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Middle-class risk perception of disasters and land reclamation in Metro Manila, Philippines

Ven Paolo Bruno Valenzuela^{1*} , Miguel Esteban²  and Motoharu Onuki³ 

Abstract

The United Nations estimate that by 2030 about half of the world's population would be comprised of the middle-class, who mostly live in the increasing number of megacities around the world. Southeast Asian megacities, such as Metropolitan Manila, have long been troubled by rapid urbanization, increasing disaster risk, and the looming impacts of climate change. As a response, there is a growing focus on disaster and climate resilient policies in megacities, most of which have only centered on how future disasters and climate uncertainty would impact vulnerable communities. This has resulted in policies that cater towards relocation of the poor to combat disasters and climate change. This exploratory study attempts to elucidate how the middle-class views disasters and land reclamation in Metro Manila, the Philippines. Using an online questionnaire survey of 425 middle-class respondents, the study shows that middle-class perception of risk potentially amplifies vulnerability and reduces the resilience of the poor. While knowledge about the risks is high, the capacity of the middle class to act is low, especially compared to vulnerable communities. Also, climate change and disasters are viewed primarily as environmental issues, which is compounded by inadequate defenses. Land reclamation, along with coastal informal settlements, are viewed as an intrusion into the environment. This study finds that the middle-class's perception of risk may marginalize the poor by favoring eviction of vulnerable communities in coastal areas, including those targeted for land reclamation, under the pretext of controlling the city's population growth and environmental impact.

Keywords Middle-class, Perception, Disaster risk reduction, Climate change, Urbanization, Reclamation

1 Introduction

Seventeen of the world's megacities (urban areas with more than 10 million inhabitants) are in the Asia–Pacific Region, and this is expected to increase to 22 by 2030 (UN-Habitat and UNESCAP 2015). Most of these megacities are situated along the coast and, due to rapid

urbanization, infrastructure and other economic assets intruding into the shoreline, exposes them to natural hazards and climate change impacts (Kron 2013; Neumann et al. 2015). Studies on the impact of climate change and disasters have focused mainly on the poor. However, urbanization has led to a growing global middle class that is expected to comprise half of the global population by 2030 (UNDP 2013).

Vulnerability is a core concept situated at the nexus of the study of disasters, climate change, and sustainable development, and has been often associated with poverty and inequality (Winser et al. 2004). Rapid urbanization, especially in developing regions of the world such as Asia–Pacific, has increased the exposure of vulnerable informal settlements to extreme weather (Revi et al.

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2014). Disaster awareness surveys mostly involve these vulnerable communities, which have shown that poverty and improper disaster education exacerbate risk, as these communities tend to underestimate the hazards, overestimate their capacity to respond, and prioritize present needs over long term disaster prevention (Esteban et al. 2017a; Kurita et al. 2006; Mercado 2016; Takagi et al. 2017; Valenzuela et al. 2020b). Nevertheless, organized vulnerable groups have also shown willingness to engage in community-based disaster risk reduction and climate change adaptation activities that minimize losses from such events (Pineda 2012). Past disasters in Metro Manila may have led to social cohesion amongst most informal settlements, though this may also be due to existing power relations within settlements in response to crisis events (Cannon and Schipper 2014; Usamah et al. 2014).

Disasters impact various sectors of society differently, with the poor often suffering more than the others, but they can also force large numbers of people into poverty (Hallegatte et al. 2016). The compounding costs of disasters has been increasing over the past few decades and has led to residential instability, where people who lack resources are the first to suffer as they are unable to secure long-term housing (Elliott and Howell 2017; Guha-Sapir et al. 2017). As disaster costs rise and compound, individuals and communities who are not poor but rely on unstable income sources start to suffer from disaster-induced residential instability, even in wealthy countries such as the United States (Howell and Elliott 2019). In Asia, where many countries have a wide wealth distribution inequality, disaster studies usually focus on the lower-income classes, which have been labelled as ‘vulnerable’ and are subsequently the target of disaster resilience projects. Although literature on disasters and climate change impacts on coastal megacities is growing, the middle class, a sector where members may fall into poverty due to compounding disaster costs, is relatively understudied, with little published research focusing on the global North (Kramarz 2021; Rhodes and Besbris 2022). Understanding middle-class perceptions and how these drive urban development policies in megacities in developing regions of the world is vital to ensure the long-term sustainability of urban areas.

Despite limited evidence, the Intergovernmental Panel on Climate Change 5th Assessment Report (IPCC-AR5) states that there is high agreement that urban dwellers may exert pressure on city governments through cooperative multilevel governance to address disaster and climate risks (Revi et al. 2014). However, there is a lack of studies on the role of the middle class, a non- ‘vulnerable’ group that nevertheless has the ability to demand the government to provide better services and drive

policy reforms (Albert et al. 2015; Birdsall 2010; Desai and Kharas 2017).

This descriptive, exploratory, and explanatory study provides aims to provide insights about the risk perceptions of the middle-class and its implications on urban development through a case study of Metro Manila, Philippines, a Southeast Asian megacity at high risk to climate change and disasters (Albert et al. 2018). Through an online questionnaire survey, the research explores how does the middle class in Metro Manila perceives climate change and disaster risk, and its interaction with urban development infrastructure, especially land reclamation. Such perceptions are examined through the Pressure and Release Model and the Social Amplification of Risk Framework, and pay special attention to a background of reclamation projects being conducted in Manila Bay that aim to provide economic growth and coastal protection (Philippine Reclamation Authority 2016; Roxas 2019).

2 Review of literature

Metro Manila is at high risk to a variety hazards, which influence public perception of how the city should grow, alongside other issues such as population growth and rising inequality. Megacities in highly exposed developing countries are often leaning towards traditional physical infrastructure-based solutions to prevent disasters (Miller and Douglass 2016). However, rapid urbanization and climate change add complexity and uncertainty that may lead to severe disasters in the future (Field et al. 2012; Revi et al. 2014). These traditional approaches to disaster risk reduction, such as the construction of physical defenses and population relocation solutions, are usually unable to keep up with the growing complex socio-economic issues in rapidly urbanizing areas in developing countries (Miller and Douglass 2016). Metro Manila’s experience with typhoon Ketsana in 2009, where nearly a thousand died, highlights this complexity.

The flooding due to typhoon Ketsana resulted in the relocation of informal settlements as a core flood protection strategy in Metro Manila (Balgos 2015; Singson 2013). This disaster resurfaced the historical class tensions between the poor and elites, which enabled a risk narrative that underpins the poor as both vulnerable to and as a cause of floods (Alvarez and Cardenas 2019). Thus, informal settlements are perceived by policymakers as contributing to the blockage of floodways, despite the reality that the megacity has been negligent in investing and implementing environmental management policies (United Nations University et al. 2014). This is termed by Alvarez and Cardenas (2019) as “resiliency revanchism”, or the politics of revenge of the elites to paint the poor as the primary cause of disasters. Evicting them from the city serves to address two woes: disaster

risk and cleanliness. However, these communities have long accepted to live with floods and have been the target of various resilience-building projects (Balgos 2015; Siriwardane-de Zoysa 2020). For instance, informal settlers in BASECO Compound, a coastal informal settlement on reclaimed land, are knowledgeable about the hazards in their community, are aware of evacuation procedures, and are able to help each other in the aftermath of disasters (Mercado 2016; Valenzuela et al. 2020a). Moreover, coastal areas along Manila Bay, where BASECO Compound is located, are also being primed for land reclamation projects (See Fig. 1).

There are at least 22 approved and proposed reclamation projects in Manila Bay, which promise mixed-use development that can bolster economic growth and act as coastal defense (Philippine Reclamation Authority 2016; Roxas, 2019). However, these projects have also been criticized with regards to their environmental impacts, as well as actually being at increased risk to coastal hazards (Rodolfo 2014). While government supports the relocation of communities in at-risk zones, such projects have been mired with problems, often requiring strong community-based organizations to negotiate and facilitate relocation (Rebullida 2003; Shatkin 2000). Studies on post-disaster resettlement have highlighted the need to incorporate community cohesion and access to basic services and livelihoods for resettlement to be effective (Pormon et al. 2023; Quetulio-Navarra et al. 2014; See and Wilmsen 2020). Despite this, relocation of communities as a result of reclamation has received little

attention, and such projects continue to raise the fear of eviction amongst coastal informal settlements along the bay (Abad 2019; Chavez and Agbayani 2020; Valenzuela et al. 2020a).

