobilization.(Coaffee, 2013)

The multifaceted nature of resilience constrains framing measurement techniques, and raises concerns on resilience of what and resilience to what, or resilience for whom (Meerow, Newell, et al., 2016, Vale, 2014) Furthermore, recent case studies worldwide point out that adaptive capacity and level of exposure are compromised in the attempt to build another's resilience. Even sometimes, resilience trade-offs result to an introduction of a new threat. A case in point why resilience should be put in a context of wider sustainability challenges including climate change, unsustainable urbanization, and social inequalities. (Chelleri, Waters, et al., 2015) Thus, demanding for transformative governance approaches that emphasize issues of social justice and capital in discussions of resiliency. Vital to this is the determination of actors who are active in building resiliency and the processes they undertake, and whether their configuration is reflected in governance structures and policy instruments. (Chelleri, Schuetze, et al., 2015, Henstra, 2012)

2.3 Operationalizing resiliency and the household configuration.

2.3.1 Collaborative decision making and collective action.

At the core of collaborative governance approach is the recognition of "complex systems which are capable of adapting, transforming and learning while navigating unpredictable evolution trajectories." (Chelleri, Waters, et al., 2015, p.182) Chelleri, Scheutze et al. (2015) postulates, after examining extreme potential vulnerability vis-à-vis rapid urbanization in neglected

Mexican neighbourhoods, multiplicity in adaptive capacity even within the same scale and context of a given population. Therefore, understanding what builds and limits adaptation and transformation is necessary in operationalizing sustainable transformation in order to manage various approaches and differing scales of resilience. (see also Bahadur and Tanner, 2014, Béné, Mehta, et al., 2018, Berkes and Ross, 2016)

Additionally, resilience at community level demands unequivocal importance because (i) developing and engaging local resources by community members for co-existence with uncertain future risks is practicable (Berkes and Ross, 2016) and (ii) transitioning towards decentralized resiliency-building necessitates transfer of responsibilities and control to households. (Chelleri, Waters, et al., 2015)

It must be noted that community resilience consists of autonomous household responses, and does not exist in isolation. It is affected by an integrated and interdependent place-specific set of contextual conditions – multiplicities of levels, actors and institutions; vertical and horizontal interactions; heuristic connections. (Nunan, 2018, see also Pelling and Manuel-Navarrete, 2011)

In particular, autonomous household response are direct measures by households regarding the need to adapt to hazards. These are often conjectured from views that national and municipal states' capacity to arrest climate-related threats and risks is prolonged. (Elrick-Barr, Smith, et al., 2016, Murphy, Pelling, et al., 2018, Mycoo, 2014, Qin, Romero-Lankao, et al., 2015) Thus, autonomous household response refers to households' ability to independently, timely and efficiently prevent, minimize, accommodate or recover from impacts of a hazard.

Furthermore, independent responses occurring outside formal policy channels are more prevalent among the poor in low-income countries. (Mycoo, 2014) Unfortunately, there is limited knowledge on household-scale resiliency measures especially in developing countries. (Bahadur and Tanner, 2014, Elrick-Barr, Smith, et al., 2016, Murphy, Pelling, et al., 2018, Mycoo, 2014, Qin, Romero-Lankao, et al., 2015)

2.3.2 Autonomous household response to resiliency problem.

City dwellers and economic activities grapple with new reality that calamities are not anymore rare unexpected occurrences. As a result, households and collectively as communities are compelled to formulate strategies that build neighborhood resiliency and support individual agency on the basis of distributive decision making. (Usdin, 2014)

Goldstein, et. al. (2015) examined how communities enhance resilience within complex urban systems and suggest that drawing on knowledge from different experience and shared meaning is essential for resilience. Required knowledge is specific to households and is articulated and reshaped collectively at the community level. This intrinsic characteristic is vital in developing a better understanding of households with their complex status quo and possible futures. As households struggle together in comprehending temporal and spatial context, they develop a better understanding of what influences their view regarding possibilities for changes that can be achieved, establish new relationships and shared goals, and "revise assumptions underlying institutional norms, rules, and practices." (Ibid., p. 1298)

However, Murphy et al. (2018) emphasize that while local understanding has broader significance in building back better communities, reported perspectives of survivors regarding operationalizing resilience resonates only at the level of individual needs and priorities. These

often comes in structural and non-structural measures pertaining to future proofing functions, structures, and processes. (Matyas and Pelling, 2015) In the analysis of Murphy et al. (2018) on eight humanitarian interventions across seven developing countries, including the Philippines, they found out that this certain predicament does not usually translate to transformative change-actions that challenge fundamental issues of associated risk. Thereby, perpetuating present vulnerabilities and restricting equitable and sustainable development.

Mycoo (2014), in her study of actual urban household response in Georgetown, Guyana, reveals that households independently respond to risks and vulnerabilities mainly as a result of perplexed action between central and local governments. Often these spontaneous adaptations are reactive response (see also Berrang-Ford, Ford, et al., 2011) and could undermine urban planning and counterproductive to urban adaptation strategies for climate change. Furthermore, the lack of coordinated action in all tiers of government in developing countries yields disarrayed household initiatives, non-compliance of land use plans and regulations, and does not promote self-regulation. In addition, households, including the urban poor, in low-income countries will most likely bear the brunt of adaptation and protection of their assets against hazards.

Independent actions by household are shaped by perception of risk, notion of climate change and resilience, tenure of household, and past experience of a disaster. However, these are also restrained by limited community cohesion, lacking spatial and technical knowledge sets, and weak forward planning and implementation regarding resiliency building. (Elrick-Barr, Smith, et al., 2016) Admittedly, spatial planning plays a fundamental role in interceding complex and interconnected resiliency systems interests including interdependence between numerous actors, scales, and risks in a dynamic built, socio-economic, institutional, and political environment. (Mycoo, 2014) While, there has been an increasing interest on household local responses to hazards and risks, (Qin, Romero-Lankao, et al., 2015) institutions and government responses still possess better capacity and resources to proactively pursue higher forms of resiliency through spatial and land use planning. (Elrick-Barr, Smith, et al., 2016)

2.4 Urban flood resiliency and the case of tropical storm Washi

2.4.1 New norm for Mindanao

Rodolfo et al (2016) studied extreme weather patterns in Mindanao and conclude that from 1990 to 2015, rate of landfall has doubled from one in every 2.5 years to one in every 1.32 years. The finding paints an ominous situation wherein Mindanawons[3] have to brace for harsher weather. Case in point is Washi and the devastation it caused in CDO.

In an unheard turn of events during 2011, Washi ravaged the island of Mindanao with CDO as the most damaged area. (RDC-Northern Mindanao, 2012) Washi was classified as typical of a tropical storm that enters the Philippine area of responsibility[4] (PAR). With winds reaching around 75 km/h and amount of rainfall usual for tropical storms that enter PAR, Washi is categorized only as a tropical storm. It neither was a severe tropical storm nor strong typhoon.

[3] People living in Mindanao

[4] area in the North-western Pacific where the Philippines' national meteorological agency monitors weather occurrences.

However, Washi produced roughly twice the average amount of monthly rainfall that hit Northern Mindanao in just a period of six hours. (Rasquinho, Liu, et al., 2013, Espinueva, Cayanan, et al., 2012) The heavy downpour inundated the capacity of river system to retain water triggering riverine flood. Saturation of soil infiltration capacity exacerbated the river flooding, triggering a flash flood that gushed huge amount of water that carried logs, uprooted vegetation and other debris downstream and washing out communities and properties along Cagayan de Oro river.

At the wake of the calamity, Washi claimed 674 lives of Kagayanons[5] with approximately 1,000 people missing, overall damage of US$ 104M in all sectors of affected areas. Washi also destroyed 5,801 houses while partially damaging 12,635, displacing around 228,576 persons (equivalent to 40% of the CDO's total population). (Carrasco, Ochiai, et al., 2016a, OCDRRMC-Northern Mindanao, 2012, RDC-Northern Mindanao, 2012) Washi's seemingly innocuous characteristic and its aftermath of being Philippines' most deadly and second most deadly tropical cyclone worldwide in 2011 strike an alarm for governments, individuals, and the scientific community. (Espinueva, Cayanan, et al., 2012)

A number of literature (Carrasco, Ochiai, et al., 2016a, Espinueva, Cayanan, et al., 2012, Rasquinho, Liu, et al., 2013, Yonson, 2017) investigate this phenomenon and point out that the disaster is a result of interplay among urbanization-related factors relating to environmental, climactic, and socio-economical.

It is noteworthy majority of affected households are informal settlers and low-income families. More positive economic outlook enticed people to migrate to CDO in hopes of landing better opportunities. The burgeoning population drove people, mostly from lower income, to live in high-risk areas including floodplains, former mangrove areas, dried-up riverbed, and sandbars.

The disconcerted management of rapid urbanization and industrialization also lead to unplanned construction of roads, buildings and other concrete structures. These inadvertent concretization and poor maintenance of critical infrastructures restrained soil infiltration capacity. Natural flow of water was either obstructed by clogged built drainages or prevented by other cemented structures.

Another critical factor is the shallowing of the Cagayan de Oro river particularly in Balulang and Macasandig, low-lying populated areas. A flash flood was already triggered upstream and ensued widespread river flooding throughout the city. The post-disaster needs assessment report by the Disaster Risk Reduction and Management Council (2012) noted operations relating to logging, mining, and short-term crop production in the upstream are to be blamed for the detriment of the watershed.

In addition, small-scale and commercial industrial sand and gravel quarrying near the river mouth were permitted by the local government but not concurred by the Department of Environment and Natural Resources-Mines and Geosciences Bureau (MGB). These

[5] People living in Cagayan de Oro city

anthropogenic activities lead to erosion and sedimentation in the rivers and subsequently hampered river's water storage capacity.

Lastly, most of the literature agree that the long history of Mindanao not experiencing extreme weather or major flood disaster have created a false sense of security. Kagayanons have become complacent despite notices about an incoming tropical storm. Further, the city lacked flood warning system even in communities that are frequently flooded. Rapid urbanization and a number of unchecked improper land use disrupted behavior of river systems, reduced natural capacity of water retention, and exposed people to a wide-array of flooding hazards and risks.

2.4.2 Urban Flood resiliency

Recent literatures underline urban flood resiliency as the capacity to manage extremes of water. Essential to future-proofing flood risk management is optimizing resources, creating linkages and synergies among stakeholders, accepting notions of failure, and continuous monitoring and adapting to uncertain future conditions. (Zevenbergen, van Herk, et al., 2017) All these notions are considered in the building back better plan of the local government following Washi in 2011.

Figure 1. Milestone relating to resiliency building in CDO post TS Washi
Source: NDRRMC, OCDRMMC, CDO City Council

The Strategic Action Plan (SAP), endorsed and approved by the Regional Development Council of Northern Mindanao[6], encapsulates in broad strokes what it means for CDO to be more resilient to flooding. In a nutshell, recovery and reconstruction post Washi involves rebuilding better communities, restoring social and economic activities, managing disaster risks, and effectively directing future development. SAP also underlines significance of empowering communities through honing local capacities, facilitating adaptability, and ascertaining root causes and vulnerabilities to disasters. (RDC-Northern Mindanao, 2012)

[6] The Regional Development Council is the highest policy making body at the sub-national level. It is composed of all provincial governors, city mayors and mayors of provincial capital towns within the region. And, 25% of its total members should come from the civil society organizations and private sector groups pursuant to the Local Government Code of the Philippines.

Carrasco et al. (2016a), in their study of the complex interactions among different stakeholders involved in post-Washi recovery, point out that materialized interventions[7] mainly consist of resettlement areas in higher grounds while enforcing the no-build zone where people used to live. This is primarily caused by pressure to deliver quick results, limitation on competency and time, and the urgency to report prompt achievements to either the national government or donors.

Susceptibility of Kagayanons to major flood disasters is linked to trends of in-migration, unchecked city boom, and informal settlements sprawling into high flood-risk areas. As a response in building flood resilience, the local government decided to focus on relocating people living within the proximity of Cagayan river to safer, higher grounds. However, interventions only concentrate on long-term housing solutions to informal settlers. Leaving other crucial factors that build flood-resilient systems ambiguous. (Carrasco, Ochiai, et al., 2016a, Rasquinho, Liu, et al., 2013, Yonson, 2017) This can pertain to other resilience enhancement mechanisms relating to structural and non-structural, (Cerè, Rezgui, et al., 2017) or elements that future-proof flood risk management such as doing more with less, seizing the opportunity, designing for failure, and monitoring and adapting. (Zevenbergen, van Herk, et al., 2017)

Finally, van Veelen (2016) argues that necessary in understanding interactions of urban development and flood risk management is constructing urban flood resiliency in a multi-scalar temporal and spatial context. This better understanding can better inform decision-making in enhancement of overall resilience that unlocks economic potentials and greater social inclusion by designing and financing critical interventions that develop resilient cities.

2.5 Land-use plan and planning process

Exponential increase of risks globally is attributed to increasing population and infrastructures locating in urban areas with high exposure to hazards. Furthermore, destructive consequence of disasters is a by-product of demographic and economic pressures on attaining highest and best use of land. This is mostly observed in densely populated areas along coasts, rivers, and mountains. (Sudmeier-Rieux, Paleo, et al., 2015, van Veelen, 2016) New urban uncertainties challenges methods, principles, and scope of planning. Land-use plan and planning continuously challenges its usual approaches to come to terms with this reality and involve a significantly dynamic and complex component of uncertainty. As a result, planning has a wider role in cities coping with associated environmental risk from climate change. Thereby further suggesting that spatial planning should increase awareness of climate change hazards in order to acknowledge the risk it poses to not just the built environment, but also to households and communities. (Jabareen, 2013) Cere et al. (2017) share this purview with emphasis on geo-environmental hazards and the importance of a multi-disciplinary and holistic approach to designing urban environment with respect to its fabric (structure), systems, and occupants.

[7] Please see annex A for details on land use objectives as stated in the comprehensive land use plan

Risk-sensitive land use planning is another breakthrough that is integrating spatial planning, adaptation, and sustainable urban form and landscape architecture. Learning from the cases of Nepal, Spain, and Vietnam, Sudmeier-Rieux (2015) asserts that risk sensitive planning can be considered an instrument for striking balance between accepting some risk for economic gain while employing nature-based solutions for protection and reduction of exposure. Critical is zeroing-in on interlinked drivers of exposure[8], provision of market-based and/or financial incentives, and participation of stakeholders.

However, Anguelovski, Shi, et al. (2016) caveats that urban land-use planning for resiliency building may worsen socio-spatial inequality. Their study investigated land-use planning processes vis-à-vis climate adaptation in eight cities from different countries (from both the global north and south) and found out that setting resilience into practice sometimes result to novel approach to resiliency building which often disregard social justice by acts of commission and omission (see also Ziervogel, Pelling, et al., 2017) or "sustainability challenges related to the built environment, urban metabolism [within and outside of city boundaries], and liveability and quality of life." (Chelleri, Waters, et al., 2015, p.183)

On the other hand, Jabareen (2013) clarifies the pre-requisites in utilizing land-use planning and unlocking potential benefits resilient cities enjoy. Firstly, analyse and identify hazards, elements exposed to hazards, scale of informality, demography, uncertainty and spatial distribution of vulnerability. This results to mapping of risks and vulnerabilities in a spatial and socio-economic context. Next to vulnerability assessment is re-conceptualizing urban governance to accommodate uncertainties and complexities of future risks and vulnerabilities. Fundamental shift of urban governance to a more holistic approach to urban resilience is critical. The third prerequisite is incorporating preventive measures relating to environmental hazard and climate change impacts in various governance approach. Lastly, planning should acknowledge and incorporate vagueness of future hazards and risks to make room for adaptation.

Santiago, et. Al (2018) conducted a comparative study on the different post-Washi recovery initiatives in CDO. Noted in the study is that decision-making process relating to post-recovery approach was heavily top-down. The prioritization of resettlement is also directly attributed to government's response to extreme hazard exposure of the affected communities. Subsequently, these areas were declared "no-build zones" and completely banned all sorts of usage of land for residential purposes.

Unfortunately, demarcation of these zones was reported to be inconsistent with the city zoning and identified high risk zones. (Carrasco, Ochiai, et al., 2016b) On the contrary, some of the affected areas continue to be residential areas despite the foreboding risks because residents have formal ownership of the property.(Carrasco, Ochiai, et al., 2016a) This has serious implication to post disaster recovery and reconstruction.

[8] economic liberalization, urban expansion, weak public institutions

In view of the foregoing, land-use plan, planning and development processes should reconsider in viewing affected communities as active actors which, on their own, have some capacity and competency to pursue resiliency measures. A shift from the traditional paradigm where the affected are considered helpless and that the only choice for reconstruction is through assistance. (Carrasco, Ochiai, et al., 2016a, Carrasco, Ochiai, et al., 2016b, Santiago, Manuela Jr, et al., 2018)

Implicitly, national and local governments should acknowledge that responsibility of post disaster recovery and reconstruction do not anymore solely rely on them. There are networks of actors who can co-create and collaborate in the undertaking. Such endeavor can be delegated to the business sector, and even the households themselves through proper land-use planning. (Sudmeier-Rieux, Paleo, et al., 2015)

2.6 Summary and conceptual framework

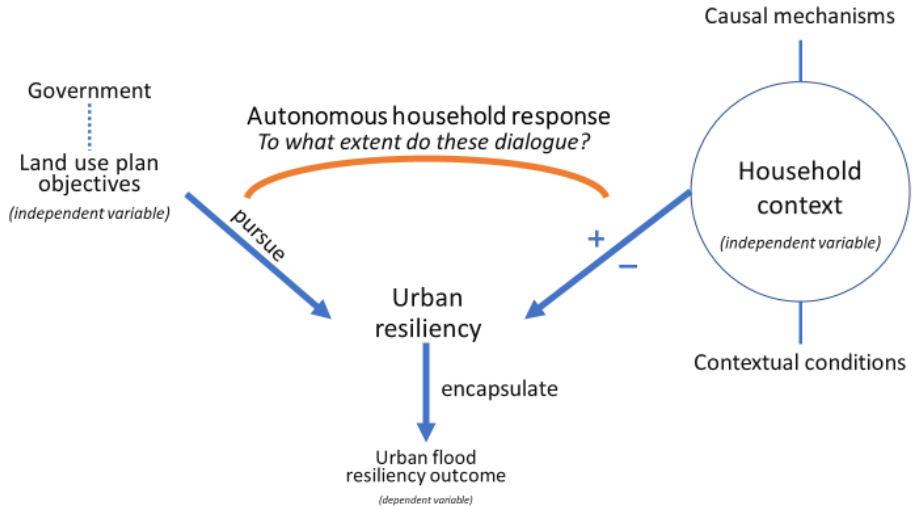
The previous sections have established that conceptual notion of resiliency has evolved from a reaction to imminent threat to holistic approach of undergoing incremental or fundamental transformation that enables structures, systems, and processes to resist, recover, or bounce-forward in the face of future hazards (Coaffee, Therrien, et al., 2018, Matyas and Pelling, 2015). In particular to flooding, urban flood resiliency entails ability to optimize extremes of water in unlocking economic potentials. (Dolman and Ogunyoye, 2018, UNISDR, 2018, van Veelen, 2016) Decisive to realizing all these is understanding the process by which a wider array of stakeholders', especially those who are traditionally not involved in resiliency building, ideate flood resilience and translate it to tangible measures until its fruition. (Bahadur and Tanner, 2014, Béné, Mehta, et al., 2018, Duit, 2016)

Urban areas are of special interest for resilience given its social, cultural, and economical significance. In addition, urban areas have an increasing pressure to appropriately design physical, institutional, and political arrangements relating to use of land and its resources because people and economies tend to agglomerate. (Gera, 2018) As a result, land-use plan and planning become potentially important in integrating uncertainty of future hazards and risk into management of urban economies. (Jabareen, 2013, Sudmeier-Rieux, Paleo, et al., 2015)

However, lack of coordinated efforts from governments and urban managers force households and businesses to autonomously respond to resiliency objectives which often are myopic and detrimental. Most notably in poor households, independent responses happen outside context of formal instruments. (Elrick-Barr, Smith, et al., 2016, Goldstein, Wessells, et al., 2015, Mycoo, 2014) This reinforces the need to address the implementation gap and by underscoring necessity of a new governance approach that results to collaborative decision making in operationalizing urban resilience objectives. (Bosher, 2014, Meerow, Newell, et al., 2016, Vale, 2014) Imperative is the understanding of resiliency building at the context of households since capacity to respond to uncertain hazards and risks at the national, and city level is protracted. (Berkes and Ross, 2016, Chelleri, Waters, et al., 2015, Elrick-Barr, Smith, et al., 2016)

This study emphasizes on understanding household context, its transition to becoming an autonomous household response, and this process played-out in pursuing urban resilience objectives and the realization of resiliency outcomes. Figure 2 highlights grounded theories and concepts that draw out from the extensive discussion in this chapter. The evolution of resiliency-thinking demands a transformative and collaborative decision making. Fundamental to achieving this is understanding how households conceptualize, translate, and realize modes of urban resiliency to attain urban flood resiliency outcomes. Lastly, pivotal in revising resilience thinking is probing contexts and mechanisms concerning resilience-related phenomena. (Hedström and Swedberg, 1996)

Figure 2. Conceptual framework



This study investigates autonomous household response as part of a baseline study that hopefully leads to formulation of a collaborative decision-making approach to urban governance. The complex process of resiliency-building is unraveled through explaining how household context in CDO, affected by sets of causal mechanisms and contextual conditions, relates to operationalizing resiliency targets of land-use plan through dialoguing with its objectives and urban flood resiliency outcomes post-Washi. Dialoguing connotes extent of relation and interaction of land-use plan objectives and household context to produce actual outputs and outcome.