In the Pressure and Release (PAR) Model, social, political, and the economic environment is as much a cause of disasters as the natural environment and is a result of a progression of vulnerability (Wisner et al. 2004). PAR views vulnerability as a progression: it is rooted in poverty and inequality and when these interact with dynamic pressures such as rapid urbanization, it creates unsafe conditions ripe for disasters to happen (Wisner et al. 2004). PAR's concept of vulnerability has been adopted by the United Nations and is defined as "...conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards" (UNDRR 2009). Most studies on disasters and climate change have focused on how hazards impact the most vulnerable, but less attention has been paid to the middle-class, a sector that is not experiencing the direct impacts of poverty and inequality. This class can be at risk to falling into poverty if the costs of recovering from disasters continuously compound over time, as shown in a longitudinal study in the United States on the impacts of natural hazards on wealth inequality (Elliott and Howell 2017; Howell and Elliott 2019). While there are studies that explore how hazards impact this social class, there are no studies on how they view climate and disaster risks, despite existing studies on the

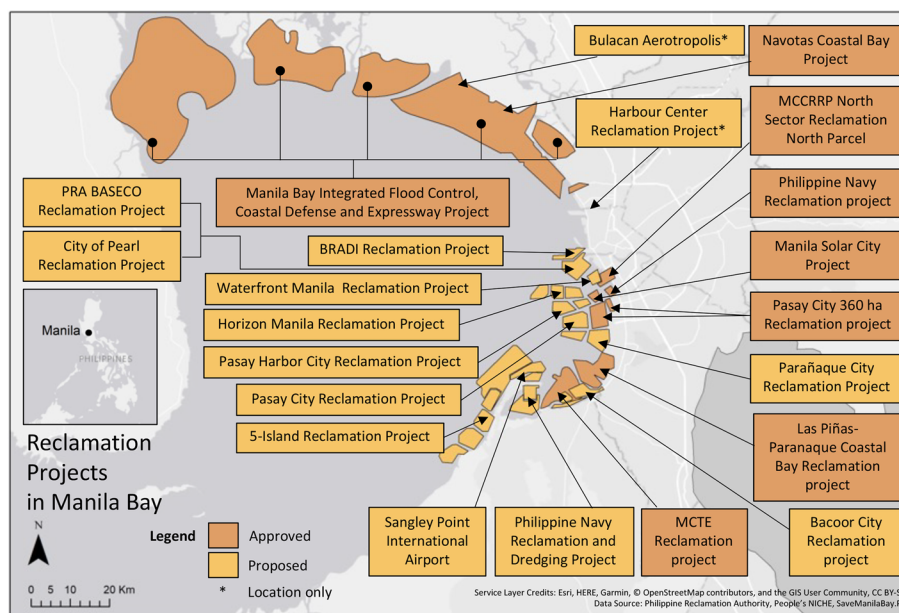


Fig. 1 Approved and proposed reclamation projects in Manila Bay

relationship of the middle-class with environmentalism and sustainability (Cotgrove and Duff 1980; Never and Albert 2021).

The middle-class is a key driver of social policies, economic growth, and development (Easterly 2001). Birdsall (2010) indicates that the middle class, defined by its higher educational attainment, is more likely to push for accountability and good governance. A study by Loayza et al (2012), using a cross-country panel data set covering 128 countries, found that when the size of the middle class increases, there is an increase in social policy on health and education, as well as an improvement in governance regarding democratic participation and anti-corruption initiatives. As a large number of the middle-class reside in urban areas, the IPCC-5AR highlights that urban dwellers influence the climate and disaster policy of their city by exerting political pressure on governments to enact risk reduction measures (Revi et al. 2014). Furthermore, studies emphasized that climate action should go beyond awareness raising by fostering public engagement and creating incentives towards change (Bernauer et al. 2016; Khatibi et al. 2021). Research on the Filipino middle-class has shown that the middle class has a strong interest in sustainability (Never and Albert 2021). Thus, this potentially makes them more inclined towards public engagement and push for incentives for change.

While continued economic development can reduce social vulnerability to climate change impacts, it is also known that the middle-class may drive policies that disproportionately benefit them more than others (Matthews and Hastings 2013; Ward and Shively 2017). Recent events in Philippine politics may have steered the middle-class's concept of accountability and good governance towards the punishment of those who are deemed a hindrance to development, including the urban poor (Curato 2016; Garrido 2020). The perception of resilience by the middle-class may thus contain an element of punishment of the poor, and may enable revanchist policies under the guise of resilience building (Alvarez and Cardenas 2019). Investigating how members of the middle-class view risk would therefore be useful to understand the risk narrative they ascribe to and how this may become the prescription of how the megacity should develop, despite potential gaps in their own knowledge of risk and practice.

3 Research framework and methodology

3.1 Defining the middle-class in Metro Manila

In 2015, half of the Filipino middle-class who are 24 years and older are likely to have attained tertiary education than those in the lower income bracket (Albert et al. 2018). Despite their vital role in development, there is no consensus on who constitutes the middle class (Albert et al. 2015; Birdsall 2010), though income is often part of

the classification. The absolute minimum starting point for members of this income class should be to earn more than USD 2/day, which is the absolute poverty line designated by the World Bank and adopted by most countries (Banerjee and Duflou 2008). However, other scholars are more inclined to establish a starting income of USD 10/day, stating that achieving economic security is what separates them from the poor (Birdsall 2010; Kharas 2010).

Albert et al. (2018) defines the Filipino middle-class by using official poverty lines and the 2017 Family Income and Expenditure Survey, and according to them consist of households who earn an income between 2 to 12 times the poverty threshold of PhP 9,520 (around USD 190 per month). They then divide this income class into three tiers: lower middle-income at PhP 18,200 – 36,400 (USD 364–728), middle middle-income at PhP 36,400–63,700 (USD 728–1,274), and upper middle-income at PhP 63,700–109,200 (USD 1,274 – 2,184). These 3 tiers comprise about 40.2% of the population of the country in 2015, most of whom live in urban areas such as Metro Manila and its adjacent provinces (Albert et al. 2018).

While the middle class have better access to basic services than lower income classes, those within and lower than the low middle income bracket are more likely to encounter housing insecurity, which can bring them to poverty as a result of compounding disaster costs (Albert et al. 2018; Howell and Elliott 2019). In the present study the middle-class will hence be defined as those *“having achieved a sense of economic security that allows to concern themselves with the future.”*

3.2 Pressure and release model and the social amplification of risk framework

The PAR Model is one of the most accepted frameworks for studying disasters and climate change. PAR's progression of vulnerability, where root causes such as poverty and inequality interact with dynamic pressures such as rapid urbanization and environmental degradation eventually creates unsafe conditions, is adopted into this study. However, the focus is on whether the middle-class are aware of the root causes of vulnerability and how it progresses to create situations ripe for disasters to happen. Vulnerability often hinges on technical standards of poverty that seldom take into consideration social, political, and cultural contexts (Alvarez and Cardenas 2019; Bankoff 2001). Studies often focus on the elite vs. poor dichotomy that dominates the political discourse of vulnerability. As stated earlier, lost between these dichotomies is the discussion of the role of the middle-class in perpetuating discourses on disaster risk.

Thus, the present research adapts the Social Amplification or Attenuation of Risk Framework (SARF) by Kaspersen et al (1988) to understand middle-class risk

perception and its role in creating the prevailing risk narratives present in a megacity. In SARF, psychological, social, institutional, and cultural processes amplify or attenuate public responses to potential hazard events, and these contextual factors shape an individual's estimation and evaluation of risk (Kasperson et al. 1988; Renn et al. 1992). While other risk perception frameworks discuss how risk perception is considered in decision making (such as the Protective Action Decision Model or the Protection Motivation Theory), SARF focuses on how risks are portrayed by different information sources and how an amplified (or attenuated) risk perception can impact risk governance (Kasperson 2015). This framework is used by multiple studies that focus on the impact of risk communication of various events, such as views on haze and dengue, media portrayal of genetically modified foods, and portrayal of climate change (Frewer et al. 2002; Ng et al. 2018; Renn 2011).