Eventually, findings go back to how political institutional, and socio-political processes are critical in the ability to produce and maintain public and equitable goods and services in a complex and changing configuration. (Duit, 2016) Crucial is the emergence of a resilient governance structure and how it affects delineation of what needs to be resilient and when something may become resilient. Equally important are developing and exploring competing models of resiliency-building and how it is generated and eroded. Only then can practitioners and city managers integrate wider use of resiliency-building within public administration. (Ibid.) Especially that global literatures point out that institutional and government response have higher potential to address root causes of risks compared to individual and household approach to local response. (Mycoo, 2014)

Chapter 3: Research Design and Methods

3.1 Introduction

The unprecedented devastation caused by Washi in CDO makes an excellent case study. Previous chapters of this study have established that inter-related ecological, physical, and social-economic factors exacerbated devastation caused by flash flood and city-wide river flooding. A dire situation that could have been avoided if only rapid urbanization was adequately directed. Finally, it has been proven by existing literatures that those affected by Washi are not helpless themselves and have the capacity to rise above the calamity.

3.2 Research questions

3.2.1 Main question

> To what extent autonomous household responses dialogue with land-use plan objectives in pursuing urban resiliency in Cagayan de Oro City, Philippines after TS Washi in 2011?

We go back to the objective and main question of this research, explain behavior and context of households in CDO and the extent these play out in the pursuit of building urban resilience to flooding after Washi in 2011. Moreover, to what extent do autonomous household response dialogue with land-use plan objective in becoming resilient to flooding post-Washi. Answers sought will help unpack the complex process of building resilience. Hopefully, guiding those mandated by law to spearhead resiliency - governments, city managers and planners - in creating a shared vision of a resilient city for everyone.

3.2.2 Sub – research questions

1. How do households comprehend urban flood resiliency post-Washi?
2. What have households done, or doing to pursue resiliency to flooding post-Washi?
3. What are the urban resiliency objectives in CDO's land-use plan post-Washi?
4. What are causalities that influence autonomous household response relating to becoming more resilient to flooding post-Washi?
5. How has the land-use plan objectives been communicated to and adopted by households in CDO post-Washi?

We investigated (1) how households comprehend urban flood resiliency, (2) what have households done, or doing to pursue resiliency post TS Washi, and (3) causal mechanisms that influence autonomous household response. On the other hand, we also examined (4) what are the urban resiliency objectives in the city's land-use plan, and (5) how has these been communicated and adopted at the households' level especially those located in high risk areas along Cagayan de Oro river.

The independent variables are household-initiated interventions, land-use plan objectives, and the extent to which they dialogue. The interaction of these variables affects urban flood resiliency outcome (dependent variable) in Cagayan de Oro city after Washi. Autonomous

household response is the interplay between household context relating to notion of urban resiliency, and actual household-initiated interventions to become more resilient to flooding. Land-use plan details strategies that pursue urban resiliency, and affects flood resiliency outcomes post-Washi. Meanwhile, dialoguing between aforementioned factors (a causal mechanism) provides in-depth information regarding attainment of flood resiliency outcomes.

3.3 Research strategy

Case study as a research strategy is essential because the research aims to probe implementation gap regarding operationalizing urban resiliency objectives. In particular, the research employs a causal process tracing whereby we examine how theoretical causal mechanisms and factors allow linking of causes and effects together. (Beach, 2017) Facilitating greater understanding of causal mechanisms that results to resiliency outcomes that households have pursued following tropical storm Washi.

Literature refers to causal mechanisms as not causes per se, but rather causal processes that links causes with outcomes in dynamic contextual conditions and is triggered by varying elements. (Ibid.) In this research, causal mechanisms are involved in households' ideation to action to output and resiliency outcome. While, contextual conditions are shaping responses and the extent it engages with land-use objectives. While various literatures emphasize that implementation gap pertains to the need for a transformative and collaborative urban governance nexus, (Berkes and Ross, 2016, Duit, 2016, Coaffee, Therrien, et al., 2018, Meerow, Newell, et al., 2016, Nunan, 2018) critical reflection on chapter 2 points out that resilience at community level fosters concept of shared responsibility and yet scientific knowledge regarding resiliency measures at household-scale is scarce. (Bahadur and Tanner, 2014, Béné, Mehta, et al., 2018, Berkes and Ross, 2016)

As such, and aside from limitation on period for the conduct of research and available resources, data gathering concentrated on understanding household responses in CDO. The researcher recognizes that households do not fully represent all relevant stakeholders. Thus, it is with hope that results may serve as base study in crafting the transformative and collaborative urban governance nexus.

Finally, desk research is utilized during the preparatory phase of this research. Key informant interview, data analysis, and triangulation of key findings shall be used. Related literature regarding post-Washi recovery and reconstruction in CDO, reports and internal documents from mandated government offices, and credible NGOs are main sources of secondary data.

3.4 Operationalization: variables, indicators

Operationalization of concepts to focus variables are drawn from various literatures.

Household context are converted into responses depending on perception of households regarding object (what is supposed to be resilient) and notion of resilience (what makes object vulnerable and when does it become resilient.) (Duit, 2016) Moreover, responses to hazards and risks involve structural and non-structural measures. The former concerns engineering solutions to built environment while the latter is any other interventions that address

vulnerability, increase adaptive capacity and recoverability.(Cerè, Rezgui, et al., 2017) Rounding up autonomous household response is the need to develop capacity to respond, be resourceful, and learn. “Heuristic connection” is associated with critical reflexivity detailing how households integrate learning and realize notions of resiliency-building. (Matyas and Pelling, 2015, Mycoo, 2014)

Land-use plan objectives could potentially facilitate collective action by localizing modes of resilience (Murphy, Pelling, et al., 2018) and integrating into economic development and urban sustainability. (Chelleri, Schuetze, et al., 2015, Sudmeier-Rieux, Paleo, et al., 2015) Important to fulfilling this is the analysis of governance landscape - who are involved in the design and implementation of objectives - and mechanisms that effect vertical and horizontal interactions.

Lastly, It is most practical to contextualize resiliency as fundamental rather than specific to a particular hazard. Broader framing provides attention on ripple effect that may induce possible trade-offs across multiple scale. (Chelleri, Waters, et al., 2015, Coaffee, 2013) This study uses level of resiliency through urban flood resiliency outcomes in CDO post-Washi since flooding pose perennial threat to the city. (CDO city government, 2015) Status of resilience is done by examining subsequent flooding experiences and categorizing whether households were able to resist or withstand, absorb and recover, or transform. (Matyas and Pelling, 2015)

Proceed to next page for operationalization table

Table 1. Operationalization table

Concept	Definition	Variable	Indicators	Data source	Data type	Data collection method
Household context / Autonomous household response (independent variable)	Ability of households to independently respond to urban resiliency challenges. This response is influenced by household conceptualization and concretization of urban resiliency notions, and critical reflexivity.	**a. Perception of households**: how do households comprehend urban flood resiliency	1. Object of resilience: what is supposed to be resilient? a. Social functions b. Physical structures c. Institutional processes 2. Notion of causes of flooding: What causes flooding? a. Clogged built drainage / canals b. Location/Area c. Unnecessary concretization / impermeable surface d. Lack of infrastructures e. River degradation f. Improper solid waste management	Primary (applies to variables a,b,c)	Quantitative	Questionnaires, actual observation,
		b. Resiliency building initiative: what have households done/have been doing to be more resilient to flooding.	1. Structural measures a. Modification of existing structures b. Construction of new structures 2. Non-structural measures a. Participation to seminars, workshops, and trainings b. Integration of learning c. Advocacies d. Acquiring tools and equipments		Qualitative	Semi-structured interviews, key informant interviews, actual observation

		c. Heuristic connection: how do households integrate learning and realize notions of resiliency-building.	1. Availability of financial instruments a. Self-financed b. Loans c. Donations or subsidies 2. Tenurial arrangements a. Private b. Shared facilities c. Communal d. Public 3. Access to technical assistance or knowledge-base	Secondary (applies to variables a,b,c)	Qualitative	Desk research: related literature on rehabilitation and reconstruction, disaster risk reduction and management, climate change adaptation in CDO post-Washi
Land use plan objectives (independent variable)	Urban design that accommodates future risks into development promotion	**a. "biophysical" system of governance**: who are involved in ensuring implementation of objectives?	1. Awareness of land use plans 2. Participation to government-initiated activities 3. Households' perceived significance of land-use plan	Primary (applies to variables a,b)	Quantitative	Survey questionnaires
					Qualitative	Semi-structured interviews, key informant interviews
		b. Multiplicity of networks: what are mechanisms that encourage interactions?	1. Perceived duty-bearers 2. Platforms for collaboration (frequency of consultative meetings, availability of	Secondary (applies to variables a,b)	Quantitative	Desk research: official documents from government units, NGOs, funding organizations

		(horizontally and vertically)	minutes of meeting, documentation of collaborative efforts) 3. Presence of multi-sectoral organizations		Qualitative	Desk research: related literature on rehabilitation and reconstruction, disaster risk reduction and management, climate change adaptation in CDO post-Washi
		c. Integration of economic development and sustainable land-use: what are outlined strategies designed to strike balance between pursuit of progress and resilience?	1. Identified objectives 2. Outlined strategies 3. Priority projects and programs	Primary	Qualitative	Semi-structured interviews, key informant interviews
				Secondary	Quantitative	Desk research: official documents from government units, NGOs, funding organizations
					Qualitative	Desk research: related literature on rehabilitation and reconstruction, disaster risk reduction and management, climate change adaptation in CDO post-Washi
Urban flood resiliency outcomes in relation to urban resiliency (dependent variable)	Integrated approach to co-existing with water sensitivities (reducing risk while maximizing benefits). Also, the capacity to resist, withstand, absorb and recover from effects of a hazard.	**Level of resiliency:** aftermath of succeeding tropical storms post Washi.	1. Frequency of flooding 2. Extent of damage 3. Recovery mechanism	Primary	Quantitative	Survey questionnaires
					Qualitative	Semi-structured interviews, key informant interviews
				Secondary	Quantitative	Desk research: official documents from government units, NGOs, funding organizations
			4. Status of resilience a. Precursor (resist/withstand) b. Adaptive (absorb and recover) c. Transformative (fundamental restructure)		Qualitative	Desk research: related literature on rehabilitation and reconstruction, disaster risk reduction and management, climate change adaptation in CDO post-Washi

3.5 Data collection and sample size and selection

This research takes on a case study with a sampling frame of households in areas most badly hit by Washi and their corresponding responses to the urban resiliency challenge. The intent is to extract practical and strategic learnings from the phenomenon by examining unique case scenarios where the absence of essential causal and/or contextual conditions led to most damages to life, property, and economy, and presence of underlying forces afterwards that influence autonomous household response.

Data gathering was done in three phases. The first phase is the selection of case areas through desk research and interviews with local government units. Desk research involved content analysis on Washi post-disaster needs assessment and other official reports from City Disaster Risk Reduction and Management Office (CDRRMO), Office of the Civil Defense (OCD), and National Economic Development Authority (NEDA). The interviews with officials from frontline local government units concerned with urban resilience supplemented results of desk research. As a result, barangays Macasandig, Balulang, and Ecoville resettlement area are identified case areas.

Table 2. Overview of case areas
Sources: (Carrasco, Ochiai, et al., 2016a, CDO city government, 2015, RDC-Northern Mindanao, 2012)

CASE AREA	BRIEF DESCRIPTION
Macasandig	Sitio Cala-cala in barangay Macasandig is the ground zero for Washi. Cala-cala had a population of 23,310 in 2010. Except for the lone surviving structure that serves as a reminder of the tragedy, any building is prohibited as it is part of the declared no-build zone.
Balulang	Just on the other side of the riverbank, Balulang is also one of the most badly hit areas during Washi. Unlike the case area in Macasandig, a number of subdivisions or villages are located in this barangay with most of its households possessing formal property tenure. Both sides of the riverbank were identified by CLENRO as the low-lying area where river was most shallow due to sedimentation and erosion of riverbanks.
Xavier Ecoville Resettlement Project	Xavier Ecoville Resettlement Project is a special resettlement project initiated by Xavier University – Ateneo de Cagayan, a private university. It is considered as the first university-led resettlement project in the world and serves approximately 2,800 people from high risk areas of CDO. A total of 568 households are awarded with housing units. These households were greatly affected by TS Washi and had to go rigorous screening processes before they were given new permanent houses.

Second phase involved conducting a face-to-face structured interview through questionnaires It took an average of 25-45 minutes to complete administering the questionnaires. Questionnaires gathered data on how households in high flood-risk areas comprehend urban flood resiliency, which measures were taken after Washi in 2011, and what extent their level of engagement is to land use plan objectives. Cluster sampling in determining respondents is used in barangays Balulang and Poblacion. Households within the no-build zones, highest level of flood water or easement from riverbank characterized actual sample.

Meanwhile in Xavier Ecoville, self-selection is utilized whereby respondents are chosen based on voluntary participation. Beneficiaries go through a stringent selection process that validate their status as heavily affected by Washi. Hence, households have comparable characteristics, making any of them exhibiting similar criteria with sample from other area. Furthermore, researcher worked with local authorities in charge with the resettlement project and land-use planning to assure consistency of household sample.

Last phase of fieldwork utilized semi-structured interviews with key informants from household sample, frontline local government units, and civil society organizations. Semi-structure interviews took an average of 45-60 minutes. These allowed generation of in-depth information and granted opportunities to discuss factors affecting household response and resiliency outcomes that still remain unknown or might have overlooked despite diligent review of related literature. Further, it helps substantiate information needed to create rich and detailed storyline of how resiliency outcomes of households temporally unfolded. Enabling us to theoretically unpack and empirically trace complex interaction between household response and resiliency outcomes.

Purposive sampling is utilized in determining key informants. Eight out of the total 96 households were chosen for an interview based on extent of knowledge and uniqueness of experience with regard to urban flood resiliency. Three respondents are working or have worked with and for communities affected by Washi, three respondents are entrepreneurs or engaged in business ventures, and one respondent each for people with disabilities and women's sectors. In addition, eleven officials from local government units considered as frontline offices in relation to urban resiliency and seven development workers from civil society organizations (CSO) were interviewed. CSOs tapped are umbrella organizations who worked mostly on strengthening local governance structures, protecting and advancing management of watershed, and improving quality of life of Washi survivors.

Table 3. Breakdown of respondents for key informant semi-structured interviews.

Organization	Number of interviewees
Local government unit	
City Disaster Risk Reduction and Management Office	1
City Housing and Urban Development Department	1
City Local Environment and Natural Resources Office	2
City Planning and Development Office	2
Office of Civil Defense – Northern Mindanao	1
Socialized Housing and Finance Corporation	1
Civil society organizations	
Balay Mindanaw Foundation, Inc.	3
Balulang Women's Development Council	1
Cagayan de Oro Riverbasin Management Council	2
Xavier University Ecoville project management team	2
Household representation	
Community leaders / local authorities	2
Household	8
Total	26

Rounding-up data gathering techniques used is actual observation. Researchers and enumerators administered questionnaires to households face-to-face which allows direct observation regarding resiliency-building measures in real life setting. Recorders, and at times camera phones, were used during KIIs and fieldwork permitting more accurate capture of gathered data.

3.6 Validity and reliability

Extensive review on related literature regarding state-of-the-art theories on urban resiliency, urban flood resiliency, and land use planning assured that identified variables, indicators, and operationalization were done thoroughly and appropriately.

Case study research puts extra emphasis to specific contexts of research subject which makes it difficult to generalize key findings to other situations. (Van Thiel, 2014) Triangulation of key findings was done to resolve limitation regarding context-heavy. Postulations using the correspondence between hypothetical and collected empirical observations were compared to existing theories from literature.

Also, chapter 3 serves a case study protocol. The case study protocol documents steps taken, and sources of data utilized throughout the duration of the study for transparency purposes. Consequently, other researchers can track and review the whole process to assure that research is conducted in a systematic manner.

Face-to-face interviews can give rise to issues of participant error and bias. To minimize these, interviews were done in venues where respondents can be most comfortable in sharing

information. This include established prior rapport, conducted interviews on most convenient time and in areas where discussing subject matters felt safe. In addition, the researcher and enumerators are from CDO and all data collection tools are translated to the local language.

Researcher run risk of compromising objectivity as the research prolongs over a period of time. Interviews were scheduled with consideration to time intervals that provide ample period for rest, and appropriate handling of gathered data. Each enumerator[9] was only required to accomplish five questionnaires within period of eight hours. Every after filled-up questionnaire, enumerators reviewed response to quality-check data. Also, KIIs were scheduled in such a way that there were no more than 2 interviews per day.

A briefing and de-briefing were given to the enumerators to level-off expectations, fieldwork objectives, and further process actual observation. Furthermore, researcher worked with local authorities throughout fieldwork and initial findings were presented back to key informants to manage research error and bias. Altogether, interference with research situation, subjectivity and selectivity is lessened.

3.7 Data analysis techniques

Quantitative and qualitative data collected using structured interviews through questionnaire survey were processed using descriptive statistics and coding.

By measuring frequency, central tendency and variability of responses, we can extract trends and patterns. gauge how household respondents ideate urban resiliency in principle and practice, enumerate common notions of resiliency-building measures, and perceived level of awareness regarding resiliency objectives of land-use plan and subsequent resiliency outcomes. The descriptive statistical analysis initially explains perception and comprehension of household regarding urban flood resiliency, kinds of resiliency measures, and causal mechanisms and contextual conditions that impact autonomous household responses post-Washi.

Responses were coded according to keywords of measures mentioned. It begins with a "tabularasa", taking any response at face value and then categorized into shared themes. Case in point, causal mechanisms are processes or conduits through which an outcome has come to fruition, while contextual conditions are set of social, political, institutional, economic, and technical factors that pertains, but is not limited to, rolling-out of resiliency objectives in land use plans and how it dialogues with household context. The result is then cross-checked with the results from the qualitative analysis of a network of codes using co-occurrence function and other query tools in Atlas.ti.

The coding process is iterative in a way that responses and other relevant documents such as transcriptions and related literature were read several times. In the process, codes were refined and clustered semantically. Codes which are functionally similar were grouped to form a

[9] Five enumerators per case area

polished theme. Codes generated refer to complex interaction between households (actors) [10], government and civil society organizations (organizations)[11], and built-environment (structures)[11], and the configuration in which interactions play out in resilience outcomes[12] of barangays badly effected by Washi.

For example, household respondents are asked about resiliency measures that they are doing and/or have been doing, planned but not pursued, and the challenges that they encountered. These resiliency measures were further distinguished between structural and non-structural measures. Any response relating to alteration of concrete structures were tagged as modification, and installation of new tangible physical structures were coined new addition to physical environment. Modification or new addition to physical environment were further coded under "structural measures". Meanwhile, household activities, purchase of equipment and/or tools, and change in disposition were coded under "non-structural measures."

This iterative process assist understanding of what transpires within a cause or set of causes and corresponding outcome. (see Beach, 2017) As a result, mechanisms and conditions that shape household response in the context of operationalizing resiliency objectives are uncovered.

Content and secondary analysis on official documents pertaining to urban resiliency and land-use planning in CDO post-Washi were also utilized in identifying and triangulating causalities linked with household response and resilience outcomes in identified multiple case areas. Moreover, meta-analysis on literature about autonomous household response, urban resiliency, and CDO post-Washi era reinforces structured analysis on empirical material which directed towards answering the main question to what extent household-initiated interventions dialogue with land-use plan objectives to attain succeeding resiliency outcomes.

[10] Related code: Household response

[11] Related code: Dialogue between land-use plan and HH

[12] Related code: land-use plan objectives, urban resiliency, urban flood resiliency,

Chapter 4: Research Findings

4.1 Introduction

This research aims to unpack how households from badly hit areas in CDO build back better from the disaster triggered by Washi. Emphasis is given on absent or eroded causal mechanisms that lead to the adverse outcome and present contextual conditions in the aftermath that enable household to actualize resiliency outcomes.

Structured interviews through administration of questionnaires to households, key informant semi-structured interviews, actual observation, and desk research were used to generate relevant quantitative and qualitative data. Total sample frame consists of 96 household respondents and 26 key informants. Ecoville accounts the least respondents mainly because some of them registered Macasandig as their response to household residence.

All except one respondent from Macasandig, with an estimated monthly income of Php 48,000.00, fall under Philippine Statistics Authority's (PSA) lowest category of families by income class which is under Php 40,000.00 monthly income. Also, 63 total respondents live below per poverty threshold[13].

Table 4. Profile of household respondents

		Balulang	Ecoville	Macasandig
Total respondents		33	23	40
Average size of household		4	5	4
Head of household average age		53.5	45.9	49.5
Average monthly income (in Philippine peso)		13,000	9,675	8,396
Households below poverty threshold[14]		18	14	31
Type of ownership	Owned	29	23	37
	Rent	3	-	2
	Mortgaged	1	-	1

Results of fieldwork are divided according to sub-research questions. It begins with discussing CDO resiliency outcomes post-Washi. Followed by a dive-in discussion on how households have actually responded and what shaped them. A review on outlined resiliency strategies is done to investigate whether land-use plan objectives provide flexibility for adoption at local-scale. Eventual resilience outcomes are then explored at household-scale. As a conclusion, causal mechanisms are highlighted to explain extent of influence household response have with linked mode of resilience.

4.2 Cagayan de Oro rises above the adversary.

Tropical storm Washi resulted to unprecedented destruction when it poured-out double of a month's average rainfall in just six hours. The abnormal amount of water coupled with degraded river system, and uncheck urbanization resulted to Washi becoming Philippine's

[13] Php 10,481.00 monthly income is most recent poverty threshold. Poverty threshold is minimum monthly income needed to secure monthly basic essentials of a family. *Source: PSA*

most destructive, and rest of the world's second most deadly tropical cyclone despite its innocuous characteristics. Extreme weather patterns and rapid urbanization as new norm for Mindanao compel highly-urbanized areas such as Cagayan de Oro City to increase urban resiliency.

After almost a decade, CDO has risen to the urban resilience challenge post-Washi. The succeeding flooding events records a significant decrease in extent of impact and damage to life and property. Typhoon Bopha (local name: Pablo), a Category 5[14] super typhoon which happened a year after in December 2012, affected almost similar areas with Washi but registered 29 totally-damaged and 114 partially-damaged houses, with one casualty. (NDRRMC, 2012) The next significant urban flooding in CDO was Typhoon Tembin (local name: Vinta), Mindanao's deadliest tropical cyclone post-Washi. Tembin, categorized as a severe tropical storm[15], resulted to 112 totally-damaged and 1,028 partially-damaged houses, with zero casualty. (NDRRMC, 2018)

Table 5 Extent of impact of succeeding significant urban flooding in CDO post-Washi

Year	Tropical storm	Category	Maximum sustained winds (kph)	Affected population			Extent of damage		
				Brgy	Families	Persons	Casualties	Totally-damaged houses	Partially-damaged houses
2011 Dec	Washi (Sendong)	Tropical Storm	75	46	38,236	342,400	674	5,801	12,635
2012 Dec	Bopha (Pablo)	Super typhoon	280	41	14,246	55,188	1	29	114
2017 Dec	Tembin (Vinta)	Severe Tropical storm	90	38	5,943	22,731	0	112	1,028

Source: National Disaster Risk Reduction and Management Council (NDRRMC) official reports

In addition, the Annual Cities and Municipalities Competitiveness Index (CMCI)[16] identifies CDO as 2018's fifth most competitive highly-urbanized city. CDO is ranked according to its aggregate score from several sub-indicators of its four pillars – economic dynamism, government efficiency, infrastructure, resiliency. It is noteworthy that CDO greatly improved its resiliency score and is actually the most resilient highly-urbanized city in 2018.

4.3 Resiliency building at household-scale.

To assess households' perspective, respondents were asked to rank a-priori objects of resiliency from 1st to 6th. They were then asked to check all pre-identified causes of urban flooding that applies to their experience in CDO with an option to cite other factors that may not have been identified from desk research. Finally, they were asked to describe actual resiliency measures.

4.3.1. Object of resilience

With a 1.63 mean and a 1.21 standard deviation, households most likely would prioritize first their house and property in building urban flood resiliency among the options. This supports discussion in theory review that household responses principally resonate at individual needs and priorities. Second priority that households perceive are basic utilities such as electricity,

[14] With maximum sustained winds of 280 kph
[15] with maximum sustained winds of 90 kph
[16] CMCI is an annual ranking of Philippine cities and municipalities. It is a program by the Department of Trade and Industry with the support from USAID.

water, and communications. A remarkable pattern from the responses is interchangeability of basic government services, public infrastructures, and communal and public spaces.

Descriptive statistics indicate that the three objects of resilience exhibit almost similar mean and standard deviation which suggest almost equal chance any will be chosen after the second priority. Qualitative analysis reveals disaster risk management as the main reason.

Basic utilities are needed most especially whenever there is imminent threat of extreme flooding. Households, as a response, continuously monitor status of flooding threat through radio, television and telecommunication. Furthermore, public infrastructures such as street lights, roads and bridges need to maintain integrity and performance in face of flooding to guarantee mobility and access to safer areas should threat worsen. Mobility of relief services and immediate disaster response as well reflects this perception.

Of equal importance is availability of communal and public spaces, such as covered courts and schools, which are associated as evacuation areas. Whereas, basic government services are linked to essential services like water, sanitation and hygiene, health service, and food provision especially in evacuation centers.

4.3.2 Notion of causes of flooding

Topmost perceived causes of flooding are clogged built drainage/canals, improper solid waste management, and river degradation with more than 75% of total respondents mentioning these factors.

Households associate causes of flooding mainly from dysfunctional or non-operating drainages and canals which could have been caused by failure of proper solid waste management. Moreover, households also often associate flooding with deterioration of river systems citing denuded forest and other conditions in the upstream as contributing factor. Location or area and critical infrastructure are connected in a way that structural flood control projects could have prevented flooding in areas which are naturally water outlets. Lastly, inadvertent concretization narrates permeability of soil surface where surface runoff gets trapped in residential areas with no means of draining or discharging to prevent excess accumulation.

Others factors cited by respondents can be attributed to pre-identified causes but respondents might have deemed it necessary to give emphasis. They mostly cite that indiscriminate illegal logging in the hinterlands, and quarrying and mining are a result of poor watershed management. Data shows that households have substantial knowledge on causes of flooding with half of the respondents concurring to usual identified flooding factors in literatures.

4.3.3 Actual household response.

Household respondents were asked about resiliency measures that they are doing and/or have been doing, planned but not pursued, and the challenges that they encountered. These resiliency measures were further distinguished between structural and non-structural measures. Structural measures pertain to any modification or new addition to physical environment. Meanwhile, non-structural measures apply to household activities, purchase of equipment and/or tools, and change in disposition.

4.3.3.1 Structural measures

Actual household response pertaining to structural measures are categorized into repairs and renovation. Responses such as rebuild rooms and wall, strengthened foundation of house, reconstruct gate or fence are grouped under the code repairs. Meanwhile, responses pertaining

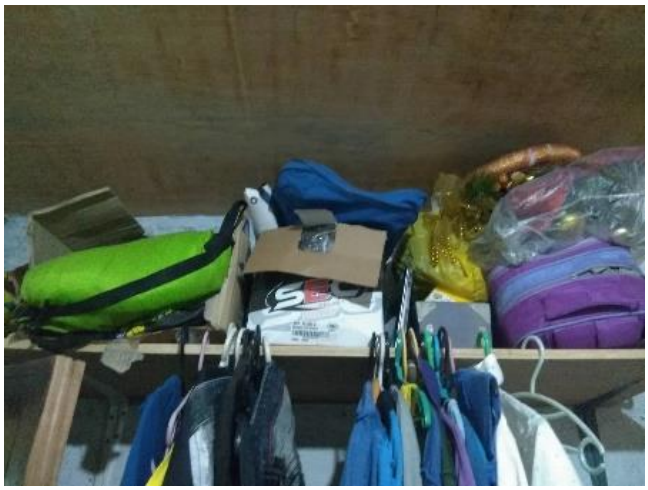
to any new constructions, additional or removal of some structures within house premise are grouped under the code renovations.

Two in every three respondents reported that they have done renovations. Most common measure is adding floors or raising the house. Examples are shown in picture 1. The house on the left is renovated to become 2-storey. The second floor is designed to be higher than recalled highest flood level. Meanwhile the high wall reinforces measure by preventing water to enter. House on the right has three floors with actual living quarters on the second and third floor. The ground floor is a common area with minimal belongings that could also function as a garage and for other purposes.

Picture 1. Most common structural measures involve raising houses above perceived base flood.

Another common form of renovation is the installation of a mezzanine-like struct ure, usually adjacent to the attic or highest area inside the house. It is mainly used for storing important personal effects which household does not necessarily need to carry with them when evacuating. Some have constructed walls outside their houses to keep flood water from entering their premises.

Picture 2. A mezzanine-like structure



These measures are undertaken with the presumption that they can keep personal belongings or people from being flooded. There are limited technicalities regarding detailed engineering design especially structural design is based on perceived base flood. Households instinctively determine elevation of these measures based on most recent flooding experience.

Notably, there is a significant number of respondents that planned to employ similar measures but were not able to actualize mainly because of financial issues. Such is also true to some of the households who were able to do actual renovations but haphazardly.

Picture 3. Unfinished houses?
(L) Picture is taken atop the on-going construction of a megadike project. (R) The elevated portion of the house is actually the back part. Both houses are inhabited and pictures are taken in Barangay Balulang.

4.3.3.2 Non-structural measures

Typical non-structural measures relate to disaster preparedness, and flood-proofing personal effects. Frequently mentioned are continuously monitoring status of any disaster threat and adhering to early warning system. Officer in charge of CDRRMO shares that there is a significant improvement regarding disaster preparedness and awareness at the household level after Washi. In subsequent major flooding incidents in the city, households were more likely to participate in pre-emptive evacuation because they understand the color-coded rainfall advisory[17]. Relatively, households keep grab bags for quicker response in times of flooding.

> Quotation: 15:7 *"We go home whenever code orange is declared. Regardless if work is suspended or not. We also have standby grab bags. Grab bags contains everything that we might need should evacuation be necessary."*

Non-structural responses also take in the form of "flood-proofing" personal items. Replacing furniture and fixtures to something made of wood or plastic since it would most likely be usable post-disaster compared to sofa-types. Households have also started to store personal effects in plastic containers or bags to prevent them from getting wet or soiled. Lastly, households invest less in-house equipment. They would only buy the bare essentials like radio, television, and common cooking and dining materials. The intention of doing all these is to minimize loss of property by ensuring that things they cannot carry to evacuation or safer areas will still be usable after flood. This enables them to immediately recover from the disaster.

> Quotation: 15:8 *"We store all our personal belongings in megaboxes. These are transparent plastic boxes or containers. It is more convenient for us to store those megaboxes in the attic whenever there is threat of flooding. Also, megaboxes protects our things from getting wet. Our house doesn't have anything fancy, it's too functional. I do not even put my books anymore in the shelves but in those megaboxes."*

[17] Color-coded rainfall advisory is used to caution people regarding the level of flood threat. Yellow for "flooding is possible", Orange for "flooding is threatening", and Red for "serious flooding in low-lying areas."

Picture 4. Flood-proofing techniques

(L) Plastic bag and (R) Plastic containers serve as storage facility. These protect personal effects from being flooded and soiled.

Cleaning communal space including within their house premise, de-clogging canals, proper disposal of garbage, and greening are also common responses. A thorough analysis reveals that an organized community has higher possibility of sustaining these kinds of activities. In addition, presence of external support from multi-sectors encourage interactions among households within the community which reinforce joint effort among community members.

Case in point, regular cleaning and maintenance of canals are usually done in Brgy. Balulang and Lumbia. Mainly as part of their homeowners association's[18] activities. However, a resident in Brgy. Lumbia shares that the regular clean-up activity discontinued after Xavier University (XU), the original proponent of Ecoville, turned-over the project to the city government in 2016. The direct and continuous supervision of XU ensured that plans and projects of Xavier Ecoville Homeowner's association (XEHA) are delivered.

> *"Always clean the canal and (adhere to) proper ways of (garbage) disposal. Don't throw garbage anywhere cause that might be the reason for clogging."*
>
> Questionnaire household respondent from Brgy. Balulang

4.3.4 Unique resilience narratives.

An outlier response illustrates a circumstance where city-level intervention is deemed counterproductive. A 45-year old household respondent, college-level and has been living in barangay Macasandig since young, recounts that people within the vicinity has adapted to occasional flooding. He even cites ability of community to assess flood threat. However, construction of a nearby flood-wall after 2009 dramatically raised flood water level causing unpredictable flooding in their area. He further adds that the presence of the flood control project ushered development of the area leading to increased business establishments. As a result, flooding experience worsens because of these additional concrete structures.

> Quotation: 13:34 *"We do not need more developments here. We do not need more buildings or commercial spaces because this area is a natural waterway. In a couple of years' time, we will find ourselves using boats because the waters will never subside if we continue to build more infrastructure that will not help lessen or alleviate the flooding that occur even if it's just minor typhoon."*

[18] Homeowners association is an organization composed of all property owners within a subdivision or village in the Philippines

According to interviewees, many of their neighbors who are financially capable bought houses or relocated in subdivisions uptown or in other safer areas. Those who could not afford, heavily rely on resettlement projects by the government and other civil society organizations. Many are still awaiting and those who cannot afford to do renovations can only manage to repair their house to a slightly improved condition than pre-Washi state. Some of the respondents still hope they will be given a permanent house in one of the resettlement projects in the city soon. For the meantime, they remain to be vigilant, and would go to their relatives who live in safer areas or evacuate in times of imminent threat from hazards.

> *"Our priority is really just to have a place to sleep in. We have a house in the resettlement area which we use from time to time. Mostly during times when there are threats of flooding. Also, a lot of people have relatives that live in higher areas. So, when the barangay warns us of a threat of excessive flooding, we can just go to them and stay at their houses until it is safe to return."*
>
> Questionnaire household respondent from Brgy. Macasandig

Another intriguing condition is compromised resilience because of failure to develop shared meaning. In Ecoville, two household respondents experienced flooding although manageable. It must be noted that resettlement is a direct household response by which constant threat of flooding is prevented through relocating outside high-risk locations.

As illustrated earlier, households are convinced that drainage and canals are of utmost importance in managing flood risk. From actual observation, households might have conflicting purview. Common in residential areas in the Philippines is discharging of household wastewater untreated to canals which potentially contributes to sedimentation. In addition, canals which acts as sewers are uncovered and is susceptible to anything that fits in. These factors contribute to obstruction of water flow which results to clogged drainage. Varying views regarding upkeep is present among households. Some believe that cleaning and tidying-up immediate surrounding is the responsibility of each households but provision and maintenance of canals is of the government or other local authorities.

> Quotation: 16:1 *"We cannot do anything because we can't avoid floods. All you can really do is clean. The drainage part is the responsibility of the government."*

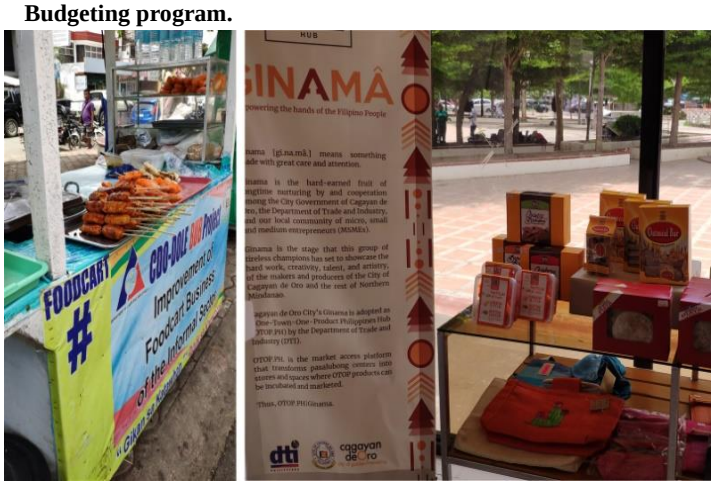
Although, there are other factors that inundate built canals aside from household wastewater. For example, some owners extended their property by encroaching and covering built canals. Despite the policy of prohibiting any modification in awarded property, many of them has done so and without any technical assistance or regard to original design and layout of the resettlement.

Pictures 5. Clogged built canals.
Left to right (1) This house in the corner lot does backyard hog raising [not in the picture] where all waste goes to the canal. (2) Modification of property lot encroaches and covers built canal. (3-4) Sedimentation and vegetation in canals at Ecoville resettlement area.

Displacement induced by Washi also interrupted traditional source of livelihood. Many of the survivors have blue-collar jobs in the city proper. Ecoville is located almost an hour away by commute from downtown proper. This context necessitates alternative source of livelihood. A visibly observable household response is backyard hog raising. While a viable option, waste disposal goes directly into the canals.

In contrast, respondents from Brgy. Balulang have organized, aside from homeowners' association[19], a people's organization. The Balulang Women's Development Council (BWDC) is a women's cooperative initiated by one of the key informants. Members of the women's cooperative meet twice every month to discuss community matters and progress of their bigasan[20] livelihood project. The women's cooperative also facilitates active participation of household in regular clean-up drives, and other matters that concern ability of households to reduce vulnerabilities. BWDC is one of the many people's organizations that were able to secure funding from the bottom-up budgeting program of the government (BUB).

Picture 6. Livelihood improvement from the Bottom-up Budgeting program.



BUB allows Sendong survivors and/or sectoral people's organizations *e.g. fisherfolk, farmers, PWD, etc.* to formulate, secure funding, and implement livelihood programs that augment household income.

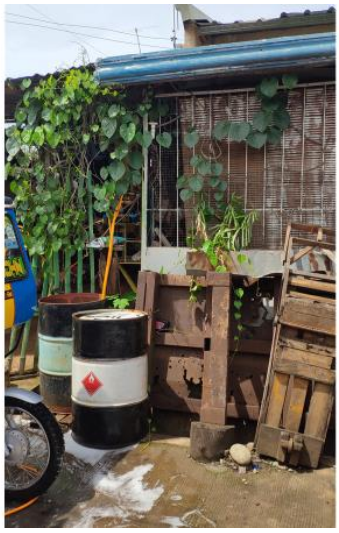
Left image in picture 6 is part of the BUB projects for informal sector. Members of the informal sector avail trainings on food handling and food carts to improve their business of selling popular local street food. Right image depicts products displayed in Ginama, a tourism assistance center in downtown proper. Income of Washi survivors turned micro-small and medium entrepreneurs have increased as a result of livelihood assistance programs. These programs provided financial and technical assistance to Washi survivors who had promising business proposal or were already engaged in business ventures but disrupted by Washi. Particulary, BUB served as a platform where survivors availed assistance in project incubation, financial management, and marketing. The program has been recognized nationally through the Galing Pook Award[21] 2017 for helping survivors and grassroot organizations build back better and progressive communities.

Water, electricity, and many other urban amenities and services are not easily accessible or available in the resettlement area. A unique response in Ecoville is water harvesting. A water hose is used to funnel water from the gutter and channels it to large container tubs. Harvested water is also used for washing vehicles, another form of alternative livelihood for some of the households. It is a manifestation of household resourcefulness to respond to limited and unstable supply of water in the community.

[19] Homeowners association is an organization composed of all property owners within a subdivision or village in the Philippines

[20] Each member receives a sack of rice weighing 25 kilos every 15th day of the month.

[21] Galing Pook award is a pioneering and prestigious program that bestows recognition on innovations and smart solutions in local governance.



Picture 7. Water harvesting in Ecoville resettlement area.

Quotation: 11:8 *"We have a problem in our water supply. We make-up for the shortage through the water barrels we have. We don't have water early in the morning."*

Across case areas, there are many chronicles of household learning, responsiveness and ingenuity which are further enabled by convergences of government units across level, NGOs, business sector and the academe. Key to making this work is households organizing themselves at the community-level to maximize drawn efforts of civil society organizations and local governments by collectively creating shared meanings of resiliency context.

4.4 Resiliency objectives in land-use plan.

This sub-chapter explores what are outlined resiliency-objectives under CDO's comprehensive land-use plan, how do planning processes integrate economic development and urban sustainability, and who are involved in the design and implementation of such objectives. Ultimately, explaining to what extent collective action towards resiliency is being facilitated at household-scale.

4.4.1 CDO land-use plan objectives

CDO City Planning and Development Office (CPDO) has provided a copy of chapters within Comprehensive Land-Use Plan (CLUP) that discuss resiliency objectives. Under this document, CLUP and planning process builds upon assessment of immediate threats, evaluation of climate and disaster risk, and perceived adaptive capacity in relation to social, economic, environment, infrastructure, and land-use. As a result, four main goals and objectives are crafted for the city.