Risk amplification (or attenuation) takes place when a risk event passes through different sources, channels, social, and the individual's understanding of the event (Kasperson et al. 1988). Physical consequences, information coverage, individual perception, public response, and societal and economic impact of the hazard influence whether risk is socially amplified or attenuated (Kasperson et al. 1988; Renn et al. 1992). This is further influenced by the place and cultural context where an individual is located (Masuda and Garvin 2006). The middle-class perception of threats and the perceived "appropriate" responses may lead to a social portrayal of risk that eventually prescribes the risk narrative of the city.

3.3 Methodology

This study gathers the middle-class risk perceptions through a survey that was distributed online, which queried respondents on their disaster experiences, assessment of safety of various areas in the city, their information sources, their perception of what causes of disasters and how they view future events.

A virtual snowball sampling method, using social media, was implemented to gather respondents. Initially, forms were distributed through a professional network of disaster risk reduction practitioners, academic circles that thrive in Philippine social media, as well as city-focused interest groups. There were significant considerations when choosing this method, as studies have shown that it can be skewed towards respondents who have internet access and can penetrate certain sectors of society (Baltar and Brunet 2012). Higher education and income levels are determinants of the middle-class. Studies have shown that households with reliable and stable internet access also have higher income and education

levels (Eder 2020; Reddick et al. 2020; Uy-Tioco 2019). While getting respondents for the survey is challenging, the study took place during the COVID-19 pandemic, at the height of stay-at-home orders, thus, making it convenient to access middle-class respondents (who are likely to have internet).

Given that the research team took advantage of their professional network of disaster risk managers in the Philippines, there were many respondents who have extensive experience working on sectors that directly deal with disaster and climate change issues, such as government workers or NGOs. While this represents a bias, it is also an opportunity to discern the thinking of middle-class respondents who are active in disaster management practice in Metro Manila.

The design of the questionnaire was influenced by prior disaster awareness studies in coastal communities in Southeast Asia (see Anh et al (2017); Esteban et al (2017a); Harnantaryari et al (2020); Mercado (2016); Valenzuela et al (2020a, 2020b)). From these influences, the questionnaire survey follows a quant-QUAL design that targets the middle-class and allows respondents to explain their answers. This allows a quantitative approach to gathering data but provides a deeper exploratory qualitative analysis of risk perceptions of the middle-class. Figure 2 shows the questionnaire design layout, which consisted of a total of 66 questions.

A Google form survey was distributed online through Facebook and Twitter between the 20th and 30th April 2020, and responses were accepted until 30 May 2020. 432 responses were gathered, of which 5 duplicate responses were removed as well as 2 that do not fit the criteria of both living or working in the Greater Metro Manila Area (GMMA), yielding a total count of $n=425$. The data was analyzed using SPSS 27, with descriptive statistics provided and Pearson's correlations being conducted. Significance starts at the 0.05 level. The authors are aware that, despite the relatively good number of respondents, the sampling method employed in this study is not necessarily good to perform an in-depth statistical analysis. The merit of this work is thus that it allows a discussion on potential relationships between factors that may inform the middle-class perception of risk.

4 Results

Table 1 provides a summary of the demographics of the respondents: 99.1% have at least tertiary level education, 73.6% are middle-income wage earners, and 84.2% are 39 years old and below. Thus, it could be summarized that respondents are predominantly young members of Metro Manila's middle-class.

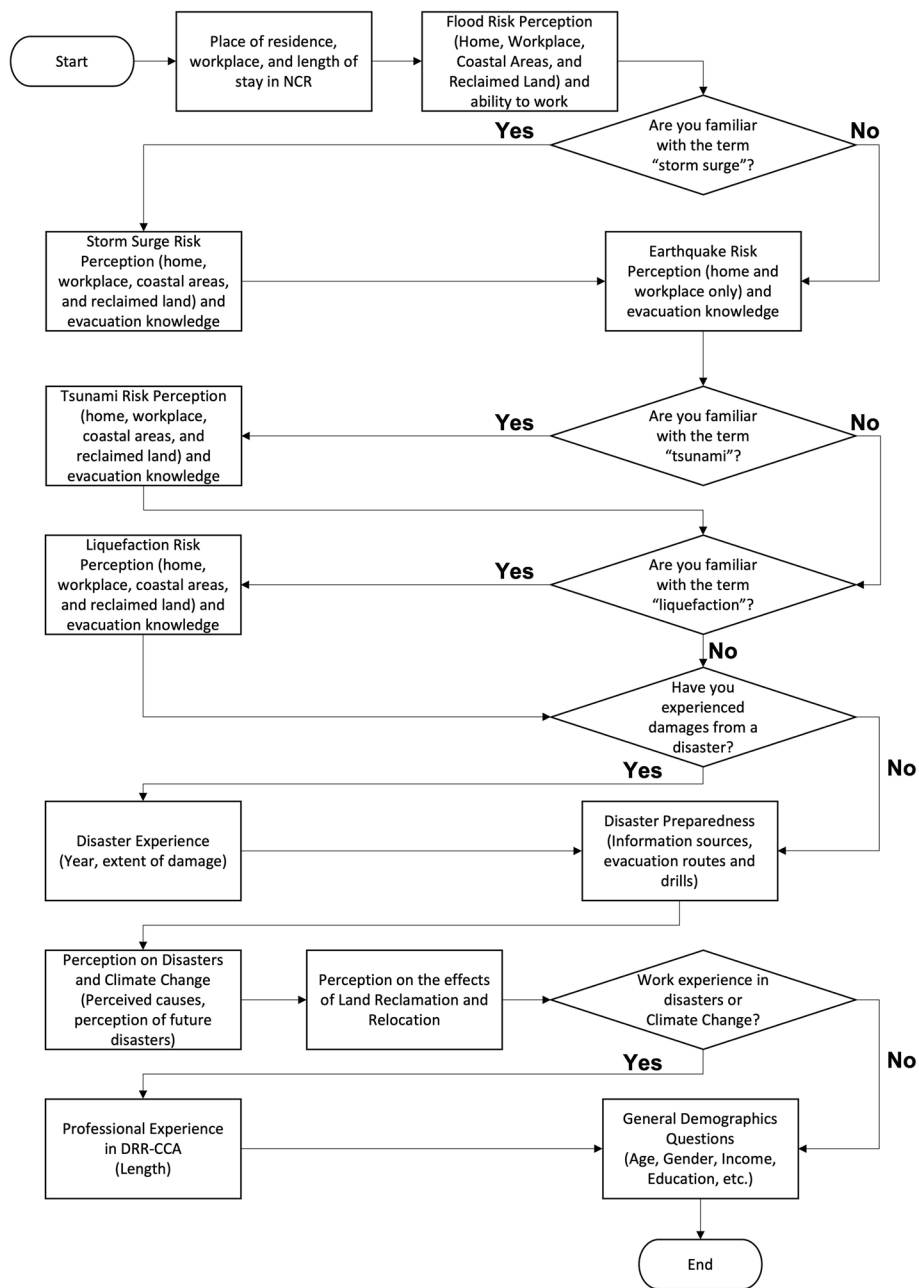


Fig. 2 Research Questionnaire Design

Coastal cities are defined in this study as urban areas with direct access to Manila Bay. Respondents mostly reside in a non-coastal city and move towards the center of the metropolis to work (See Fig. 3). 96.0% of the respondents are working in Metro Manila: 48.2% are living and working in the same city, 33.9% are moving within the metro area, and 13.9% are from adjacent provinces.