First is active and extensive participation of stakeholders in attaining "safe, healthy and secured community" through integration of disaster risk reduction (DRR) and climate change adaptation (CCA) principles in effecting socio-economic development. Next is a responsive governance that animates multiplicity of network to allow actions of different approaches and scale. The third promotes inclusive growth with a sustainable urban metabolism through proper design in areas where development cannot be prevented and encourage protection, conservation and impact mitigation in areas where development occurs. Finally, providing enabling investment climate by sustaining competitiveness.

CDO is vulnerable to flooding, typhoon, drought, and rain induced landslide basically because of its topographic characteristics and location. But among the hazards, flooding is most pressing. In an interview with the city planning coordinator and two senior planning officials, they pointed-out integration of resiliency objectives to land-use plan is a result of learning from the experience of Washi. Actually, resiliency is linked with the city's competitiveness from the standpoint of planning.

> Quotation: 14:8 *"But, as part of the learning or lessons after "Washi", even the investment programming approaches where we invite investors to come in, we have incorporated some elements of resiliency. Like, we need to secure that our infrastructure, roads, telecommunication, and other else are resilient, and even can withstand whatever [hazard there] is. Basically [it is] from our learning from Washi, so that we can still sustain the competitiveness of the city, in terms of investment. And also, to inform these businesses that we have learned from Washi. To be able to continue operation, I mean immediately after the event, [to] recover quickly the better."*

In particular to resiliency, land use sector contains three main objectives. The first objective is to "implement informal settler-related laws and relocation to a safer and decent location." Strategies include strict enforcement of river easements and no build zones, mapping of possible best location for evacuation sites, and involvement of CDRRMO in issuance of location clearance and building permit in addition to the CPDO and Office of the Building Official.

The next objective is foster "a safe, peaceful and orderly community." Strategies include activation and capacity enhancement of barangay DRRM council, implementation of early warning system particularly in identified high risk areas, mainstreaming DRRM-CCA into city government programs and policies, and strict enforcement of Republic Act 9003, or also known as the Ecological Solid Waste Management Law of the Philippines.

Lastly, "establish buffer zones from settlements in watershed areas." This particular objective looks into improving river systems and adopting a watershed approach in cooperation with other localities. It concerns with interventions through a ridge to reef approach. This approach considers the interconnectivity and synergy of the various programs, projects and activities that affect from up to the forest ecosystem to coastal/marine ecosystem.

4.4.1.1 Legal framework governing land-use plan and resiliency building

Republic Act (RA 10121), also known as The Philippine Disaster Risk Reduction and Management Act of 2010, provides for the legal framework governing operationalizing DRR and CCA principles in the Philippines. Under the national DRRM plan, all public investments regarding DRR and CCA should adhere to the principles of four thematic areas.

The first two thematic areas concern measures before a disaster happens. Disaster preparedness or empowering communities to "anticipated, cope, and recover from negative impacts" of hazards. Next, disaster prevention and mitigation by "reducing vulnerabilities and exposure and enhancing capacities of communities."

Meanwhile, the last two thematic areas guide measures during and in the aftermath of a disaster. Disaster response is providing basic physiological needs for the affected individuals. On the other hand, disaster rehabilitation and recovery deals with restoring, improving, and building back better facilities, livelihood, and living conditions.

4.4.2 Localizing modes of resilience at household-scale

Results of triangulating postulations from meta-analysis of literatures investigating post-Washi scenario in CDO and data gathered during fieldwork indicate long-term housing solution and disaster risk reduction and management initiatives as the dominating resiliency strategy realized both at the city- and household-level.

4.4.2.1 Long-term housing solution

Washi totally or significantly damaged 18,436 houses giving rise to thousands of individuals looking for better housing conditions[22]. Approximately 85% affected households come from urban squatter settlements located in floodplains, dried riverbeds and sandbars. (Carrasco, Ochiai, et al., 2016a) The aftermath of destruction greatly impaired affected families' household economy. Most members in severely affected households work as minimum wage earners or informal employees in services and construction sector before Washi. (see Escalante, Alegre, et al., 2012) Implicitly, a great majority of affected families are already vulnerable since low-income families have minimal capacity to adapt and respond due to having lesser resources (see Yonson, 2017) and insecure housing arrangements.

Declaration of many of the badly hit areas as "no-build" zones by the city government exacerbated homelessness condition of displaced households. In response, the city government identified resettlement as the main strategy for rebuilding and reconstruction. As of July 2019, city government has provided for 12,205 beneficiaries, or equivalent to 35% of informal settler families (ISF) needing resettlement in 2013. (CDO City Housing and Urban Development Department, 2019)

Picture 8. No-build zones.
(L) At least 400 households used to reside in this island bar. A megadike will soon rise in the entire island. (R) At least 1,000 households used to thrive in Sitio Cala-cala in Macasandig. Only one structure remains which serves as a reminder of the horrors of Washi.

As previously mentioned, households who have better economic status independently relocated on higher and/or safer areas using their own financial resources. For those who cannot, households signed-up for the Urban Poor Emancipation Program. The program is a refinement of the previous Piso-Piso Socialized Housing Program (referred to as Piso-Piso). These housing units were located in sand bars, delta and near riverbanks which are not titled. Piso-Piso is the epitome of weak governance structure, increased exposure to hazards among poor households, and widespread complacency.

Based on interviews and official documents, ISFs receive "piecemeal" access to home lots in flood-prone areas in exchange of paying piso[23]. Piso-Piso encouraged already vulnerable households to dwell in very risky areas without capacitating beneficiaries to assess imminent threats. Conversely, hazard information and policy instruments that promote DRRM and CCA are already in-placed even before Washi. Despite the fact, design and implementation of Piso-Piso neglects risk in exchange of patronage politics.

[22] Post-disaster needs assessment report prepared by the Office of the Civil Defense

[23] Piso is equivalent to Php 1.00.

Households were only given certificate of occupancy that came with a fine print, votes during the election. These certificates are manifestation of political bondage where eviction is possible anytime if they do not politically align with the previous administration. Not surprisingly, households didn't have any incentive to develop their properties. (Mosqueda, 2018)

The new administration issued Executive Order No[24]. (EO) 079-15 to rectify self-defeating housing solutions. EO 079-15 created a multi-sectoral task force in order to enhance the Piso-Piso and other socialized housing program. This created platforms for participation and integration of household context in the re/formulation of housing programs. As a result, households are emancipated by giving control over shaping housing solutions regardless of political alignment. Furthermore, involvement of the academe, non-government organizations and the business sector in setting-up resettlement projects and prioritizing relocation of those that are in high risk areas are more apparent. As a consequence, households are better able to abide with no-build zoning regulation because there is a more synergized and informed resettlement project.

However, resettlement areas present trade-offs that persistently challenge household. Firstly, access to urban amenities and services like commercial malls, schools, and economic prospects force households to return in high-risk areas despite receiving permanent resettlement houses. Washi only caused temporary slowing-down in the general performance of the business sector, and trajectory for city's investment outlook remained steady. Nevertheless, Washi seemingly did not significantly affect labor conditions of the region in the immediate year after the disaster. Recalling socio-economic profile of severely affected families pre-Washi, job opportunities in the service and construction sector remained constant but these are located in the downtown proper where there is additional cost for daily fare and travel time. (see Escalante, Alegre, et al., 2012)

> Quotation: 6:26 *"We cannot jeopardize education of our children. Because it's really far from our livelihood, and from the children's school. When getting home, transportation is difficult."*

Further, most households send their children to public schools. Household respondents have pointed-out cases where children have difficulty adjusting to a new school, new neighbors, and new environment. Respondents have also pointed out that essential goods and services might not be readily available. Often mentioned are school supplies, affordable day-to-day food, and areas for leisure. Moreover, convenience and mobility hampered by limited and/or more expensive public transportation to and from resettlement areas, including difficulty to commute during early morning or late evening[25].

This is discounting preparedness of public institutions, facilities and services to accommodate extraordinarily high influx of individuals in barangays of resettlement areas. All in all, resettlement areas located far from the city proper results to higher cost of living.

Additionally, sentimental attachments to original location affect household's decision to stay locate back in original address. Households who have been living in high-risk areas have been living there for a long period of time. Property has become an heirloom by which lots are sub-

[24] Executive Order is the highest form of local ordinance the mayor can issue.

[25] Early morning could be construed as before 6:00 while late evening as beyond 20:00

divided according to the number of their children. This creates a different view on the value of property and fosters a deeper connection with land.

> Quotation: 15:26 *"My mom has strong sentimental attachment to the place. The place where their ancestral house is located, where she grew up. She couldn't imagine leaving the place."*

According to household respondents from Balulang, owners who have transferred to uptown or safer residential areas put their houses on sale or for lease at more affordable rates. As a result, there is an increase in renters or new households who are aware of the flood risks but might not have prior experience. Renters are usually in-migrants coming from nearby areas seeking for better opportunities in the city.

4.4.2.2 Disaster preparedness

Bulk of household responses, as discussed in section 4.3, are within the context of disaster risk reduction and management. A thorough investigation into this phenomenon points out streamlining of government support services, strengthening of local governance structures, integration of learning from past experience and strong sense of community as drivers.

In interviews with senior city planners, Washi is regarded as the city disaster preparedness' baptism of fire. The implementing rules and regulation of This landmark legislation aims to increase capacity of local government to manage disaster risk by veering away from disaster response and recovery and into disaster risk reduction, preparedness and mitigation.

Over the years, there is a steady increase of DRRM budget which were used to increase calamity fund that in turn provided financing for city shelter plan, increasing rescue capability by buying top of the line equipment and vehicles for land and water, establishing 24/7 emergency operations center, empowering frontline units by providing trainings regarding incident command system.[26]

A senior city official, as concurred by a local authority, shares during the interview that RA 10121 formalizes an annual ex-ante budgeting for DRR, referred to as Local DRRM Fund (LDRRMF.) LDRRMF is used to mobilize the barangay DRRM council (BDRRMC). The BDRRMC is composed of local officials and household volunteers and is responsible for DRRM planning to enhance disaster response capability of communities, and conducting seminars to increase households' level of disaster preparedness.

It should be noted that there is automatic appropriation of disaster funds equivalent to not less than five percent of local government's estimated revenue from regular sources. In addition, 30% of LDRRMF should be appropriated for disaster response while remaining 70% for other pillars of DRR such as prevention and mitigation, preparedness, rehabilitation and recovery.

Households are more able to cooperate in pre-emptive evacuation because of operational early warning system. Noticeably, channels that updates households on threat level broadened to include public address system, and messages sent through cellphones, and in social media outlets.

Involvement and participation of all sectors and stakeholders concerned including the households are fostered by frontloading DRRM planning to the BDRRMC. This opens up

[26] International system on disaster management.

innovation in DRRM measures such as "animal rescue and evacuation." The animal rescue and evacuation, in collaboration with the City Veterinary's office, provides for evacuation area for livestock. In providing such innovation, households are more inclined to do pre-emptive evacuation since their source of livelihood is secured.

4.4.2.3 Reduction of (anticipated) socio-economic and environmental loss

RA 10121 revolutionizes approach to disaster risk management in the Philippines by holistically looking at reducing impact of hazards. The approach puts localizing responses more centrally in reducing socio-economic and environmental losses.

The city government issued EO 97-2015 which mainstreamed the People's Council through membership of special local bodies. The People's Council is comprised of different CSOs representing various sectors. Accordingly, Washi survivors are represented through sectoral representation in the People's council.

As a result, households are emboldened to actively engage in discussion of issues and concerns regarding building back better from the disaster of Washi. In the process, households collectively crafted a "people's agenda". It identifies smart solutions concerning income generation, alternative sources of livelihood, infrastructure rehabilitation, security of tenure, and rehabilitation of water supply. This causality is attributable to the success of streamlining response at household level to the budget cycle as proven in the BUB program. With the help of CSOs, households engage with frontline government agency to catalyze the People's Agenda. (Mosqueda, 2017)

4.4.3 Critical reflexivity and heuristic connection

The most crucial factors in enabling autonomous household response are integration of learning from past experience and flow of information and support within the neighborhood with 2 in every 3 response include either or both of the factors.

Most notable is that almost all of 96 household respondents base their decisions from previous experience. Noted among respondents is that they are accustomed to being flooded even prior to Washi. Over time, they inherently acquire institutional memory on flood path, highest water level, and exit routes. This connects to the predicament in section 4.3 where households pursue structural measures despite limited or no actual consideration of safety principles and little regard to impact on other households or at other scale.

Accordingly, one of the challenges respondents mention is the lack of technical competency to determine best course of action in commencing with the recovery phase especially when pursuing structural measures. Despite limited technical knowledge, households do it anyway.

> Quotation: 15:12 *"We had a hard time identifying an efficient design for the modifications of our house. We based our design from our experience with Sendong. We were always hesitant since we weren't really sure if the design is efficient and effective. We didn't have the technical know-how to assess the best way to proceed with structural measures."*

Strong linkage with neighbors also directly impacts ability of household to instinctively response during imminent threat of flooding. Mechanisms such as creation of Facebook group chats, regular meetings, and even pooling of resources to construct communal flood walls have been mentioned. Also, worth noting is that quick mobilization of resources from the

government, business sector, religious, and other donor organizations strengthens capacity of households to accommodate, absorb and recover from impacts of flooding.

> Quotation: 15:13 *"And us in the neighborhood have decided to stay and then just help each other cope with the risk. We even created a messenger group chat including those who reside in lower areas. They monitor the river's water level in times of flooding risk and feed updates through the group chat. It has become a community resolution where us in the neighborhood have decided to stay and help each other."*

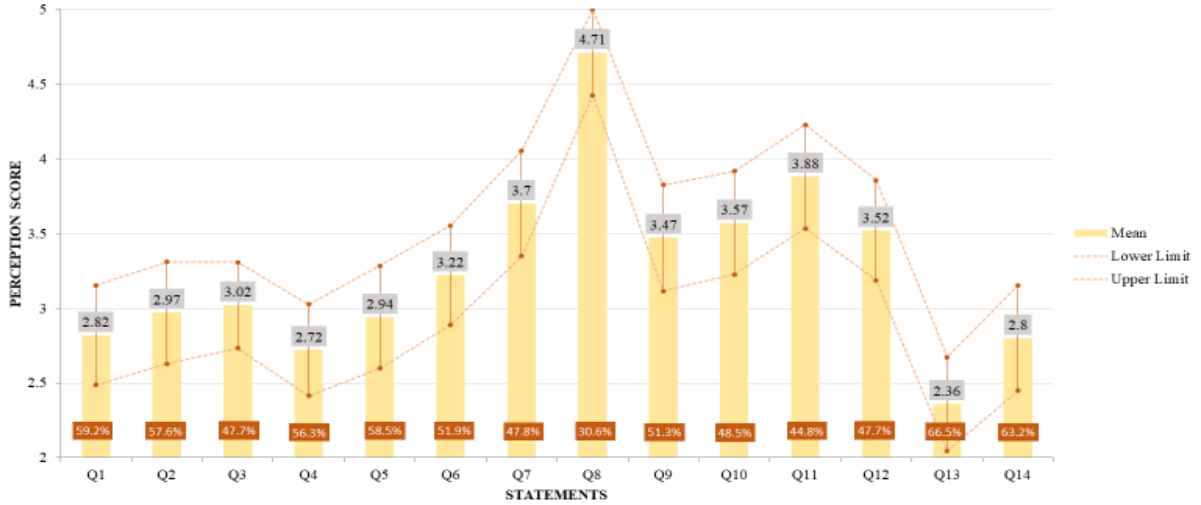
Lastly, active engagement between CSOs and local government foster strengthened local governance structures. Flood control projects are coupled with training on disaster preparedeness which are given by CSOs at the community level. Furthermore from the interview, disaster preparedness is viewed by local authorities as the more efficient and effective measure, resource-wise, in building urban resiliency because major flood control projects takes a lot of bureaucratic proceedings which could render intervention obsolete. The budget cycle process of identification, prioritization, approval by the city council for every project is cumbersome to say the least. Not to mention a slight change in identified project resets the whole budget cycle process.

> Quotation: 5:17 *"What are you going to do with all the infrastructure mitigations you have, if your communities are not aware? Sometimes, we are more focused on the preparedness because it was prioritized by the government, giving 5% DRR funds to LGUs. Even in the barangays. 70% of the 5% of your budget is for preparedness. Although there is mitigation and prevention. But they usually need big amounts. So you have to link it with other sectors. Like dikes, flood control, early warning devices, dredging, those need big amounts. But that is already being lodged in the city. If it reaches the barangay, you can see that they work more on the preparedness aspect."*

4.5 Level of resiliency outcomes

Using a Likert scale of 1 – 6 with 1 as strongly agree and 6 as strongly disagree, respondents rated statements that each describes particular aspect of perceived level of resiliency outcome. Similar literatures that also attempts to measure resiliency outcomes are used as guide in formulating the statements and in doing qualitative analysis. (see Boin and Lodge, 2016, Chelleri, Schuetze, et al., 2015, Henstra, 2012, Valiquette L'Heureux and Therrien, 2013, Vedeld, Kombe, et al., 2015) Furthermore, respondents were also asked to narrate their succeeding flooding experience, and corresponding recovery mechanisms.

Graph 1. Resiliency outcomes of household respondents post-Washi. See annex for statements and descriptive statistics.



Figures atop bar are mean and standard deviation which together signify central tendency of respondents' agreeability for each statement. Meanwhile, figures at the bottom are coefficient of variation which indicate variability of response. Higher percentage means more dispersed frequency distribution which implies that household respondents have varied resiliency outcomes in relation to their experience post-Washi. This is normal given that households respond reactively and are shaped by personal convictions. As such, each household struggle to comprehend normative temporal and spatial contexts of resiliency.

All of the respondents have mentioned that their succeeding flooding experience are during super typhoon Bopha (in December 2012) and severe tropical storm Tembin[27] (in December 2017). Consequently, higher validity of analysis is achieved since responses relate to the same triggers of severe flooding.

Household respondents agree that their immediate built structures including their house, and public infrastructures such as roads and bridges (Q1–6) can resist, and even withstand flooding. This coincides with official Tembin post-disaster data wherein houses that are totally- and partially-damaged decreased to 112 houses (98% reduction) and 1,028 houses (92% reduction) respectively. A significant factor to this is the observance of no-build zones, and most households relocating to safer areas. Although, relocating does not necessarily mean in the city's resettlement areas as such in many cases of respondents from Macasandig where they rebuild their houses on "safer location" but still within the same family compound.

Interestingly, most of the households are able to immediately start recovering the soonest flood water subsides. However aside from financial issues, households find it most challenging to cleanup. Cleaning would entail 3-5 days' worth of opportunity cost since they have to spend their full-time sorting out things that are still usable, removing mud and other debris, and housecleaning.

Respondents find it difficult to perform daily functions whenever there is threat of flooding (Q7-9). In fact, households certainly disagree that they are able to travel whenever there is advisory on weather disturbances. Reasons include the need to secure things before flooding starts, stay in evacuation centers, or avoid being stranded within downtown proper despite

[27] Tembin exhibits similar characteristic with Washi.

residing in safer areas. This can also be connected with households (Q10-12) expressing concern over continuous access to basic services like public transportation, and clean water.

Nonetheless, households are positive that information (Q13) and government services (Q14) are continuously accessible in times of flooding threat. Accordingly, households are able to respond appropriately through participation in pre-emptive and forced evacuation, and manage to absorb and recover from flooding due to presence of post-disaster relief, recovery and rehabilitation assistance. Besides government efforts, convergence of multisectoral disaster response further enables households to withstand, absorb, and recover from immediate impact of not just flooding but also other hazards.

> Quotation: 15:19 *"It feels like this is not us anymore. It does not feel cozy or homey anymore."*

However, such resiliency outcomes come with trade-offs. Living conditions may have been more adaptive to impact of flooding but livability becomes too functional, and capacity to respond to other hazards is reduced because of lesser livelihood opportunities in the resettlement areas.

4.5.1 Communicating and adopting land-use plan objectives

Respondents were asked to rate on a Likert scale of 1 - 6, with 1 signifying strongly agree and 6 as strongly disagree, statements that gauge effectivity of communication and extent of adoption of land-use plan objectives by households. *Refer to graph 7.*

Households disagree that they are aware, familiar, or have even heard of about land use plan in at least the last five years. (Q1-4) Responses also confirm that households do not consult in any way land-use plan (Q5) or it only comes as an afterthought when deciding about pursuing resiliency building measure.

This affirms that learning from previous experience with hazards is vital in enabling resiliency-building at household-scale especially among low-income households who cannot afford to pursue drastic measures like buying a new house outside flood-prone location or fortifying existing or constructing new built structures without compromising sound engineering design.

Furthermore, when household respondents were pressed to provide answers on what they think land-use plan objectives are, almost half of the response indicate no idea or that they do not know what it is. Other responses hint on interlinked ideas of protecting and conserving integrity of environment, managing disaster risks, and enhancing livability of a specific area. Also, households think of land-use plan objectives as a list of projects, including socialized housing, and construction of dikes.

Likewise, answers to what do respondents think about importance of land-use plan indicate that households are not aware of its purpose. Meanwhile, some households perceive the land-use plan as essential in mapping-out which areas are safe for residing and development, how to respond in times of disaster, and what are public investments that can improve quality of life. In addition, households disagree that they have participated in any activities by the government that relates to land-use plan and planning. (Q6) This contradicts claims of local government and even results of desk research that participation of households through the barangay is encouraged.

Results from analysis of qualitative data underlines three causal mechanisms that entice dialoguing between household context and land-use plan objectives. First is a bottom-up

planning kind of approach where households partake in the process of articulating strategies that pursue common development objectives at household-level, as such was in the case of the BUB program and the crafting of a People's Agenda. Next mechanism is the institutionalization of government support services through enactment of policy instruments such as RA 10121 which was instrumental in setting-up logistical and financial arrangements for DRR. Complementarily, local ordinances EO 079-15 paved the way to creation of a city housing and urban development unit, and 97-2015 which established the People's council.

> Quotation: 5:24 *"But I think after Sendong, it was a multi-stakeholder approach, so it's not only the city government. I think the presence of the International NGOs, academe, and religious sector was of great help in dealing with resiliency especially in housing. With Build Back Better, at least their houses now are located in better areas, and that is part of resiliency. You build your recovery in a better position."*

The least-used is issuance of clearance and permits. From interviews with a barangay senior official and community leaders, any built structure, its subsequent major modification, removal, or demolition should be given clearance by local government units. Approval document, such as permits, guarantee that technicalities of construction complies with land-use ordinances and regulations. However, the only instances where clearances are issued from the Barangay is when large business enterprise decide to locate in their area. The barangay makes sure that their proposal is outside the hazard area and is located within the industrial and/or commercial zones.

> Quotation: 12:15 *"I'm not really familiar with that [land-use plan]. I don't have much idea about what the land use plan is. What we know about land use plan is when big establishments apply for it. That is the time the land use plan functions. But I have never heard of small houses adopting the land use plan. In my own observation, it is not adopted among households."*

In addition, land use planning stays at the level of the city government. Planning has been devolved to the barangay unit to encourage participation of households but technical and institutional capacity to carry-out such complex task are lacking or weak. As an affect, engagement of barangay with household in terms of land-use planning is mainly disaster risk management since it has clearer planning guidelines, and readily available funds from the LDRRMF.

> Quotation: 14:10 *"We have two approaches. Basically, most of these functions go to the barangay. But these barangays are not capable to prepare preparations or planning on their own. So, [we assist first at the]- barangay level DRM planning. Then, Barangay level [for the] Barangay Development Planning."*

Optimistically, households are amenable to the notion that land-use plan and engagement of household in achieving set objectives are important. (Q7-8) Although, results of data gathering show that household respondents have diverse attitude towards land-use plan, they all agree that household participation and resiliency objectives in land-use plan are crucial in becoming resilient to flooding.

Conclusively, land-use plan is immaterial in the ideation of resiliency building measures at household-scale. Further, households mostly engage with CSOs in the formulation of resiliency

objectives, particularly in capacity development for DRRM. As such, households do not associate these processes as land-use planning and detach themselves to land-use objectives.

Despite that, actual household response contributes to the overall resiliency outcome. Most notable is that autonomous household response create safer community by self-directed integration of lessons from previous disaster experience and principles of DRR-CCA. In addition, households would like to relocate away from risky areas given the opportunity, but not preferably in relatively remote resettlement projects. Lastly, autonomous household response depends on disaster preparedness as root causes are best addressed at institutional and government level. As conclusion, households are pursuing resiliency objectives instinctively drawing from institutional memory, and information within social channels.

This contextual condition must be treated with reservation since communication and adoption of land-use plan objectives by households have serious repercussion in leveling-off expectations. Wrong notions of city-wide interventions could lead to catastrophic impact at household-level.

For example, households in Macasandig mentions completion of the mega-dike as the definitive solution to riverine flooding. Upon closer inspection from official documents, the mega-dike is designed for a 25-year period return flooding. However, Washi is calculated to be a 50-year return flooding and forecast simulation of similar occurrence will cause flooding in some densely-populated areas in barangays Macasandig, and Balulang despite the mega-dike. (Lo, Taat, et al., 2017) Also, a publication by Mines and Geosciences Bureau indicate a 100-year period return flooding that has yet to come. Highest floodwater reported was in 1916, 1957, and 1982. (MGB-Northern Mindanao, 2008)

4.6 Major findings

This chapter investigates the process of low-income households translating perceptions and notions of resiliency to actual structural and non-structural measures, and fruition of desired outcomes.

Households associated urban flooding with dysfunctional or non-existent structural measures such as built canals. Defective drainages are worsened by non-adherence to proper solid waste management that obstruct natural and built waterways. Furthermore, anthropogenic effect of indiscriminate illicit activities in hinterlands and unnecessarily excessive construction of structures inundates soil infiltration capacity and river systems. These in turn pose perennial threat of flooding especially on area near the waterways.

Results of fieldwork illustrates novelty resiliency-building measures at household-scale such as flood-proofing items by storing personal effects in “megaboxes” and plastic bags, stand-by emergency kits called go bags, and installation of a mezzanine-like structure. These ingenuities are borne of extracting lessons from previous or related disaster experience such as base flood and water path. Accordingly, acquired learnings are self-directed which runs the possibility of limited knowledge and maladaptation.

On the contrary, household response possibly could be detrimental especially that it operates on individual interests which are competing, and often contradicting. Such was the case in backyard hog-raising and encroachment of built-canals in Ecoville. Also, it can reinforce social inequality where those who have less find themselves grappling with inferior structural measure from lack of credible engineering design, and relying from assistance of external organization which could be intermittent. Lastly, Piso-Piso project in Macasandig as the ground-zero of Washi disaster indicates wrong notion of long-term solution results to

household response that have catastrophic impact. The increasing informality and the rising need for decent, affordable housing, combined with weak governance structure that preys on these contextual conditions resulted to already vulnerable households bearing the brunt of the disaster.

Land-use plan objectives were vital policy response since it outlined strategies that integrated socio-economic development, and environmental integrity. Further, the CLUP springs from risk assessment and evaluation which mapped hazards and vulnerabilities on a spatial lens. More importantly, RA 10121 provided legal grounding for institutional and financial arrangements that sustains autonomous household response' responsiveness, resourcefulness, and state of learning. For example, the city's "animal rescue" is an innovation in DRRM as a result of frontline government units (CHUDD and CDRRMO) picking-up on articulation regarding disaster experiences of households whose livelihood depends on livestock raising. Also, the LDRRMF ensures automatic appropriated budget for DRRM and CCA which eases-up burden of having to go through long bureaucratic process of the normal budget cycle.

However, data indicates that land-use plan is negligible from the standpoint of households. Half of the respondents are oblivious to what goes in and on with land-use planning. Fortunately, CSOs from the academe, NGOs, and some businesses fill-in the gap. Their active participation reinforces household's capacity to withstand, absorb and recover from impacts of geohazards. Common form of support includes long-term (resettlement) and immediate (construction materials) housing solutions, capacity building for disaster preparedness, provision of relief services during post-disaster, and other technical assistance such as financial management, idea incubation, and marketing.

Broader framing of resiliency enabled this study to comprehensively assess resiliency outcomes pertaining to hydrometeorological hazard.

The findings argue that households have become more resilient to flooding by indicating continued performance and maintenance of integrity relating to physical structures and institutional processes in times of and throughout flooding experiences post-Washi. However, sustaining social functions such as going to school/office, and able to travel at the face of imminent threat remains to be a challenge. Details point-out significant reduction of exposure to flooding risk but also results to decreased adaptive capacity. This is more pronounced to households who have fundamentally restructure their structure and identity by relocating to resettlement projects within the city.

Socio-economic profile of households denotes that most of household members get their livelihood from minimum-wage or informal work in services and construction sector in the city proper. By relocating to relatively remote resettlement areas, they are forced to either quit their job with limited source of alternative livelihood, or go back to their original location and pursue substitute resiliency measures which could be unbecoming.

Another outcome which generally applies to all case areas is the decreased livability which affects quality of life. By pursuing non-structural measures to increase adaptive capacity, household conditions become too functional. While in itself is not bad, households have expressed to make their structures more comfortable and cozier but are left with no choice but to invest less in household activities, furniture and fixtures to cushion financial loss should flooding occur.

Finally, ideation to interpretation and realization of resiliency outcomes at household-level is encumbered by institutional logics, disassociation with land-use planning processes, and rigidity of traditional governance that perpetuates patronage politics and unresponsive methods. Fortunately, households' experience of resiliency building in CDO post-Washi hints

at observance of critical reflexivity. Active presence of CSOs stir households to find sources of information and ingenuity. This explains households' positive outlook on importance and significance of land-use plan objectives and its potential of reinforcing autonomous household response in achieving greater resiliency outcomes.

Chapter 5: Conclusion and recommendations

5.1 Introduction

This chapter deepens findings of the study by corroborating theory discussion in chapter 2, and responding to the research question and objectives in chapter 1.

Results of the study are context-heavy to chosen case areas. Nonetheless, the study provides actual information on household experiences by attempting to explain how resiliency-building measures at household-scale in CDO post-Washi unfolded. Accordingly, extensive review on related literature concludes that underlying causalities mentioned in this study relates to universal root drivers of the need for resiliency-thinking in urban governance. Consequently, generated practical propositions, and new knowledge applies beyond political jurisdiction of local government of CDO and transcends into fields of urban management, resiliency, and disaster risk reduction and management.

5.2 CDO and Washi as an excellent case study

Tropical storm Washi's seemingly innocuous characteristic and its destructive aftermath baffled governments, households and the scientific community. The Washi disaster is provoked by abnormal natural disturbance and the interplay of degenerated environment systems, positive economic outlook, and disconcerted urban governance. (RDC-Northern Mindanao, 2012)

Anthropogenic effects of human activities in the forest upland and land-use in urban communities degraded natural systems' soil infiltration and water absorptive capacity. Moreover, households living in high risk areas have become accustomed and adapted to regular flooding. Unfortunately, the abnormal downpour brought by Washi triggered flash flooding upstream which caught the complacent households off guard. (Espinueva, Cayanan, et al., 2012, Rasquinho, Liu, et al., 2013)

The burgeoning informal settlers looking for better jobs in the city pressured government institutions to provide decent and affordable housing solutions. Unfortunately, low-income households got lured into settling in floodplain areas, including the ill-planned socialized housing Piso-Piso program of the city government. Traditional politics exploiting the already vulnerable households and weak governance structures resulted to catastrophic loss of life, income, and property. (Franta, Roa-Quiaoit, et al., 2016)

5.3.1 Important concepts

The study looks at household response, land-use plan objectives, and urban resiliency as important concepts.

Autonomous household response, as an independent variable, is the translation of household context regarding resiliency as a concept and in practice. Particularly, study linked causes to resiliency outcomes and looked at contextual conditions that affect such process.

The study also examined resiliency objectives of CDO local government's land-use plan and how it outlines strategies, and mechanisms that allow resiliency building at household-scale.

Finally, urban flood resiliency outcomes are regarded as measurement for the dependent variable of urban resiliency because flooding is the most significant hazard in CDO. (CDO city government, 2015) It is also used to signify extent of dialoguing between household context and land-use plan objectives to operationalize desired resiliency goals. Urban resiliency, as the unit of measure, is conceptualized more broadly, as supposed to against a specific hazard, to

allow factoring-in of cascading impacts that possibly result to trade-off in multiple scales. (Chelleri, Waters, et al., 2015, Coaffee, 2013, Normandin and Therrien, 2016)

5.3 Special learning from household experience in CDO post-Washi

This case study traces households' process of ideation, application, and realization of resiliency outcomes in CDO. Sampling frame consists of households living in barangays Macasandig and Balulang, and those who have resettled in Ecoville. Almost two-thirds of total household respondents live below poverty threshold, with respondents from Balulang having average monthly income of slightly above it. Special learning is achieved in this case study as it investigates unique causal mechanisms and enabling contextual conditions that affects response of households severely affected by Washi.

Data gathering employed four data collection techniques. Structured interviews through administration of questionnaires, semi-structured interviews with key informants, desk research analysis, and actual observation. Extensive review of state-of-the-art theory about urban resiliency, autonomous household response, and land-use planning were conducted to ensure that operationalization of concepts is consistent. Additionally, identification of case areas was a result of secondary analysis on literatures that investigated Washi phenomenon in CDO and official documents and reports from relevant government agencies.

Descriptive statistics were used in processing quantitative data while iterative process of coding was used in the analysis of qualitative data.

5.3.1 How do households comprehend urban flood resiliency?

In the case of households in CDO, flooding is primarily associated with dysfunctional or non-existent structural measures that allow draining of water such as sewers and canals. Relatedly, households associate the failure to implement proper solid waste management as another major cause of flooding because trash prevent or obstruct water flow in built and natural waterways. In addition, effect of flooding is aggravated due to inadvertent addition of concrete structures that physically lock floodwater, and by anthropogenic effects of denuding forests in the hinterlands and indiscriminate land-use in urban areas. (see also Franta, Roa-Quiaoit, et al., 2016)

On the other hand, households' context regarding object of resiliency resonates at individual interest. Personal properties and belongings are of utmost concern for households that needs to be resilient. Interestingly, the next perceived important objects of resilience are interdependent and interconnected.

Households need to have access to basic utilities to continuously receive information of status and updates of threat level, and communicate to others in the face of or all-throughout occurrences of a hazard. Next is public infrastructures need to sustain and maintain function in order to allow mobility of individuals to move to evacuation centers or other safer areas, and of disaster responders to provide disaster relief and rescue operations.

Communal and public spaces like schools and multi-purpose covered courts are also perceived as important objects of resilience because they function as evacuation centers. Relatedly, basic government services need to perform core functions at the face of imminent threat so that essential needs like clean water, sanitation and hygiene, and food is provided to households as part of immediate disaster relief response.

5.3.2 What have households done, or doing to pursue resiliency to flooding post-Washi?

Actual responses of households are predominantly within context of disaster risk reduction and management.

Households often respond by adapting built structures according to perceived base flood and flood path. This typically comes in the form of rebuilding house to an improved condition, and elevating houses either by adding floors or other structures at a height higher than previous flooding experience. Modifications of houses are designed to function as immediate evacuation route or area, and storage for important belongings.

Also, households respond by curbing potential financial loss by investing less in appliances, prioritizing functionality of house interior rather than aesthetics, preferring items that can better withstand flooding like plastic chairs instead of sofa, and flood-proofing personal effects.

Another typical resiliency building measure is relocation. Households with better financial status relocate to private neighborhoods outside high-risk areas. However, those who cannot afford have to heavily rely on resettlement projects within the city.

Most common non-structural household response is disaster preparedness. Households are oriented and understand the early warning systems, and more likely to cooperate in calls for pre-emptive and voluntary evacuation. Other non-structural measures include pursuing alternative source of livelihood, cleaning house premises, participation to clean-up drives, and tree planting.

Noteworthy, the study has presented novel solutions such as addition of a mezzanine-like structure inside the house that functions as an elevated storage to keep things from being flooded, storing personal effect in "megaboxes" and plastic bags for flood-proofing, and stand-by emergency kits which enables households to quickly evacuate.

5.3.3 What are the urban resiliency objectives in CDO's land-use plan post-Washi?

In accordance with legal framework, DRRM and CCA principles involve preparedness, prevention and mitigation, response, recovery and rehabilitation. The first two themes deal with empowering communities to reduce, "anticipate, cope, and recover" from potential undesirable impacts of hazard before it happens. While the other two deal with provision of essential needs during a disaster, and rebuilding back better post-disaster affected infrastructures, livelihood, and quality of life.

Resiliency objectives of the city's comprehensive land-use plan envisions active engagement of stakeholders in achieving socio-economic development by facilitating inclusive and sustainable investments that integrate DRRM and CCA principles.

Particularly to land-use sector, the objective is to foster safe, secured, and orderly communities by enforcing adherence to no-build zones, activation and empowerment of local structures for DRRM and CCA, implementation of early warning systems, and adopting a watershed approach to improve river systems.

5.3.4 What are causalities that influence autonomous household response in becoming more resilient to flooding post-Washi?

At the core of engaging autonomous household response are landmark legislations that revolutionized DRRM and CCA to encompass a more holistic approach that puts emphasis to localized response in reducing impact of hazards.

The first of which is RA 10121 which sets institutional and financial arrangements in operationalizing DRRM and CCA principles. Households are able to withstand, accommodate and recover from impact of flooding because there are wider modes of early warning system, increased rescue capacity of local government, more visible BDRRMC, and increased calamity fund which, among others, developed disaster preparedness of households, and enhanced capacity of disaster responders and evacuation centers to provide better immediate relief

services. Moreover, EO 079-15 enabled the refinement of the Piso-Piso socialized housing program by integrating lessons from households' disaster experience. This process sets precedence to crafting succeeding housing solutions.

Another breakthrough is mainstreaming of the People's Council in local special government bodies through issuance of EO 097-2015. The People's Council fostered collective integration of resiliency narratives of household from various sectors and translated into a People's Agenda. People's Agenda is a set of identified priority programs and projects covering income generation, infrastructure rehabilitation, security of housing tenure, and rehabilitation of water supply. The most successful of which is the BUB program which enabled Washi survivors to pursue alternative source of livelihood resulting to improved adaptive capacity.

Central to making all these mechanisms work is the active involvement of CSOs. CSOs fill in the implementation gap by facilitating collective household resilience narratives through community organization and bridging it to avenues of collaboration in government interventions.

5.3.5 How has the land-use plan objectives been communicated to and adopted by households post-Washi?

Land-use plan objectives are communicated through local structures such as the barangay, and mainstreamed platforms that engage multiple interests of various stakeholders including households. Platforms such as the People's Council which was pivotal in crafting a people's agenda, CHUDD which integrated learnings from household disaster experience in designing housing solutions, and through active participation and engagement with CSOs in disaster relief and preparedness.

Results pointed-out that households do not in any way directly consult with land-use plan objectives when deciding which resiliency-building measure to take. Though, in the process of self-directed learning, searching for sources of alternatives, and critical reflexivity, households internalize and intuitively apply concepts of DRRM and CCA.

5.4 To what extent autonomous household response dialogue with land-use plan objectives in pursuing urban resiliency in CDO post-Washi?

Household response is the complex process of households ideating and translating into structural and non-structural measures to realize notions of resiliency at household-scale. (see Cerè, Rezgui, et al., 2017, Coaffee, Therrien, et al., 2018, Duit, 2016, Duží, Vikhrov, et al., 2017) Household response are considered autonomous household response because households independently responds from the purview that interventions at national or city level take too long to respond to resiliency problems in a timely and effective manner. (Mycoo, 2014)

This study has provided evidence that land-use plan objectives are not directly significant in households' process of resiliency building as households have limited knowledge on what goes on and in with land-use plan. Furthermore, households based their priorities on personal convictions which are shaped by learnings from previous disaster experience and reshaped by diverse resiliency narratives from horizontal and vertical interaction across social networks.

Conclusively, autonomous household response contributes to the realization of land-use plan objectives by adhering to no-build zones, relocating to safer and secured areas whenever opportunity presents, and adherence to early warning system. By intuitively integrating DRR and CCA principles, autonomous household response build back better, eco-conscious and progressive communities.

5.5 Conclusion

Basic questions of resilience thinking relate to what does resilience mean - what object needs to be resilient, what makes it vulnerable, and when does it become resilient - to households. (Duit, 2016) Connectedly, resilience narratives frame highly contextualized and constructed notion of resiliency which could measure household context. (see Béné, Mehta, et al., 2018) This study has provided actual resiliency narratives at household-scale by detailing post-Washi experiences of vulnerable households in CDO.

The researcher would like to conclude this study by highlighting important lessons that have policy implications and can possibly contribute to formulating a collaborative decision-making approach to urban governance. (see Coaffee, Therrien, et al., 2018, Elrick-Barr, Smith, et al., 2016)

Essential to autonomous household response concretely contributing to achieving resiliency objectives of land-use plan is the capacity of households to be responsive, resourceful, and reflexive. (see Matyas and Pelling, 2015, Qin, Romero-Lankao, et al., 2015) Complementarily, there should be flexibility of land-use plan objectives to allow localizing modes of resilience. (see Jabareen, 2013, Murphy, Pelling, et al., 2018, Sudmeier-Rieux, Paleo, et al., 2015)

Autonomous household response can undermine other's resiliency outcomes because these are myopic in a sense that it operates at context of individual interest. (see Mycoo, 2014) Such was the case in CDO where instances of modifying property encroach built canals. Another example is in pursuing backyard hog raising as alternative source of livelihood, people are exposed to possible disease from water and odor pollution.