4.1 High extreme hazard awareness but limited knowledge of evacuation procedures

About half (49.6%) of the respondents have experienced damage from a previous disaster. Typhoons, heavy rainfall, flooding, and earthquakes have been highlighted as the hazards that would most likely affect residents of Metro Manila (Bollettino et al. 2018), and this study validates this, as respondents indicated that they have indeed

Table 1 Frequency distribution of respondents

Category		Count	%
Gender	Male	181	42.6%
	Female	235	55.3%
	Prefer not to say	9	2.1%
Age Group	20—29	165	38.8%
	30—39	193	45.4%
	40—49	39	9.2%
	50—59	17	4.0%
	60—69	10	2.4%
	70+	1	0.2%
Education Level	None	0	0.0%
	Elementary	0	0.0%
	High School	4	0.9%
	College	298	70.1%
	Postgraduate	123	28.9%
Years residing or working in Metro Manila	Does not live or work in Metro Manila	22	5.2%
	Less than 3 years	22	5.2%
	3—5 years	32	7.5%
	5—10 years	62	14.6%
	10—15 years	52	12.2%
	More than 15 years	86	20.2%
Residence and workplace in coastal Areas	Since Birth	149	35.1%
	Both are non-coastal	292	68.7%
	Workplace is in a coastal area	32	7.5%
	Residence is in a coastal area	46	10.8%
Occupation	Both are coastal	55	12.9%
	Academe	36	8.5%
	Civil Society, NGOs, and Religious Institutions	24	5.6%
	Government	74	17.4%
	Media	3	0.7%
	Other	1	0.2%
	Private Sector	225	52.9%
	Retired	3	0.7%
	Self-employed	38	8.9%
	Student	17	4.0%
Monthly Income	Unemployed	4	0.9%
	Less than ₱ 12,000	6	1.7%
	₱ 12,001—₱ 25,000	65	18.5%
	₱ 25,001—₱ 50,000	143	40.6%
	₱ 50,001—₱ 100,000	105	29.8%
	₱ 100,001—₱ 200,000	30	8.5%
Professional Experience in Climate Change Adaptation and Disaster Risk Reduction (CCA-DRR)	More than ₱ 200,000	3	0.9%
	Yes	124	29.2%
Length of time working with CCA-DRR issues	No	301	70.8%
	Less than 1 year	40	31.5%
	1—3 years	40	31.5%
	3—5 years	21	16.5%
	5—10 years	19	15.0%
	More than 10 years	7	5.5%

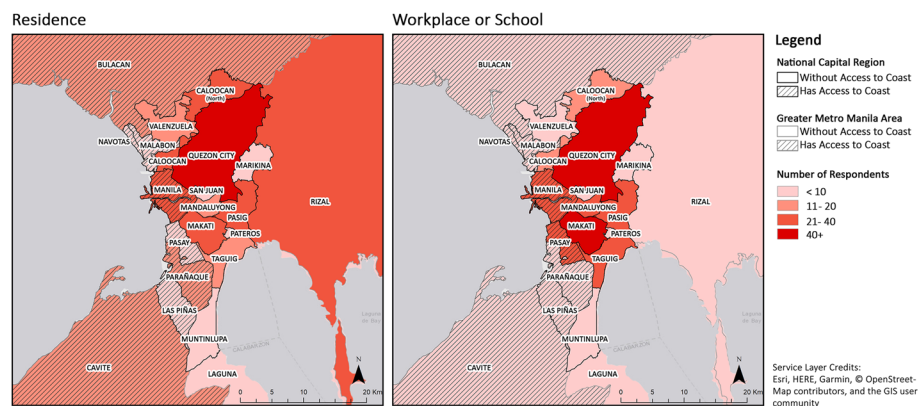


Fig. 3 Residence and workplace of respondents in Metro Manila and its surrounding regions. The map divisions are at the city level (Metro Manila is formed of many smaller cities)

experienced that event. Furthermore, Typhoon Ketsana is usually mentioned by respondents when alluding to previous disasters. It is noted that 75.6% of respondents only experienced minor to no damage from previous disaster events.

The combined experience of the 2009 Typhoon Ketsana floods and the awareness raising activities regarding the Valley Fault System has likewise contributed to the knowledge of flood and earthquake risks in the megacity. Given this, the respondents were queried on their knowledge of extreme coastal hazards and evacuation procedures against them. High hazard knowledge is exhibited, and 93.4% indicated they are familiar with the term storm surges and all of them know about tsunamis. This is higher than what was found in past at-risk coastal communities in Southeast Asian countries such as Indonesia and Vietnam, or even the Philippines, which hover around 50–75% for storm surges and around 70–90% for tsunamis (Anh et al. 2017; Esteban et al. 2017a, b; Valenzuela et al. 2020a, 2020b). 61.6% indicated familiarity with soil liquefaction, a hazard on which, to date, little to no awareness studies have been conducted in Metro Manila.

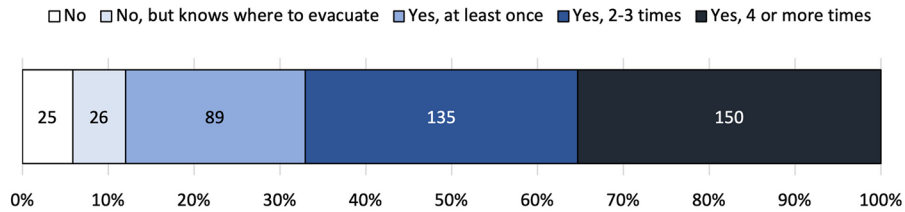
Figure 4 shows the summary of evacuation knowledge. Participation in evacuation drills is higher compared to at-risk coastal communities, with 88.5% having participated in at least one of them in the last 5 years. The nearest evacuation area from their residence is typically an open field (24.5%) or school building (24.0%). The nearest evacuation area to their workplace is usually an open field (44.7%), followed by a dedicated evacuation center (22.4%). Interestingly, not knowing what type of evacuation is nearest to both residence and workplace ranks third. Regarding the distance to the nearest evacuation center, more than half of the respondents stated that it is less than 1 km for both their residences (50.6%)

and workplaces (62.8%). However, 22.8% and 19.1% indicated they do not know its distance from their residence or workplace, respectively. While a large majority of the respondents know how to evacuate in the case of earthquakes (77.2%), less than half know how to evacuate during storm surges (47.9%), less than a third during tsunamis (28.9%), and less than a quarter for liquefaction (24.4%).

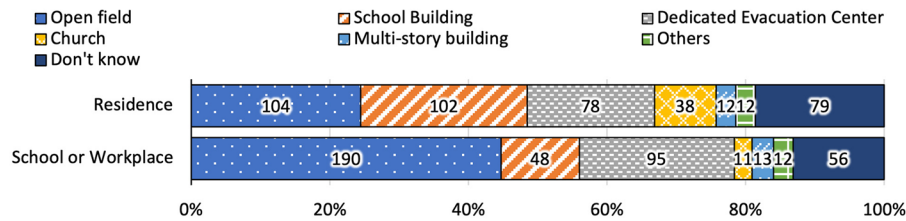
Chi-square tests show that there is no association between exposure to coastal areas and knowledge of evacuation procedure for storm surges ($\chi^2=5.091$, $df=3$), tsunamis ($\chi^2=1.998$, $df=3$), and liquefaction ($\chi^2=1.651$, $df=3$).