Furthermore, the already vulnerable low-income households were the most affected even in the aftermath of Washi. Households find themselves pursuing inferior resiliency-building structural measures and heavily relying on donations and subsidies for post-disaster relief, recovery and rehabilitation. This predicament is universal where low-income individuals have lower adaptive capacity because they have fewer resources to mobilize when pursuing resiliency objectives. In addition, interventions can perpetuate inequality if it disregards issues of social justice. (Anguelovski, Shi, et al., 2016, Yonson, 2017) Case in point is households' experience of the Piso-Piso program and how patronage politics taking undue advantage of weak governance structures put thousands of informal settlers in harm's way.

As such, it is important to process household narratives to a collective level as knowledge required for resilience can be expressed and reshaped from individual perspective to shared and informed meaning of diverse experience. This can also challenge distribution of decision-making process and move towards a more collective action. (Goldstein, Wessells, et al., 2015, Usdin, 2014)

CDO's experience in pursuing urban resiliency post-Washi from households' standpoint hints at contemporary approaches worth showcasing. RA 10121 reinvented approach to resiliency building by institutionalizing a systemic process that includes a holistic approach covering pre, during, and post disaster interventions. By setting up institutional and financial guidelines, an ex-ante budgeting system for DRRM enabled frontline government agencies to modernize equipment, increase response capability, improve disaster relief services, and strengthen local DRRM structures. Furthermore, the approach puts local response more centrally by conducting seminars and trainings that significantly apprised households of disaster preparedness.

Another policy breakthrough is the streamlining of government platforms through issuance of local ordinances EO 079-15 and 097-2015. Redesigning of socialized housing programs, recognizing the People's Agenda, and legitimizing roles of CSOs in development planning

through the membership of People's Council in special local bodies are instrumental in giving meaning to lessons learned from households' disaster experience.

These landmark policy instruments entices eradication of silo-mindset of households by making sense of lessons learned to broaden perspective, consider inter-organizational interdependence with CSOs acting as conduits making households able to pursue individual objectives and still be independent from governance structures, (see Henstra, 2012, Valiquette L'Heureux and Therrien, 2013) and stimulate processes that accommodate flexibility and adaptability in order to shift away from unresponsive and tedious traditional methods. (see Pelling and Manuel-Navarrete, 2011, Stark, 2014)

The researcher would like to commend how CDO's experience of post-Washi has transformed institutions, processes, and even identity to become more resilient. However, referring to this study's problem statement, actual resiliency building-measures take the stance of anticipating, accommodating and recovering from disaster impacts. This does not address the root causes of why the necessity to build resiliency, which is unchecked rapid urbanization, unsustainable urban metabolism, and degradation of environmental systems. Arguing that resiliency bridges the gap between DRRM and CCA, a proposed policy measure that has been mentioned many times in the interviews could be a smart solution to operationalizing urban resiliency objectives, the Payment for Ecosystem Services (PES) scheme. PES is where households in the upstreams could be given remuneration in exchange for ecological benefits. This has great potential in making DRRM and CCA in full-cycle.

5.6 Moving forward

Original conceptualization of this master's thesis involves a greater scale of data but limitation on technical competency, resources, and time limits scope to dialoguing between household context and land-use plan objectives only. The following are interesting areas that might rouse experts in urban governance, disaster risk reduction and management, climate change, and land-use planning. I am more than willing to share my data.

Patterns or trends from raw data:

- Relationship between view or attachment to land and resiliency building. Some households view their property in a non-conventional way which fosters deeper connection with land.
- Powerplay among households and between actors in creating shared meaning especially that linking is more effective when a third-party facilitates the process *ie CSO*
- How other stakeholders such as the academe, NGOs, business sector and including governments dialogue with land-use plan objectives to translate their own resiliency context to actual stakeholder's response. Something in the like of comparing different stakeholders' response and how they contribute to collective action towards resiliency-building

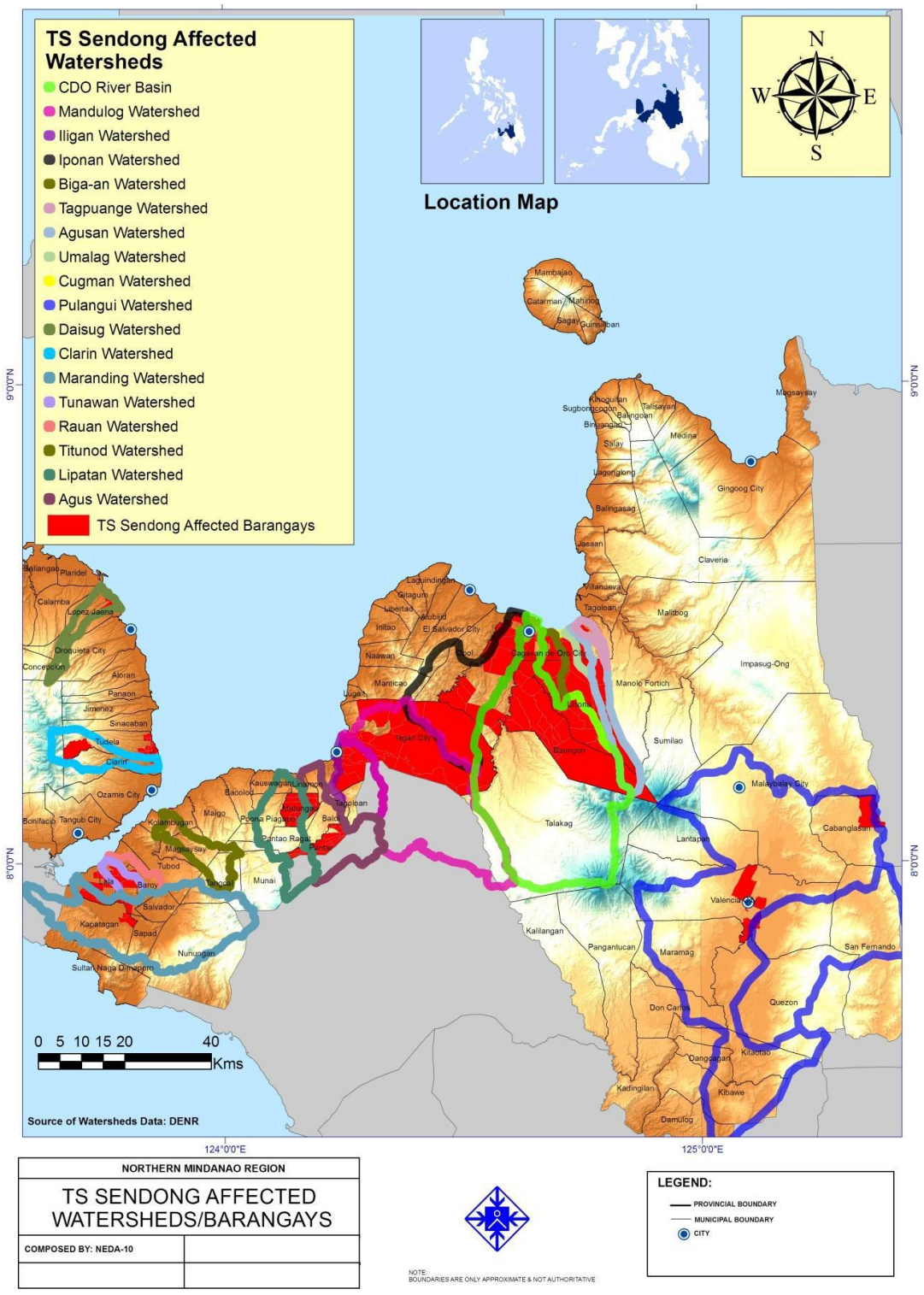
Practical areas in moving forward:

- How much of the ex-ante DRRM budgeting really goes to the different components as prescribed by RA 10121? From the interviews, researcher only hear about the pillars related to interventions during and post disaster. Prevention, mitigation is crucial in addressing root causes as mention in the statement of the problem.
- Payment for Ecosystem Services (PES) scheme is a proposed measure that ensures funding for "environmental" services in the upstream. PES holds promising potential as this could integrate full-cycle pillars of DRR and CCA. Also, following learnings from this study, PES might be designed to resemble institutional logic of ex-ante budgeting system pegged part of the locational, permits objective of CLUP.

ANNEX 1: Affected areas in Region 10 – Norther Mindanao

Map 1 Source: RDC–Northern Mindanao, 2012

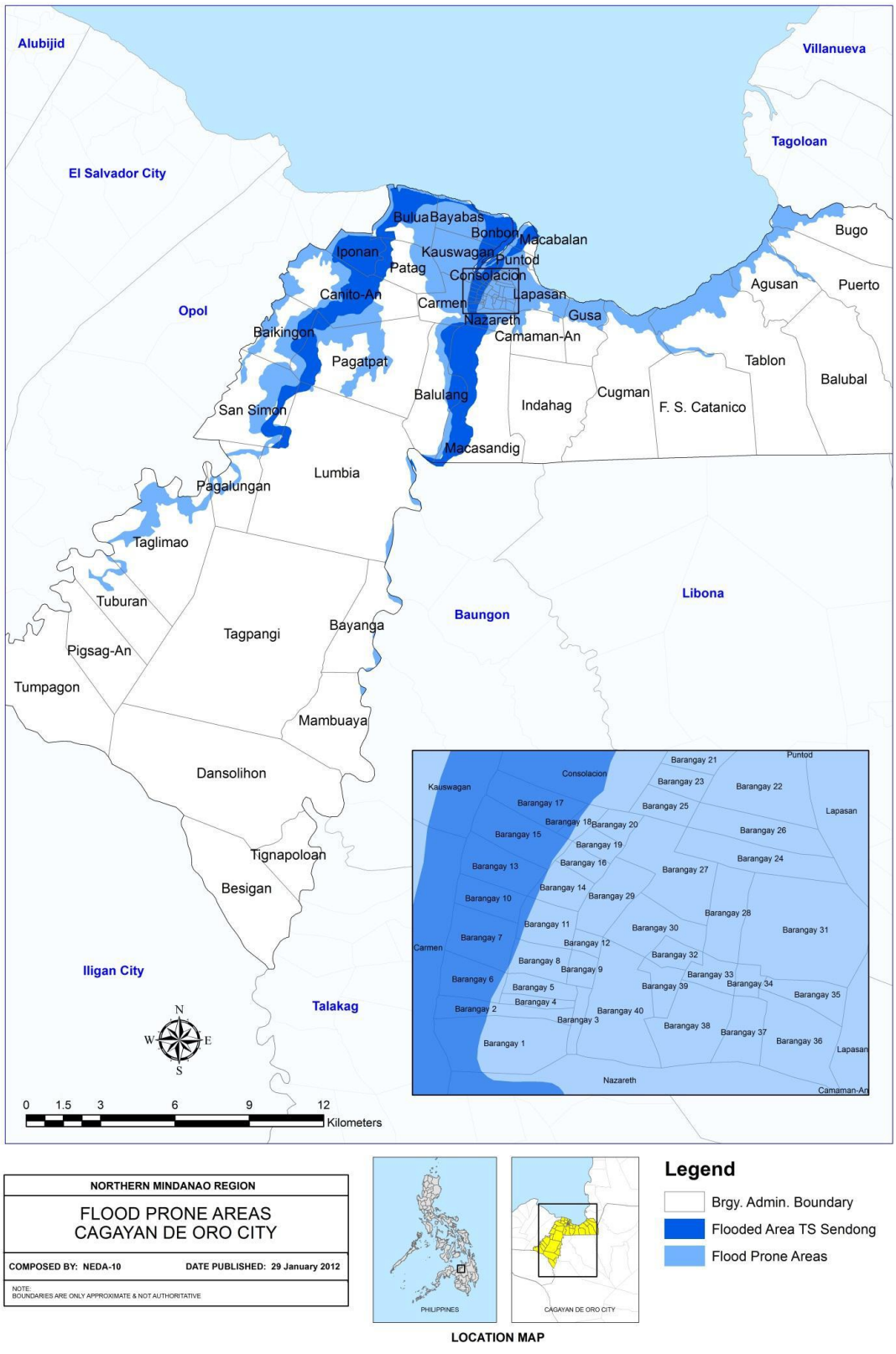
Mindanao used to boast of its natural comparative advantage of being typhoon free. Washi, local name Sendong, ravaged the Northern part of Mindanao on December 2011.



ANNEX 2: Flood Prone Areas in CDO

Map 2 Source: RDC-Northern Mindanao, 2012

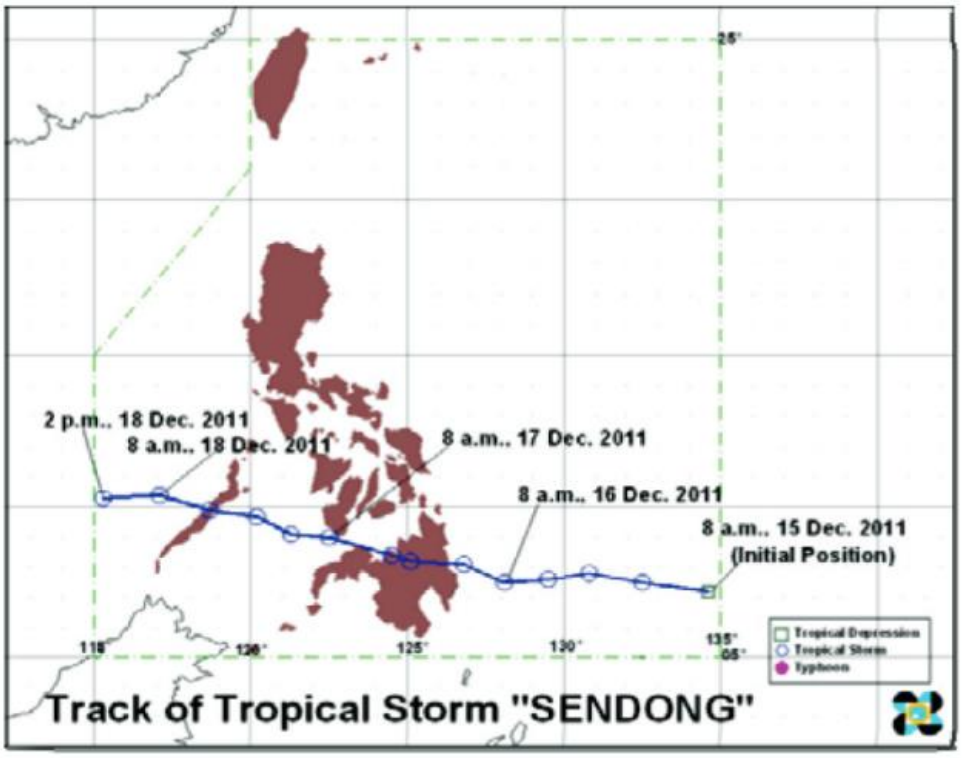
Based on the assessment of threat level and adaptive capacity, the most significant hazard to CDO are typhoons and flooding. There is a distinction between typhoon to flooding because some of the urban flooding occurs even without any typhoon.



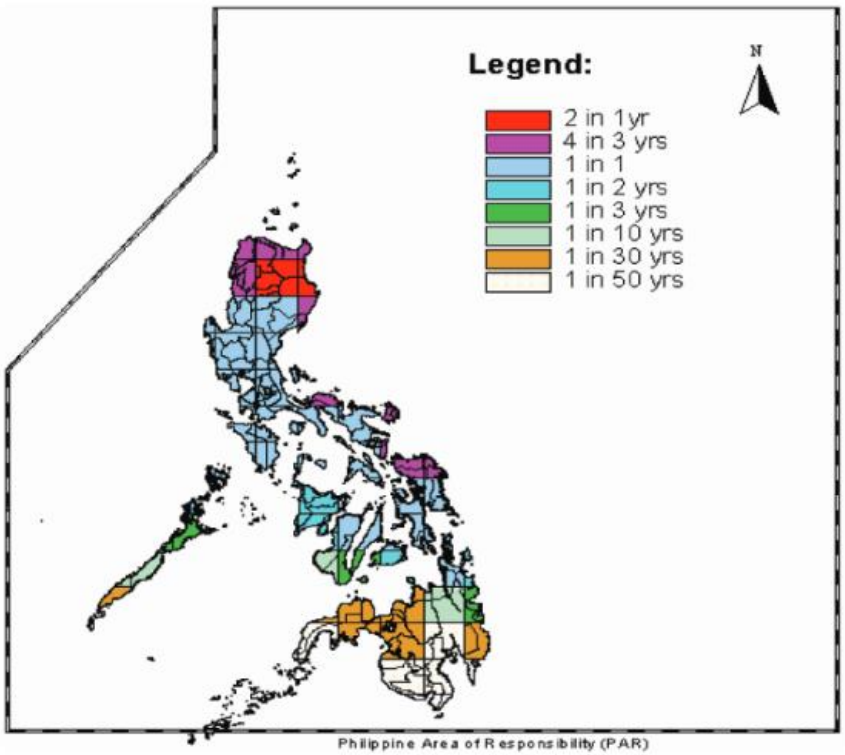
ANNEX 3: Frequency of tropical cyclones in the Philippines

Map 3 Source: Espinueva et al., 2016

Path of tropical storm Washi



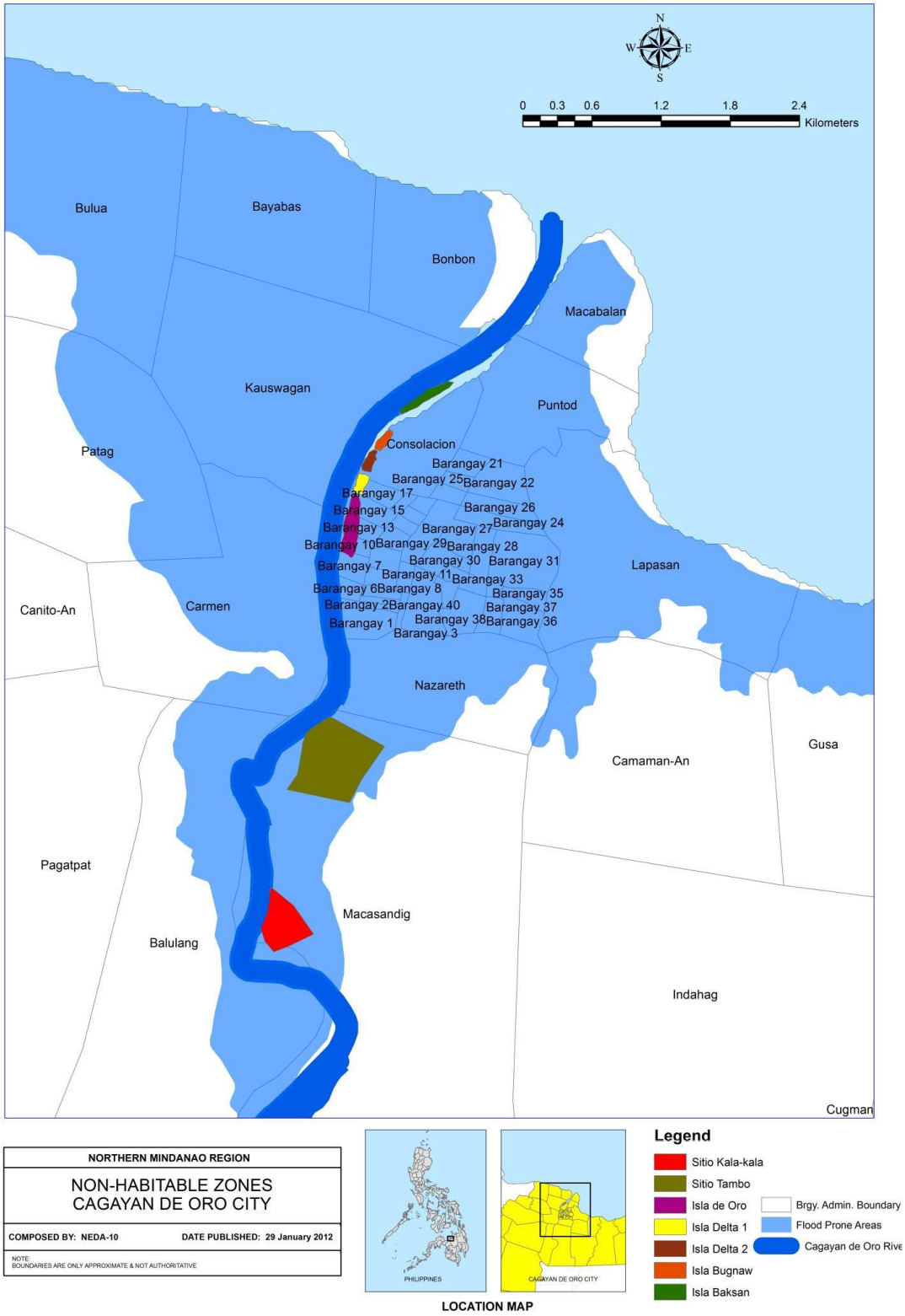
Frequency of tropical cyclone occurrences in the Philippines.



ANNEX 4: Declared non-habitable zones in CDO.

Map 4 Source: RDC-Northern Mindanao

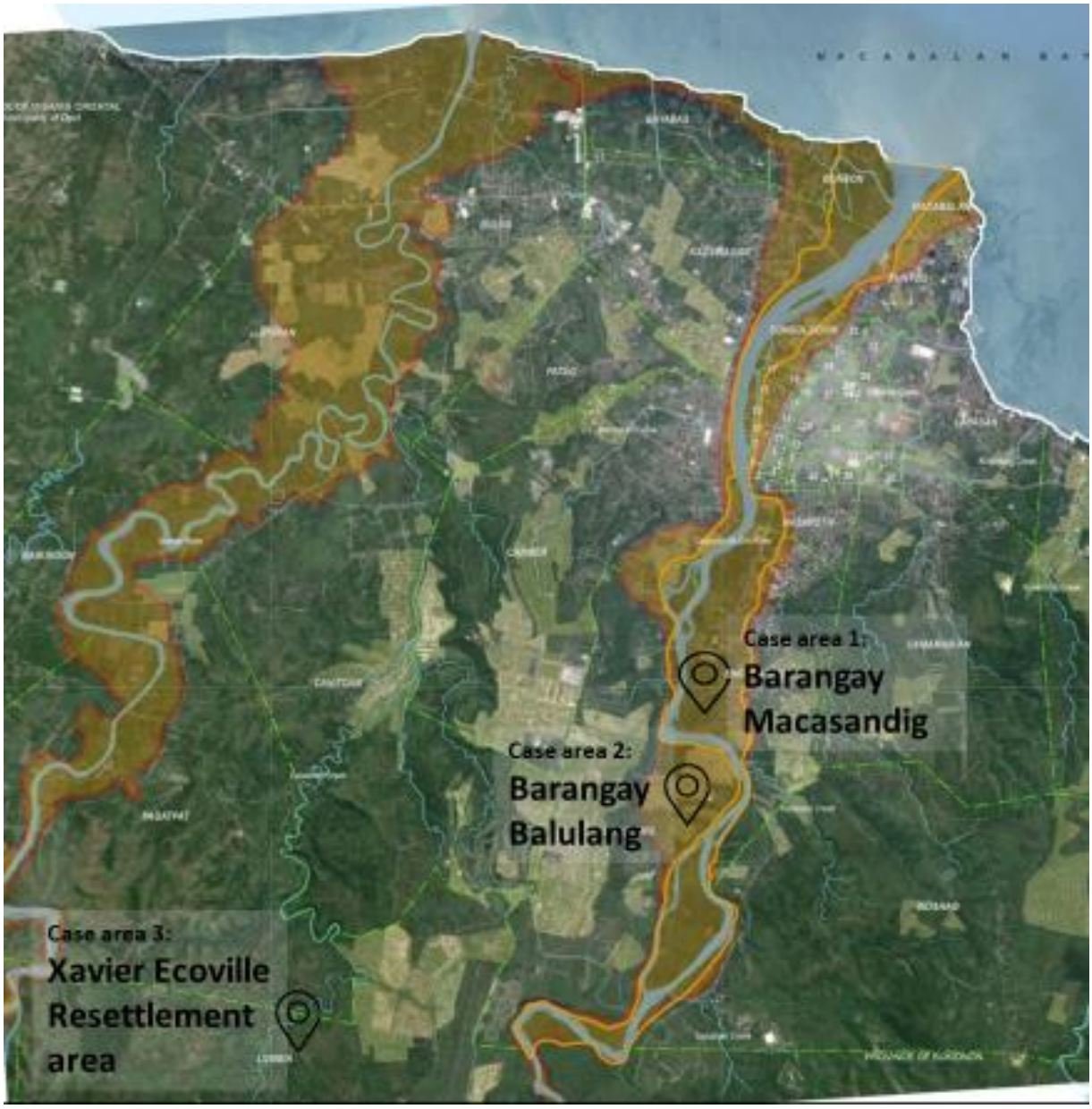
Most areas severely destroyed by Washi were declared as no build zones leaving many of its informal settlers inhabitant no place to go back to.



ANNEX 5: Location of identified case area

Map 5 Source of base-map: (CDO city government, 2015)

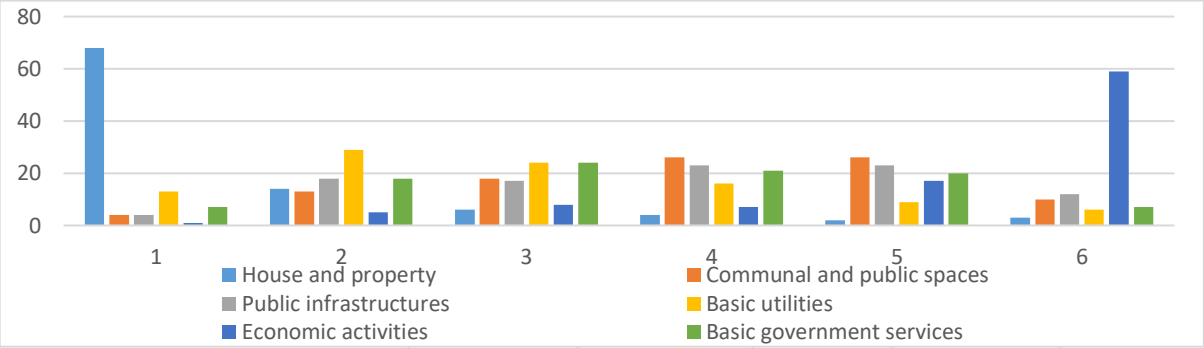
The extent of damage caused by Washi affected almost half of the barangays of the city. For this study, the most badly hit areas of Balulang and Macasandig, and the Ecoville are chosen as case areas.



ANNEX 6: Results of descriptive statistics

Household respondents were asked to rank 1st to 6th which among the identified object should be prioritized.

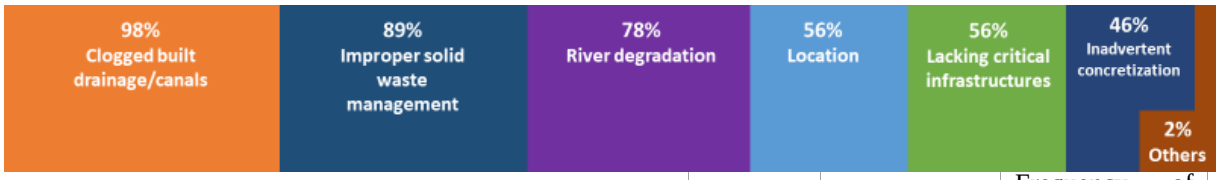
Graph 2. Household response to what should be prioritized in pursuing urban flood resiliency.



Field	Minimum	Maximum	Mean	Std Deviation	Variance
House and property	1	6	1.63	1.21	1.47
Communal and public spaces	1	6	3.9	1.33	1.76
Public infrastructures	1	6	3.81	1.41	1.99
Basic utilities	1	6	2.97	1.39	1.93
Economic activities	1	6	5.18	1.27	1.61
Basic government services	1	6	3.52	1.38	1.9

Household respondents were asked to check which among the pre-identified causes of flooding apply to their experience. An option "others:" is included to provide for generation of new information.

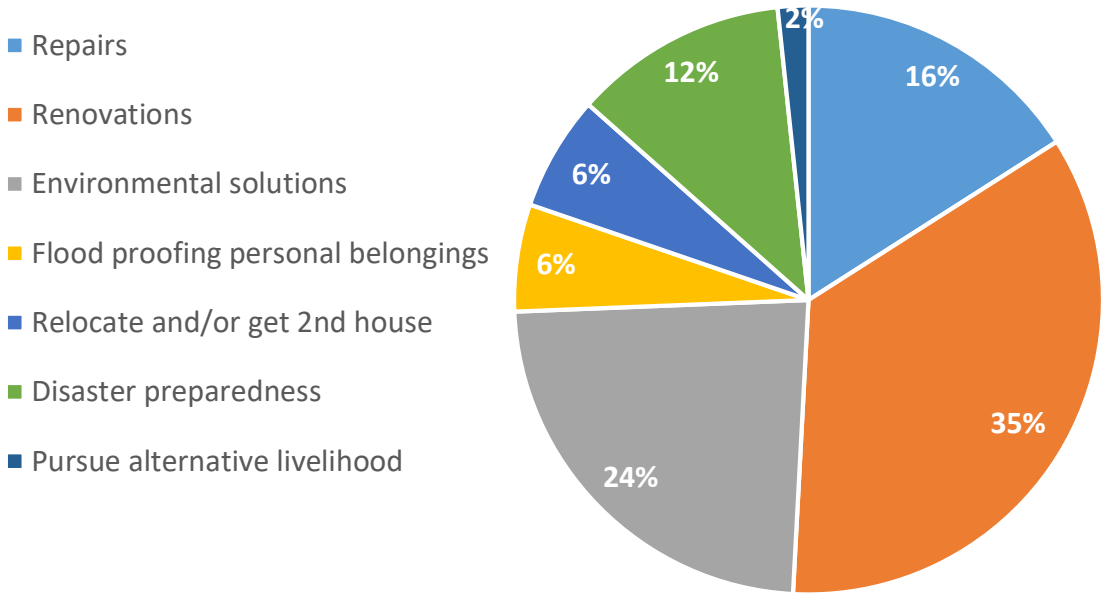
Graph 3. Frequency of response for causes of flooding.



	Response count	Total household respondents	Frequency of mention (Response count /total household respondents)
Clogged built drainage/canals	94	96	97%
Improper solid waste management	85	96	88%
River degradation	75	96	77%
Location/area	54	96	56%
Lack of critical infrastructure	54	96	56%
Unnecessary concretization / impermeable surface	44	96	45%
Others	8	96	8%

Household respondents were asked to detail which measures were actually pursued to become more resilient to flooding

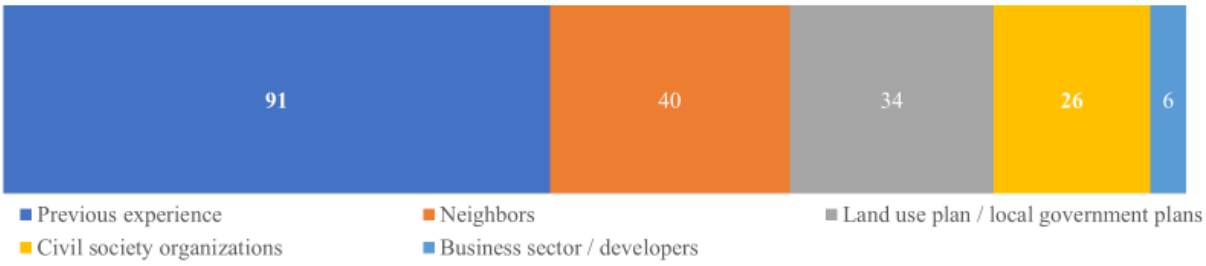
Graph 4. Summary of pursued resiliency building measures by household respondents.

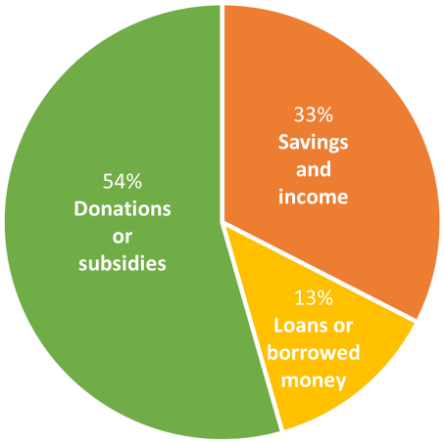


	%	Freq
Repairs	16%	38
Renovations	35%	83
Environmental solutions	24%	56
Flood proofing personal belongings	6%	14
Relocate and/or get 2nd house	6%	15
Disaster preparedness	12%	28
Pursue alternative livelihood	2%	4

Household respondents were asked to check every possible basis for deciding which resiliency measures to pursue.

Graph 5. Response count regarding basis of deciding which resiliency measures to pursue.

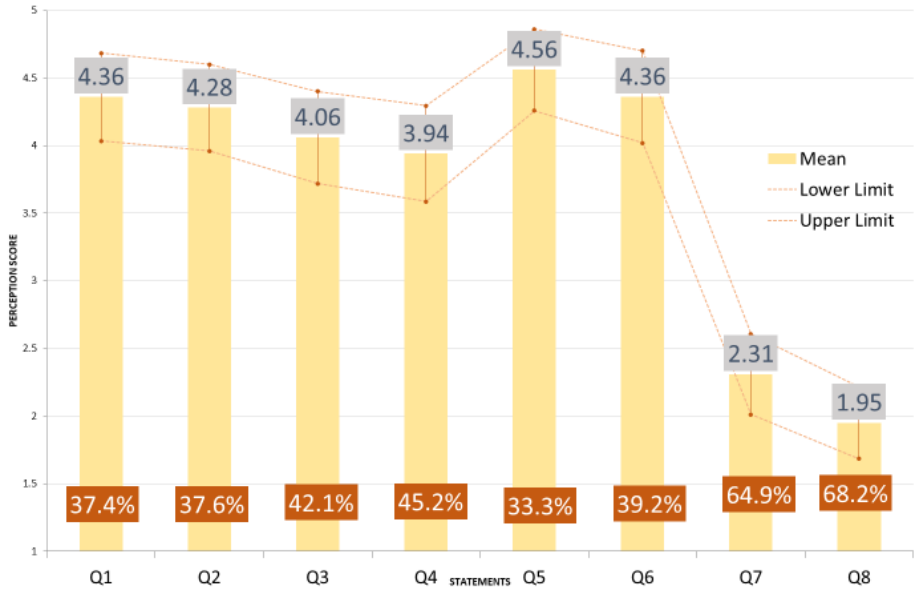




Graph 6. Source of resources that enables household to recover from flooding impact.

Households were asked to indicate how were they able to finance pursued resiliency measure

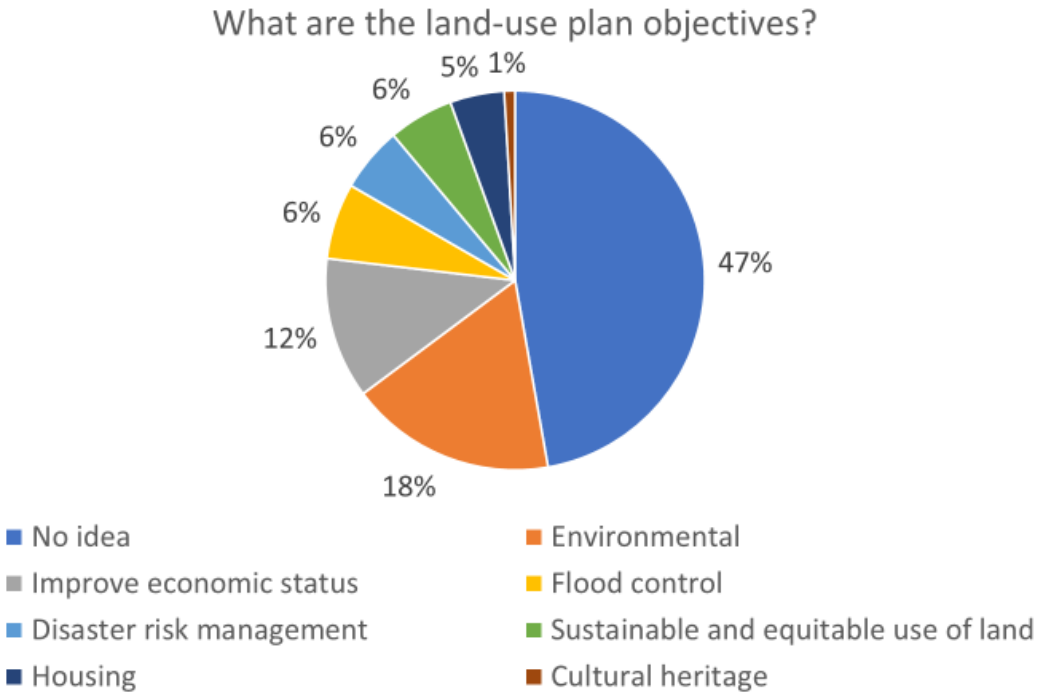
Graph 7. Central tendency and variability of responses to statements measuring communication and adoption of land-use plan objectives

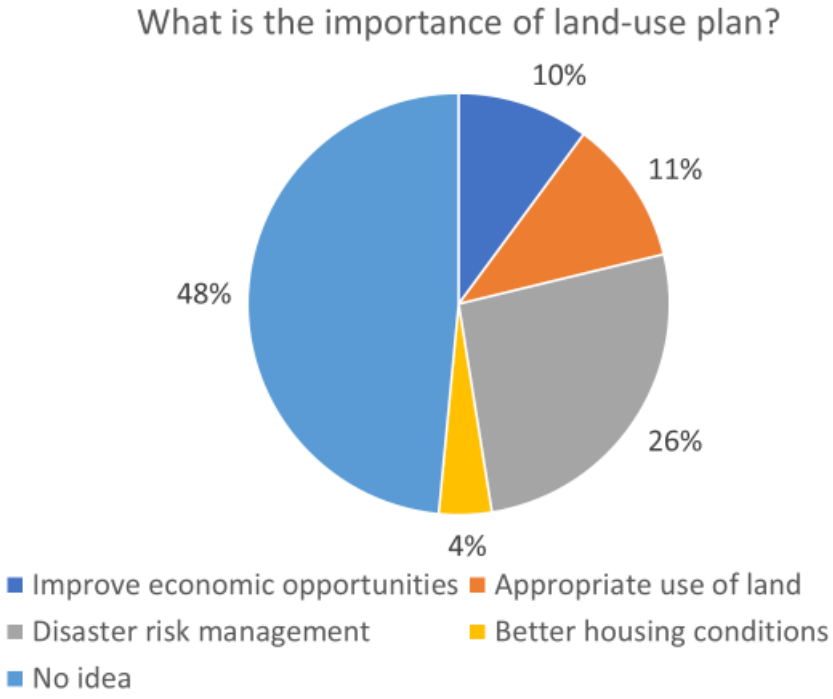


#	Field	Min	Max	Mean	Std Dvtn	Var
1	I am aware of the land use plan.	1	6	4.36	1.63	2.64
2	I am familiar of the land use plan objectives.	1	6	4.28	1.61	2.6
3	I have a role in achieving land use plan objectives	1	6	4.06	1.71	2.92
4	In at least the last five years, I have heard about any land use plan.	1	6	3.94	1.78	3.15
5	In at least the last five years, I have consulted with the land use plan.	1	6	4.56	1.52	2.31
6	I have participated in any activities by the government relating to land use plan and planning.	1	6	4.36	1.71	2.93
7	Land use plan is important in making us more resilient to flooding.	1	6	2.31	1.5	2.25
8	Pursuit of resiliency objectives in land use plan should be everyone's duty.	1	6	1.95	1.33	1.78

Household respondents were asked regarding what are land-use plan objectives that details strategy in pursing resiliency and how do they perceive importance of
Such.

Graph 8. Results of questionnaire survey regarding what households think objectives of the land-use plan are and the importance of it.





ANNEX 7: Land use sector objectives as stated in the comprehensive land use plan.