Respondents were also queried on their sources of disaster information, their perception of its adequacy, and knowledge of tsunami warning system in Manila Bay (See Fig. 5). As data was gathered through an online survey, it was expected that most respondents would get their information through the internet (95.1%). Broadcast media follows second (91.5%), followed by mobile SMS alerts (87.1%). This is far higher than families, friends, and relatives (63.5%) at 4th place. The average number of information sources of the respondents is 5.1 ($SD=1.9$). In the disaster awareness surveys mentioned earlier, broadcast media had always been the source, typically followed by public address systems or from authorities, with the respondents typically having 2–3 information sources. Having on average 5 sources of information, with the internet being the most used source, is a potential differentiating factor between the middle class and the most vulnerable working class. Previous studies have shown that lower income classes are already challenged in having access to the internet, and this is especially seen during the COVID-19 Pandemic (Eder 2020; Garrote Sanchez et al. 2021; Lythreath et al. 2022; Wei and Hindman 2011). Respondents generally view the information obtained as adequate. Those who view it otherwise

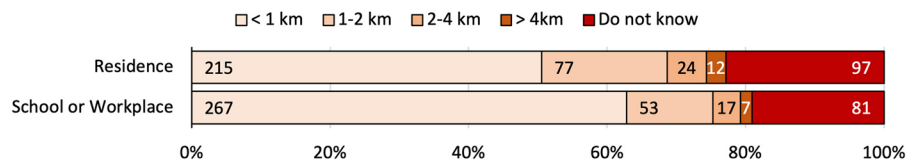
1. Participation in evacuation drills in the last 5 years



2. Type of evacuation area from residence or workplace



3. Distance to nearest evacuation center



4. Number of respondents with knowledge of evacuation procedure for extreme hazards

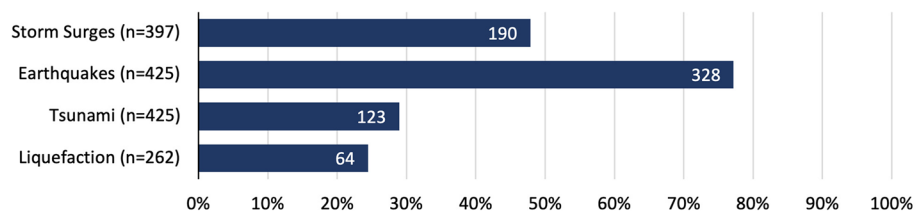


Fig. 4 Summary of evacuation knowledge of respondents (n = 425)

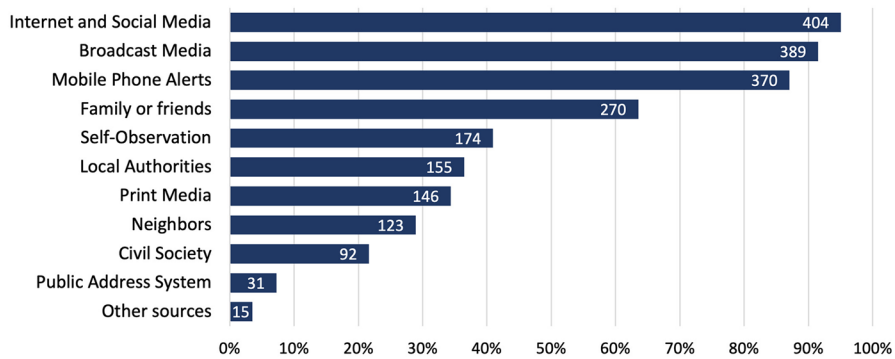
indicate issues with how the message on hazards are conveyed, as captured by this response:

Sometimes information from the media just reports the technical warning conventions only and does not put it in context. Sometimes it uses jargon interchangeably. For example, some outlets refer to magnitude of an earthquake and then later use intensity, both in the same report and with very little definitions on what those numbers might mean. It is the same with alert levels on possible volcanic eruptions or outbreaks of fire. They just say “alert bravo,” but those terms don’t mean anything to the public.

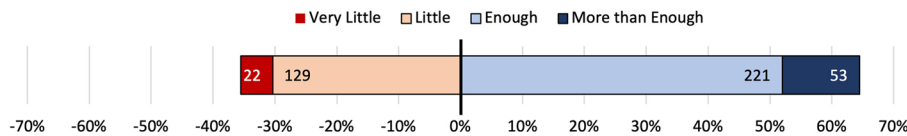
While a tsunami warning system has been established in Manila Bay (Acosta 2018; e2s Warning Signals 2015; Valenzuela et al. 2020b), a large majority (85.4%) do not know that this exists. There is a weak correlation between knowledge of the tsunami warning system and length of CCA-DRR work experience ($r_s = 0.270$; $SE = 0.080$; $P < 0.01$).

Thus, the first key research finding is that there is very high knowledge of extreme coastal hazards such as storm surges, tsunamis, and liquefaction amongst the respondents, but they have limited knowledge on how

Disaster information sources (multiple responses allowed)



Perception of adequacy of disaster information



Knowledge of tsunami warning system in Manila Bay

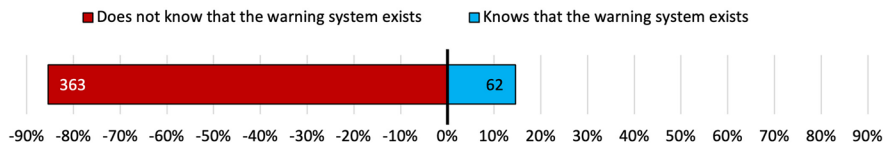


Fig. 5 Summary of disaster information sources and knowledge of respondents (n = 425)

to evacuate from them (with less than half feeling they know how to do so).

4.2 Disasters are perceived to be primarily caused by environmental degradation and lack of defenses

Respondents rated the perceived threat intensity of a specific hazard (floods, storm surges, earthquakes, tsunamis, and liquefaction) to a particular location (residence, workplace, coastal areas, reclaimed land), ranging from very low risk (1) to very high risk (5). A Cronbach's alpha reliability test determined that this Likert-scale has good internal consistency ($\alpha=0.853$). Figure 6 shows a diverging bar graph of the respondents' hazard risk perception for each location. The overall average hazard risk perception scores fall under the neutral range, though there is a difference in risk perception between places. Place of residence and workplace, which are areas that the respondents potentially frequent the most, are deemed at lower risk from hazards. On the other hand, coastal areas and reclaimed land are perceived to be at least at high risk.

The respondents were then queried on their perception of how various urbanization issues regarding disaster

risk reduction, climate change adaptation, and sustainable development would lead to disasters. Fifteen negative-form statements were presented to respondents, who were asked to indicate through a 5-point Likert-scale whether they agreed or disagreed. Broadly speaking, respondents very strongly agreed with the 15 items ($M=4.33$, $\alpha=0.968$). These items are divided equally into 3 domains: urban governance, environmental issues, and physical defense, as shown in Fig. 7. The issues listed in the failure of urban governance allude to causes and drivers of vulnerability, items in environmental issues represent hazards and their exacerbating factors, and issues on physical defenses are linked to items that expose population to hazards.

The mean ranges of the Likert scores show that respondents strongly agreed that disasters are caused by environmental issues ($M=4.45$, $\alpha=0.946$) and a lack of physical defenses ($M=4.36$, $\alpha=0.926$). Respondents agree that urban governance issues ($\alpha=0.891$) are a primary cause of disasters but falls short of the threshold for strong agreement with a mean score of 4.19. Thus, when these issues are ranked for the middle-class respondents,

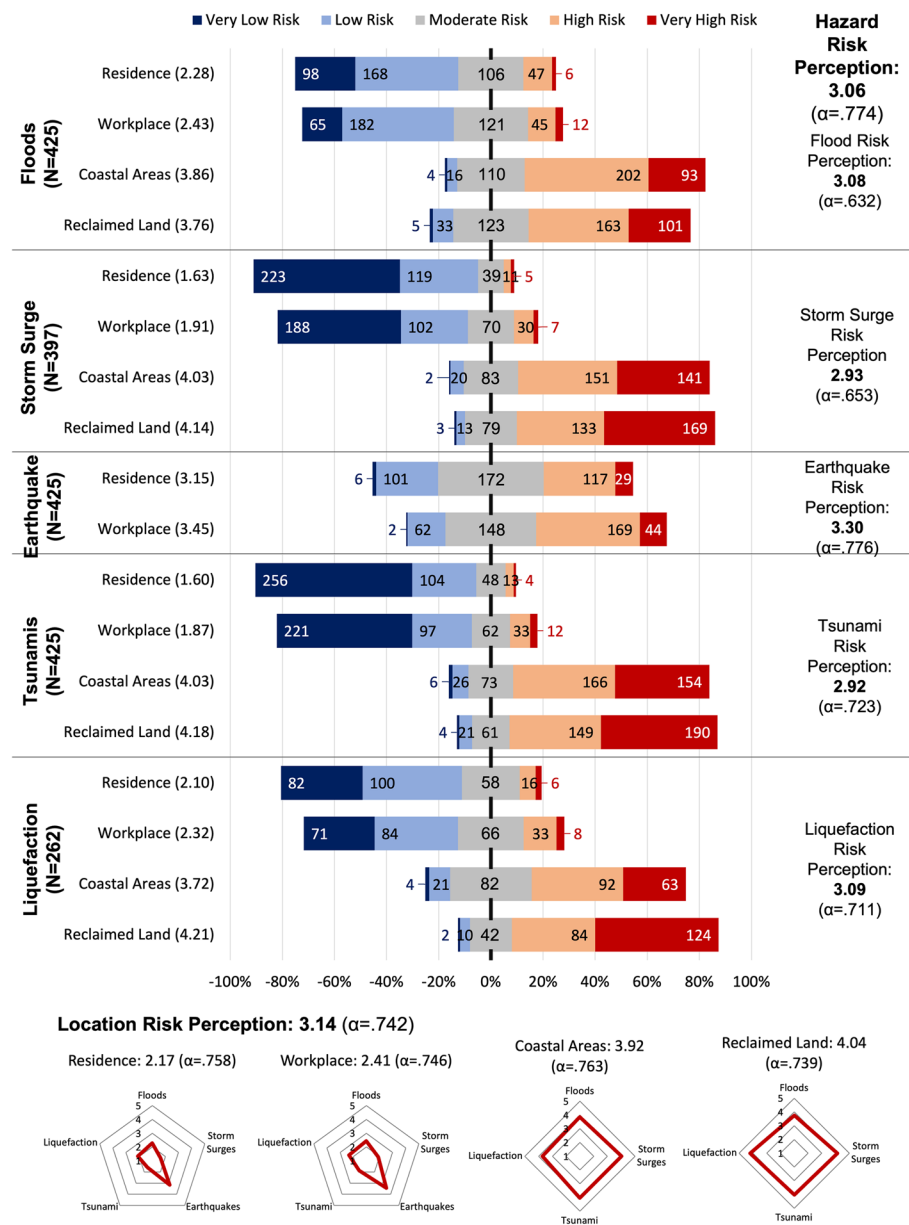


Fig. 6 Diverging stacked bar of hazard risk perception according to location

environmental issues resonate the most, followed by the lack of defenses, and then urban risk governance.

The perception that environmental issues is a top concern amongst the listed cause of disasters can be seen clearly when the items in Fig. 7 are ranked. The top 5 causes for respondents are: environmental degradation (M=4.58, rank 1); clogged drainages, waterways and riverways (M=4.54, rank 2); global climate change (M=4.53, rank 3); and intensifying tropical cyclones and lack of nature-based coastal defenses (M=4.47, both tied at rank 4). The 5 lowest for them are: land reclamation

(M=4.22, rank 11), land subsidence (M=4.18, rank 12), rapid urbanization (M=4.15, rank 13), rapid population growth (M=4.14, rank 14), and poverty (M=3.95, rank 15). Despite respondents agreeing that poverty leads to disasters, it is the lowest among the 15 statements, while rapid population growth and rapid urbanization also fell short of the “strongly agree” threshold of 4.20. Poverty, Rapid Urbanization, and Rapid Population growth are in the failure of urban governance domain. This implies that respondents view that addressing environmental issues should be the focus of risk governance, echoing previous

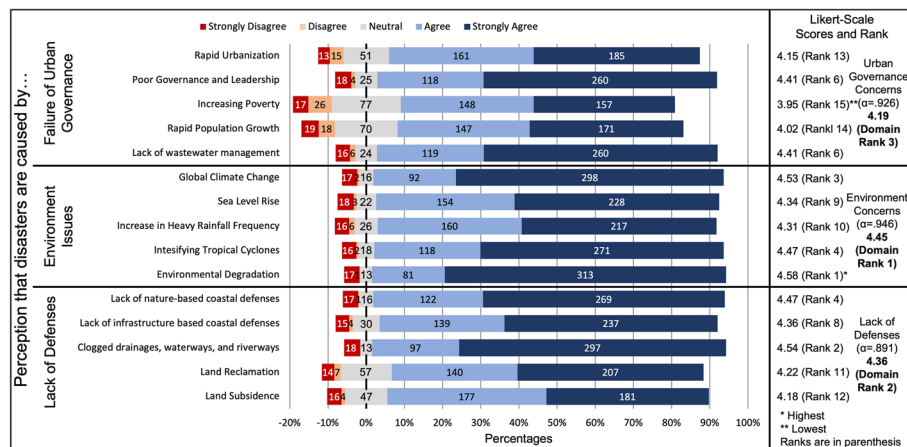


Fig. 7 Perception of how urbanization issues affect disaster risk using a diverging stacked bar graph and Likert-scale items with mean scores, ranks, and domain scores

works on defining the middle-class (Cotgrove and Duff 1980; Never and Albert 2021).

It is unsurprising that 84.24% of respondents thought that future disasters would likely significantly worsen ($M=4.23, SD=0.775$), with 147 respondents choosing to explain their answers. As evident by the previous discussion, many view environmental degradation a core issue, though it should be noted climate change is also referenced by many:

In my opinion, in events of disasters, we are more concerned about those people that were affected. Therefore, the increase in population increases the risk of casualty. Honestly, in the news, it is always about who were affected, damages incurred as reported as costs and not about environment. I believe people give little value about the bay, trees, mountains and rivers.

While respondents agree with poverty being a cause of disasters, as seen in Fig. 7, it rarely appears in the explanations about future disasters, and is largely discussed along with population growth. This was captured by one of the respondent’s answers:

“Poverty and the increasing density of population in these critical areas [does] not necessarily cause disaster[s], but they would make disaster management very difficult to the point of impossible”

While it may be assumed that respondents who have worked on climate change adaptation and disaster risk reduction may see poverty as a core cause of disasters, this study finds no correlation between having professional CCA-DRR work experience and the view that poverty contributes to future disasters.

4.3 The middle-class views reclamation as maladaptive but favors relocation of the poor

Land reclamation can have both positive and negative consequences on a megacity. While the cost and benefits of reclamation to adaptation is still being discussed, the majority of coastal cities in Asia conduct land reclamation for development purposes (Martín-Antón et al. 2016). Figure 8 shows a diverging stacked bar chart summarizing the respondents’ perception of land reclamation and its potential effects on the megacity.

Land reclamation is viewed as a potential source of disasters, making it unsurprising that in Fig. 8 most respondents (69.4%) have a negative perception of the ongoing reclamation projects in Manila Bay. The potential effects of land reclamation (including relocation) have overall poor internal consistency ($\alpha=0.577$), as indicated by the wide spread of opinions shown in Fig. 8. Positive effects have a questionable consistency ($\alpha=0.633$) while negative effects are poor ($\alpha=0.559$). Removing coastal protection from the positive effects and increased flooding from the negative effects (as they cancel each other out) increases the internal consistency of the rest of the identified effects to acceptable levels ($\alpha=0.704$). Nearly half agree that reclamation will bring increased tourism activities (48.1%) and economic growth (47.8%), though more than half (58.1%) disagree that it will increase protection from coastal disasters. However, respondents agree with all the statements regarding reclamation bringing adverse effects, 78.6% agree that it increases flooding, 75.3% agree that it destroys the coastal environment, and 54.6% agree that it drives land subsidence.

Table 2 shows the correlation table between the perception of reclamation and its various effects on the city.