Lifted from (CDO city government, 2015)

CDO comprehensive land-use plan uses results of analysis of threat level and evaluation of adaptive capacity. This table presents land sector objectives of the land comprehensive land-use plan

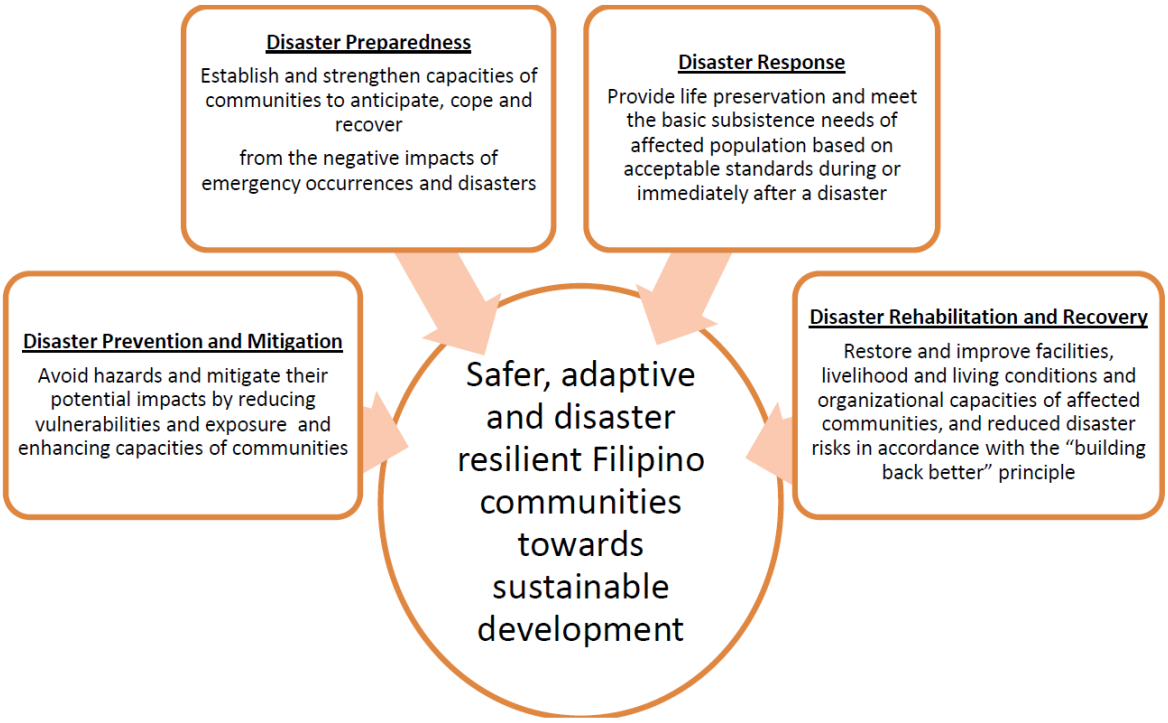
OBJECTIVES	**Implement informal settler-related laws and relocation to a safer and decent location**	**A safe, peaceful and orderly community**	**Establish buffer zones from settlements in watershed areas**
DEFINITION	• Informal settlers are located in high-risk areas like rivers, creeks, etc. This objective will address the impact of hazards such as typhoons and landslides • If we can relocate settlers in high risk areas, there will be fewer casualties	• Improvement: to develop a well-planned community • A "well-planned community" indicates that all factors affecting the community will be considered during flooding as well as in other hazards • The objective also places emphasis on safety which is of prime importance	• Improvement: to establish buffer zones from settlements in river systems areas • It may be the best to primarily look at river systems instead of watershed areas which are bigger in coverage
CLIMATE CHANGE ADAPTATION OPTION(S)	• Re-activate local housing board • Propose creation of city housing/shelter department/office • Strict enforcement of river easements • City Disaster Risk Reduction and Management Council (CDRRMC)	• Activate and enhance capacities of Barangay Disaster Risk Reduction and Management Council (BDRRMC) • Implementation of Early Warning System at the barangay level particularly in high risk areas • Info-board not only for "Smart" subscribers	• Strict enforcement of river easements • Prohibit settlements within the legal easement along riverbanks by strict implementation of existing laws • Preparation and adoption of Watershed Management Plan with other localities

	approval as requirement in the issuance of locational clearance/building permit • Prohibit settlements within the legal easement along riverbanks by strict implementation of existing laws	• Implementation of all lifelines and major infrastructures • Programs/projects should be supported with geo and hydrometeorological hazard clearance from Mines and Geosciences Bureau and other mandated government agencies • Mainstreaming of DRRM plan and climate change adaptation into city government's programs and polices • Strict enforcement of Republic Act 9003 or also known as Ecological Solid waste Management	• Watershed Approach – Retention Ponds, Reforestation and Rehabilitation of Forest Establish Protected and Conservation Area
OTHER OPTIONS (CC, DRR)			• Maintain/sustain protected and conservation areas

ANNEX 8: DRRM and CCA Principle

As lifted from the National Disaster Risk Reduction and Management Plan 2011-2018 primer
Source: National Disaster Risk Reduction and Management Plan

"The NDRRMP sets down the expected outcomes, outputs, key activities, indicators, lead agencies, implementing partners and timelines under each of the four distinct yet mutually reinforcing thematic areas. The goals of each thematic area lead to the attainment of the country's overall DRRM vision, as graphically shown below."



ANNEX 9: Network of codes per important concepts

Analysis of qualitative data were done in an iterative process. First phase includes coding documents by keywords in its face value. Second phase involved coding keywords which are semantically similar to create themes. Third phase involved reviewing of literatures to check codes generated. Codes generated that seemed irrelevant were checked again, codes that didn't fit according to discussion of concepts were improved. Checking codes generated at face value and returns to first phase until researcher was confident enough coding is sufficient. Last phase was establishing / creating links among codes to signify relationship. Literatures were consulted in doing such

Figure 3 Autonomous household response network of codes

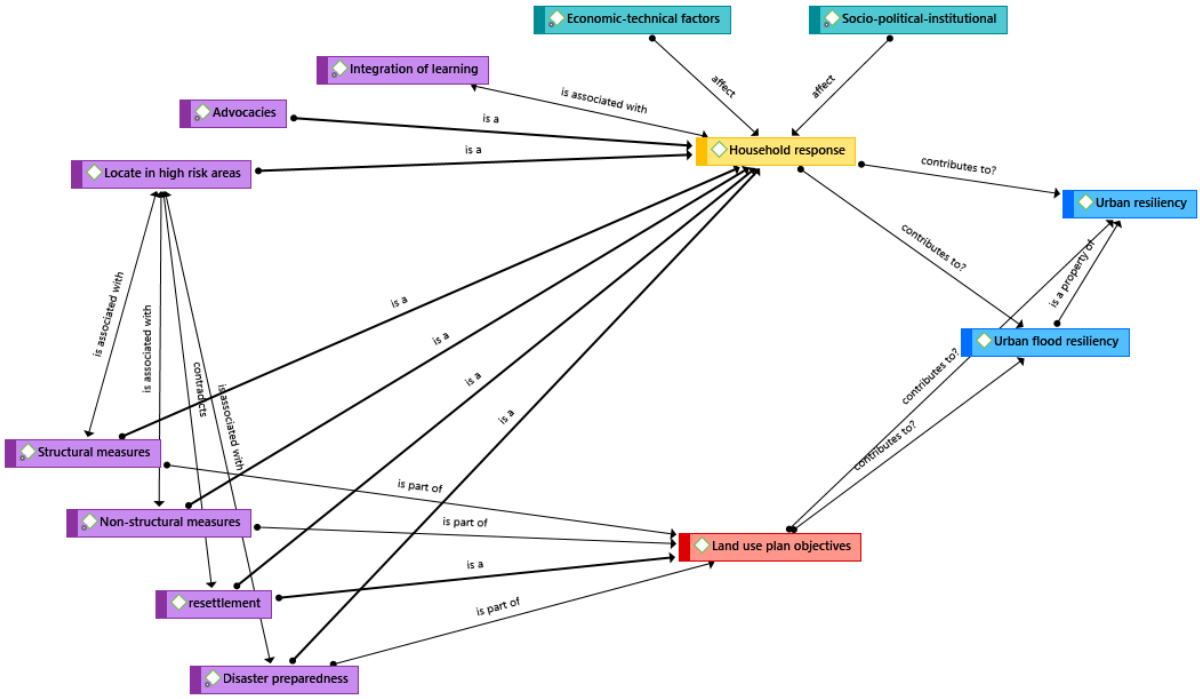


Figure 4 Land-use plan objectives network of codes

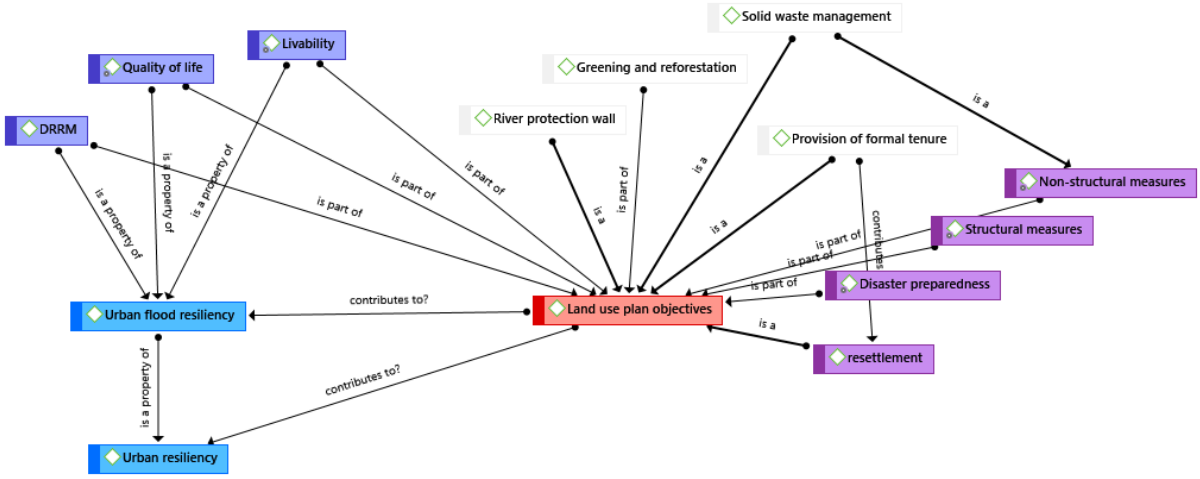


Figure 5 Dialoguing of autonomous household response and land-use plan objectives

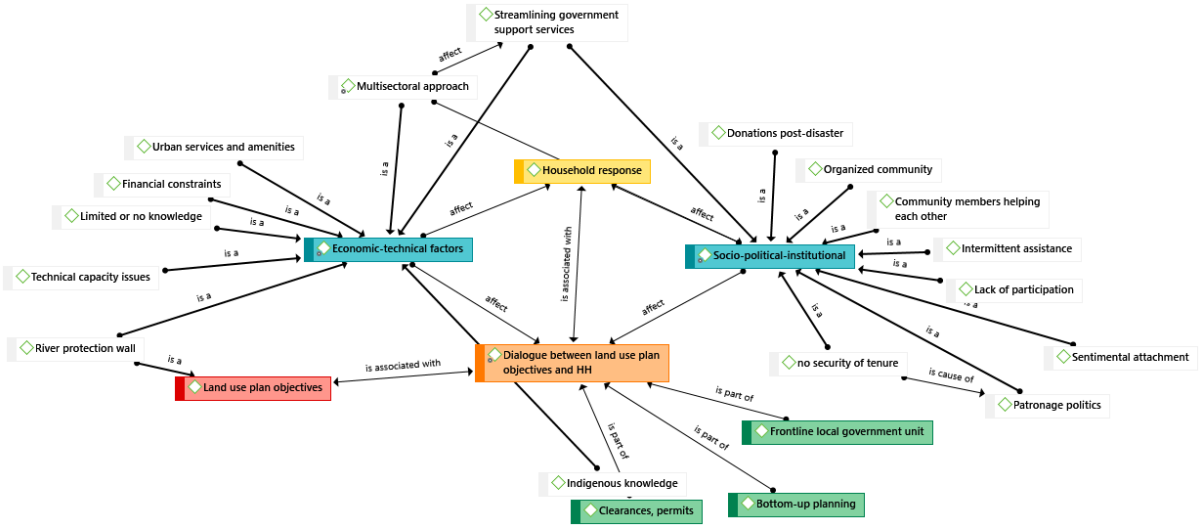
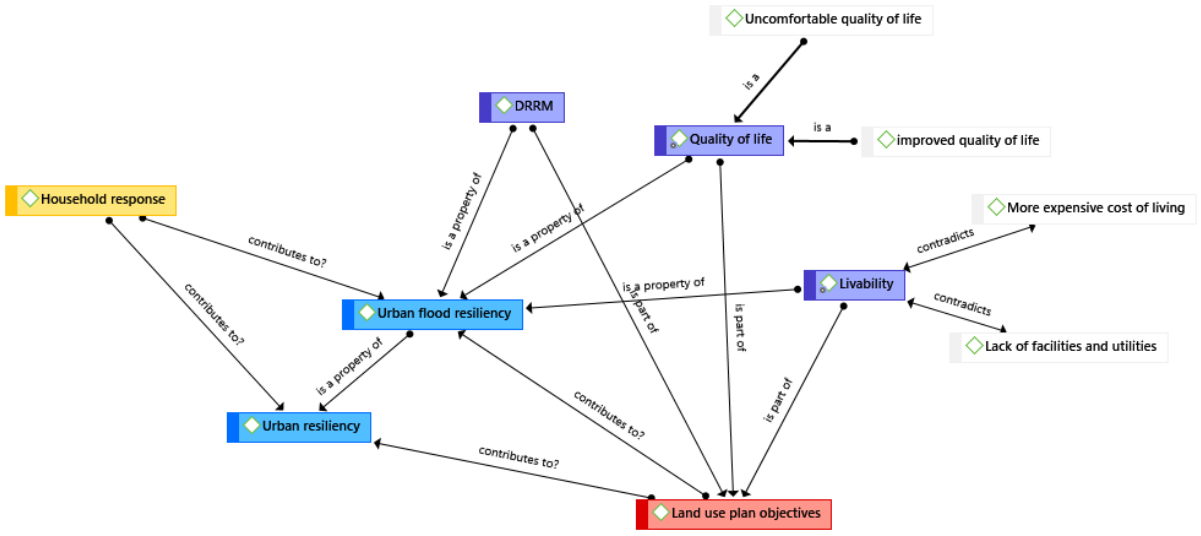


Figure 6. Urban resiliency land-use plan objectives



ANNEX 10: Survey questionnaire

Good day! I am Karl Sam M. Maquiling, a master's student at the Institute of Housing and Urban Studies under the Erasmus University Rotterdam, Netherlands. Currently, I am finishing my thesis on operationalizing urban flood resiliency objectives of land use plans after Sendong. I am humbly requesting that you go through each item thoroughly and generously share your insights. Your response will be greatly appreciated. Rest assured confidentially of all information gathered will be observed at all times. Daghang salamat!

I.

Please rate the following according to what should be prioritized in pursuing urban flood resiliency

My house and my property	1st	2nd	3rd	4th	5th	6th
Communal and public spaces	1st	2nd	3rd	4th	5th	6th
Public infrastructure e.*g. roads, bridges, etc.*	1st	2nd	3rd	4th	5th	6th
Basic utilities *e.g. clean water, electricity, internet, etc.*	1st	2nd	3rd	4th	5th	6th
Economic activities *e.g. shopping malls, office, shops, etc.*	1st	2nd	3rd	4th	5th	6th
Government basic services *e.g. health, education, social services, etc*	1st	2nd	3rd	4th	5th	6th

II.

What do you think are main reasons why flooding occurs (you may select all that apply)?

- o Clogged built drainage / canals
- o Location/Area
- o Unnecessary concretization / impermeable surface
- o Lack of infrastructures
- o River degradation
- o Solid waste management

Others: _____

III.

Please rate the following according to level of importance. Kindly encircle the number that corresponds to your answer.

1 – Strongly Agree; 2 – Agree; 3 – Somehow Agree;
4 – Somewhat Disagree; 5- Disagree; 6 – Strongly Disagree

1. My built structures prevent water from flooding my property.	1	2	3	4	5	6
2. My built structures help prevent water from flooding the neighbourhood.	1	2	3	4	5	6
3. My built structures prevent worsening of flooding whenever flooding occurs.	1	2	3	4	5	6

4. Concrete structures within my premises endure flooding. *ie does not get destroyed/damaged amidst flooding* 1 2 3 4 5 6

5. Roads, bridges and other connectivity infrastructures can still be accessed whenever there is flooding. 1 2 3 4 5 6

6. Roads, bridges and other connectivity infrastructures can still be access throughout the entire duration of flooding. 1 2 3 4 5 6

7. Me and my household members are able to go to work/school in the face of flood threats. 1 2 3 4 5 6

8. Me and my household members are able to travel in the face of flood threats. 1 2 3 4 5 6

9. Me and my household members are able to perform daily functions (*i.e shopping in commercial establishments, deal with business transactions, etc)* in the face of flood threats. 1 2 3 4 5 6

10. Me and my household members have continuous access to clean water whenever there is flooding. 1 2 3 4 5 6

11. Me and my household members have continuous access to electricity whenever there is flooding. 1 2 3 4 5 6

12. Me and my household members have continuous access to public transportation whenever there is flooding. 1 2 3 4 5 6

13. Me and my household members have continuous access to government services whenever there is flooding. 1 2 3 4 5 6

14. Me and my household members have continuous access to information (tv, radio, internet) whenever there is flooding. 1 2 3 4 5 6

15. What are/were modification you did in your physical environment after Sendong?

Modification to existing structures	Length of modification period (incremental, progressive, one-time)	Materials used	Financial arrangements (Self-financed, Loans or borrowings, Donations or subsidy)	Tenurial arrangement (Private use, shared by few households, common use)

16. What are/were constructions of new structures you did after Sendong?

Construction of new structures	Length of construction period (incremental, progressive one-time)	Materials used	Financial arrangements (Self-financed, Loans or borrowings, Donations or subsidy)	Length of modification (incremental, one-time)

17. What are other measures that you have undertaken to increase resiliency to flooding?

18. What are/were planned modification or construction that did not materialize?

19. What were the challenges encountered in realizing planned resiliency building initiatives?

20. What are/were changes in household activities after Sendong?

21. What are/were trainings or seminars you attended relating to pursuit of flood resiliency after Sendong?

Trainings	Organizer (Community, government, NGO, etc)	Year

22. What are/were advocacy activities that you engaged or participated in relating to pursuit of flood resiliency after Sendong?

Advocacy activities	Organizer (Community, government, NGO, etc)	Year

23. What are your sources of information in deciding which measures to take in pursuing urban flood resiliency?

- o Previous experience
- o Neighbourhoods
- o Land use plan / Local government plans
- o Civil society organizations
- o Business sector / Developers

Others: _____

24. How many times have you experienced flooding after Sendong?

Month, Year	Damage to property	Loss of income	Injury/Deaths	How many weeks after did it take for you to start recovering?	How many weeks after did it take for you to fully recover?

25. How were you able to recover damages/loss to property from succeeding flooding?

- o From savings and earned income
- o Loans or borrowed money. If yes, from whom or which credit window? _____
- o Donations or subsidies from civil society organizations
- o Donations or subsidies from government

Others: _____

Please read the following statement carefully and encircle the choice that best describes your answer.

1 – Strongly agree; 2 – Agree; 3 – Somewhat agree;
4 – Somewhat disagree; 5- disagree; 6 – strongly disagree

26. I am aware of the land use plan.	1	2	3	4	5	6
27. I am familiar of the land use plan objectives.	1	2	3	4	5	6

28. I have a role in achieving land use plan objectives	1	2	3	4	5	6
29. In at least the last five years, I have heard about any land use plan.	1	2	3	4	5	6
30. In at least the last five years, I have consulted with the land use plan.	1	2	3	4	5	6
31. I have participated in any activities by the government relating to land use plan and planning.	1	2	3	4	5	6
32. Land use plan is important in making us more resilient to flooding.	1	2	3	4	5	6
33. Pursuit of resiliency objectives in land use plan should be everyone's duty.	1	2	3	4	5	6

34. What are some of the land use plan objectives?

35. What is the importance of land use plans?

36. Who should be adopting land use plans?

- o Individual level
- o Household
- o Community
- o City
- o Local government
- o National government

Others: _____

IV.
Type of ownership (rent, mortgage, owned): _____

Residence: _____

Age of head of household: _____ Highest level of educational attainment: _____

Average monthly income of head of household: _____

Size of household members (living within the property) _____

Relation to head of household	Age	Level of education	Livelihood (employed, schooling)	Average income

ANNEX 11: Semi-structured interview guide questions

For government:

- How do households pursue urban flood resiliency post Washi?
- What do households usually do in pursuing urban flood resiliency?
- What are experiences of households in the succeeding occurrences of flooding? *e.g. timing, frequency, level of impact, and damage*
- Are household-initiated interventions in accordance to land use plan objectives?
- What are identified programs and projects that potentially help households pursue their own resiliency-building measures?
- How has land-use plan been communicated to households?
- How has land use plan objectives been adopted at households' level?

For civil society organizations:

- How do households pursue urban flood resiliency post Washi?
- What do households usually do in pursuing urban flood resiliency?
- What are experiences of households in the succeeding occurrences of flooding? *e.g. timing, frequency, level of impact, and damage*
- What are household activities/initiatives wherein land use plan was consulted?
- What are household activities/initiatives wherein household-initiated measures are adopting land use plan objectives?
- How has land use plan been communicated at households' level?
- How has land use plan been adopted at households' level?

For community leaders and/or households:

- How do households pursue urban flood resiliency post Washi?
- What do households usually do in pursuing urban flood resiliency?
- What are experiences of households in the succeeding occurrences of flooding? *e.g. timing, frequency, level of impact, and damage*
- Are household-initiated interventions in accordance to land use plan objectives?
- What are identified programs and projects under the land use plan that potentially help households pursue their own resiliency-building measures?
- How has land-use plan been communicated at households' level?
- How has land-use plan been adopted at households' level?

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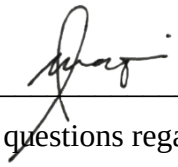
Your Signature(s) : 

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