There is a strong positive correlation between the perception of ongoing land reclamation projects in Manila

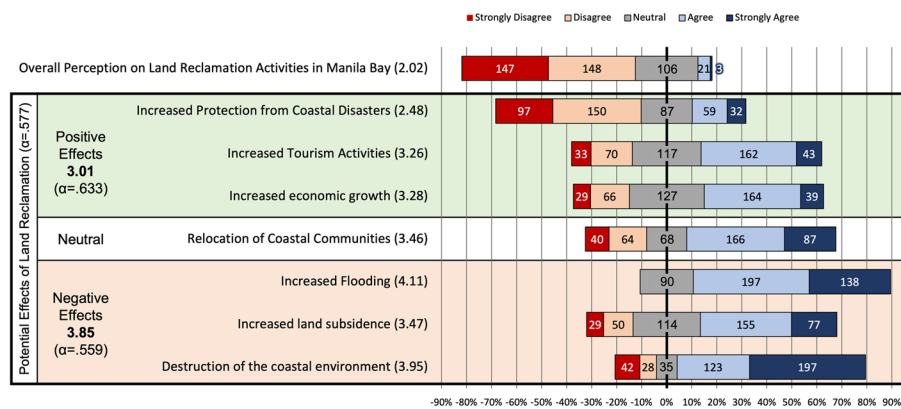


Fig. 8 Diverging bar graph of overall perception of ongoing land reclamation and its potential effects (n = 425)

Bay and increased coastal disaster protection ($r = 0.404$, $P < 0.01$). On the contrary, this perception of land reclamation in Manila Bay has a strong negative correlation with increased flooding ($r = -0.431$, $P < 0.01$), as well as a moderate correlation with destruction of the coastal environment ($r = -0.323$, $P < 0.01$). There is also a strong positive correlation between the idea that reclamation increases economic growth and that it increases tourism activities ($r = 0.607$, $P < 0.01$). Relocation of coastal communities has a moderate correlation with increased

tourism ($r = 0.365$, $P < 0.01$), land subsidence ($r = 0.306$, $P < 0.01$), and destruction of the coastal environment ($r = -0.385$, $P < 0.01$). Increased flooding due to reclamation and destruction of coastal environment are moderately correlated ($r = 0.319$, $P < 0.01$). Finally, there is a strong correlation between increased land subsidence and the destruction of coastal environment due to land reclamation ($r = 0.476$, $P < 0.01$). There is no significant relationship between CCA-DRR work experience

Table 2 Correlations for coastal land reclamation and its effects on the city (n = 425)

Perception on Land Reclamation Projects in Manila Bay	Positive Effects			Neutral Relocation of coastal communities	Negative Effects		
	Increased coastal disaster protection	Increased economic growth	Increased tourism activities		Increased flooding	Increased land subsidence	Destruction of coastal environment
Perception on Land Reclamation	.404**	.265**	.181**	-0.025	-.431**	-.200**	-.323**
Increased coastal disaster protection	.404**	.255**	.155**	-.107*	-.341**	-0.093	-.326**
Increased economic growth	.265**	.255**	.607**	.205**	-0.061	.199**	0.076
Increased tourism activities	.181**	.155**	.607**	.365**	-0.018	.175**	.190**
Relocation of coastal communities	-0.025	-.107*	.205**	.365**	.124*	.306**	.385**
Increased flooding	-.431**	-.341**	-0.061	-.107*	.124*	.256**	.319**
Increased land subsidence	-.200**	-0.093	.199**	.205**	.306**	.256**	.476**
Destruction of coastal environment	-.323**	-.326**	0.076	.365**	.319**	.476**	.385**

** $P < 0.01$

* $P < 0.05$

and the overall perception on Manila Bay reclamation projects.

Respondents were provided space to explain their answers. Those who disagree with land reclamation cite environmental concerns. It is also perceived that its environmental impact increases exposure to hazards. Land reclamation as disaster prevention was not mentioned. While some respondents agree that it brings about economic growth, they also indicate that such benefits outweigh the costs. Those who have a neutral opinion explain that they lack knowledge on the projects themselves, or that they have yet to weigh in the cost and benefit of reclamation.

The relocation of coastal communities was treated in this study as neither a positive nor negative effect of land reclamation, as the relocation of at-risk communities can be an adaptive or maladaptive practice depending on the effective implementation of resettlement programs. 59.5% of respondents agree that reclamation would lead to communities being relocated, and 57.9% of respondents would rather relocate those affected by reclamation to an off-city site. Respondents who opted for off-city relocation mainly argue that the city is overpopulated, and relocation would ease the crowding, as highlighted by this comment:

“The congestion in urban areas is one of the cause[s] for the exacerbation of flooding in the metro. There is a need to decongest the city and move away from urban areas. Or at least control the population here.”

In contrast, 22.4% prefer in-city relocation, and 7.1% indicated relocation anywhere (only 4.5% indicate that these communities should not be relocated). There is a highly significant relationship between CCA-DRR work experience and relocation choices ($X_2=16.915$, $df=5$, $P<0.05$), with those who have experience more likely to opt for in-city relocation. Respondents who indicated that they prefer in-city relocation (and those who are against relocation) argue that the main reason why these poor communities are in the city is because of economic opportunities (and hence removing them from the city will just make them return). A commonality between the explanations is that basic services and economic opportunities should be provided for in any relocation option – whether in-city, off-city, or anywhere.

5 Discussion

Engineering-centered and resettlement-focused disaster prevention strategies in developing countries are challenged by the growing complexity of urbanization and development, particularly in rapidly urbanizing parts

of Asia (Miller and Douglass 2016). In the Philippines, disaster prevention plans tend to perpetuate revanchist ideologies (Alvarez and Cardenas 2019), reinforce the notion of who can live in the city (Yee 2018), and drive inequality and seclusion in the resettlement process (See and Wilmsen 2020). Similar concerns are also appearing when it comes to risk reduction strategies in other megacities in developing countries, such as Indonesia regarding the case of the Great Seawall of Jakarta (Colven 2017; Takagi et al. 2017). This study finds that the perception of risk of the middle-class may enable policies that neither address the root causes of vulnerability nor increase resilience in the city.

5.1 Middle-class perception of disasters and its amplification of risk in the megacity

Poverty and inequality are considered root causes of vulnerability (Wisner et al. 2004). This study finds that middle-class respondents have a broad view of the different causes of disasters. However, for them, poverty and inequality are overshadowed by environmental issues, which consistently ranked as one of the top causes and often referred to when discussing the threat of disasters to the city. The growing challenges of urbanization and climate change, backed by scientific assessments and personal observations, have created a prevailing view that the city will not be able to cope with future hazards.

Megacities have to deal with complex socio-economic development issues (i.e., rapid urbanization), and high levels of future uncertainty challenge existing methods of assessing risk (Kasperson 2015). This study highlights that the middle-class have high hazard awareness and can access or even refer to scientific reports to validate their perceptions of risk. However, these scientific reports are often based on a concept of vulnerability that may not be applicable to a society that regularly experiences hazards (Bankoff 2001). For instance, Metro Manila's disaster policies have favored the concept of physical vulnerability (i.e. building materials of the houses) rather than a holistic understanding that includes social, economic, and historical aspects of vulnerability (Balgos 2015; Balgos et al. 2014; Bankoff 2003; Morin et al. 2016; Porio 2011). This leads to relocation-focused strategies that move the poor away from risk zones (Alvarez and Cardenas 2019; Balgos 2015) being accepted by the middle-class as a primary solution to reduce risk. This is then rendered urgent under the backdrop of increasing risk, especially in a megacity that is perennially listed as one of the most at-risk to disasters and climate change (Sundermann et al. 2014; United Nations University et al. 2014).

Several individual characteristics may affect how risk is perceived, such as whether a person lives or

works in a coastal area and if they have work experience relating to climate change adaptation and disaster risk reduction. This is potentially because respondents who have these traits must account coastal hazards as part of their daily routine. This is also the reason why some of those who work with CCA-DRR issues may know more about the existence of Manila Bay's tsunami warning system. Daily life experiences play a role in the perception of the safety of a particular area (Cutter et al. 2008, 2003), and respondents indicate that areas outside those frequented in their daily routine (i.e., coastal areas and reclaimed land) are unsafe. Risks can be socially and spatially constructed by factors that are location specific or place dependent (Masuda and Garvin 2006) and, in this study, the perception is that these areas are environmentally degraded, ill-defended, and congested. While scientific assessments indicate that coastal urban areas are being increasingly affected by disasters and climate change (Revi et al. 2014), the marginalization of these places, as seen in how the respondents view coastal areas and reclaimed land, may socially amplify risk.

The middle-class is known to concern itself with environmentalism (Cotgrove and Duff 1980), and this study indeed shows that respondents have environmental concerns. Respondents cited and emphasized environmental issues that leads to degraded environment as a top cause of disasters, overshadowing poverty and inequality. This finding on disaster risk perception highlights and validates that the middle-class, despite being knowledgeable on social issues, have a tendency to prioritize concerns that directly affect them (Matthews and Hastings 2013; Ward and Shively 2017). The Pressure and Release Model of Disaster Risk categorizes a degraded environment and a lack of disaster defenses as "unsafe conditions", which arise from the interaction of root causes of vulnerability (i.e., poverty and inequality) and dynamic pressures (i.e., rapid urbanization) (Wisner et al. 2004). This is concerning, as the drive towards a clean environment without understanding the complexity of development issues enables eviction of the poor to achieve the desired aesthetics of the city (Alvarez and Cardenas 2019; Yee 2018). While there are respondents who highlight the need to address poverty, there is preference towards benevolent relocation outside of the urban area rather than in-city relocation, except for those who work with CCA-DRR issues.

5.2 Middle-class risk perception and its potential to reduce resilience

While poverty, rapid urbanization, and rapid population growth are factors that can increase risk in the city, the middle-class in this study tend to perceive a degrading

environment as the top reason behind disasters. Existing policies and programs have attributed the flooding issue in Metro Manila to obstructed waterways, with government officials often pointing out that informal settlements contribute to the pollution that hinders outflow of water into Manila Bay (Alvarez and Cardenas 2019; Castelo 2019; Morin et al. 2016; Singson 2013). This study finds that informal settlements are also seen by the middle-class as being part of the cause (i.e., as respondents highlight congestion in the city and the challenge they pose to disaster management), as well as the most at-risk (i.e., communities to be relocated due to exposure). The middle-class view of risk may enable the policies that support relocation of informal settlements even though that these policies may have been designed to evict rather than provide proper resettlement (Alvarez and Cardenas 2019).

Despite this, it should be noted that these communities are known to be able to develop the capacity to become resilient against hazards (Delica-Willison and Willison 2013). Following the 2009 floods, local and international actors have made efforts to capacitate the poor through community-based disaster risk management (Balgos 2015; Pineda 2012), which may have increased the resilience of the at-risk communities. However, it seems that these are not considered in the risk perception of the middle-class. Though this study does not go deeper into these intricacies, the capacity building activities for the poor may be overshadowed by the need to address environmental issues and lack of defenses – with the poor being asked to be removed from risk zones. This does not address the primary reason why impoverished communities settle and adapt to risk, which is the need to earn a living from the economic opportunities present in the city (Valenzuela et al. 2020a). Thus, the middle-class' perception of risk and their strong preference for relocating poor communities outside of the city may exacerbate vulnerability, especially when the needs of these communities are not addressed.

Another potential issue that may arise from the middle-class' view of risk, albeit this time regarding adaptation options, is seen in the possible implications of the middle-class' negative perception of land reclamation. While respondents are lamenting that the city is becoming more at-risk to disasters, reclamation is not viewed as a viable adaptation option due to its perceived environmental impacts. However, recent literature on coastal land reclamation is divisive on its environmental impacts and potential as a climate change adaptation strategy, generally emphasizing that its success depends on the quality of engineering work done when reclaiming land (Chee et al. 2017; Lee 2014; Martín-Antón et al. 2016; Sengupta et al. 2018). The Philippine Reclamation Authority has

emphasized that proper reclamation decreases flood risk, and that ongoing and planned reclamation should incorporate a coastal flood management strategy (Abaya 2011; Philippine Reclamation Authority 2016). On the environmental front, while reclamation on its own can be environmentally degrading, when an ecosystem approach is comprehensively integrated in its implementation, it may allow ecological restoration of degraded coastal zones (Convention on Biological Diversity 2016; Jiang et al. 2015; Matsuda and Kokubu 2016). While this study was not designed to argue for or against land reclamation projects in Metro Manila, the findings show that the middle-class's drive to protect the environment to defend the city from hazards potentially hinders them from seeing reclamation as a strategy to reduce risk. Thus, there is a need to engage and openly discuss the nature and aims of reclamation projects in Manila Bay.

Respondents who explained their views emphasize that environmental degradation as a result of reclamation will lead to an increase in flood risk. Thus, it is unsurprising that the middle-class respondents in this study have painted reclaimed lands as the most at-risk areas in the megacity. This contrasts with those who live on reclaimed land, who typically feel that land reclamation has contributed to reducing disaster risk (Valenzuela et al. 2020a). Informal settlements in Metro Manila have been living with and adapting to hazards and their views on risk, especially on land reclamation, must be considered by the middle-class as well as policymakers (Morin et al. 2016; Porio 2011; Siriwardane-de Zoysa 2020; Valenzuela et al. 2020a). This would allow for proper dialogues to enable planned or just resettlement.

5.3 Limitations and recommendations for future research

The study was designed to be exploratory and descriptive of the middle-class perception of disaster risk and climate change impacts. The virtual snowball sampling technique used provided a study that is mostly reflective of the views of a young middle-class resident, and the findings could be improved if they were conducted through a more robust and less biased means of data collection. Perception of the poor as a risk driver are alluded to by the respondents of this study, but the relationship between this and the actual capacity of the poor to respond to disasters were not established. Thus, another aspect that can be further researched is how the middle-class views the adaptive capacity or resilience of the poor. Finally, Typhoon Vamco (locally named Ulysses) made landfall on 11 November 2020 and its effects to the metropolis was similar Typhoon Ketsana in 2009. The study was conducted before Vamco, and this recent disaster experience may exacerbate the perception of risk of the middle-class in Metro Manila.

6 Conclusions and recommendations

The global middle-class population is increasing and their perception regarding disasters and climate change will play a pivotal role in the growth of megacities. This exploratory study, which made use of an online survey to gather the opinions of middle-class respondents on risk in Metro Manila, has elucidated the potential implications of these perceptions. Through the Pressure and Release Model and the Social Amplification of Risk Framework, the study shows that middle-class perception of risk caters to their class concern over the environment, with the issues of poverty being a root cause taking a back seat in the discussion.

These findings provide a deeper nuance to the Pressure and Release Model, as it explores how the middle-class factors in the progression of vulnerability. First, the middle-class is shown to have a high knowledge of the hazards that may affect the metropolis, often referring to both scientific assessments and personal experience to indicate how they think disasters and climate change will affect the future of the city. Despite high awareness, they have limited knowledge on how to react to extreme coastal hazards. Second, disaster risk is framed as a result of a degraded environment, though governance concerns are not directly seen as a root cause. Finally, the middle-class potentially favors the eviction of the poor from the megacity as a means of disaster risk reduction. This viewpoint stems from the marginalized being painted as both a cause of flooding and being at-risk to disasters.

The study validates the SARF framework by showing that contextual factors, such as social class, or the middle-class as a socio-economic class (as seen in the case of Metro Manila), shape how people evaluate risk. These findings point towards a need to raise middle-class awareness on the social issues that are central to disaster risk reduction and climate change adaptation. The preference of the middle class for environmental protection may lead to a social amplification of risk, where vulnerable sectors of the population are marginalized as they are seen to be encroaching on the environment. The middle-class respondents of this study were on a position of privilege, having access to education and information and having achieved a certain sense of economic security – all of which are challenged by the future risks brought to by climate change and disasters. Though studies discussed earlier argue that climate action should go beyond awareness raising, either through public engagement and or incentivization of actions, this study shows a need to educate people on the progression of vulnerability.

This study builds on existing yet limited literature that was predominantly focused on the middle-class in developed countries by elucidating how middle-class perceptions of risk may play a role in creating risk narratives in

megacities in developing regions of the world. The narratives of risk that the middle-class ascribe to in a rapidly urbanizing megacity, as seen in the case of Metro Manila, is not reflective of a holistic consideration of the progression of vulnerability, especially poverty and inequality. If this is not addressed, policies that aim to evict at-risk communities might be enacted, not addressing the root causes of vulnerability, and potentially decreasing medium and long-term resilience.

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Authors' contributions

Conceptualization, V.P.V.; Formal analysis, V.P.V., M.E., and O.M.; Investigation, V.P.V., and M.E.; Methodology, V.P.V.; Project administration, V.P.V. and O.M.; Supervision, O.M. and M.E.; Validation, V.P.V.; Writing—original draft, V.P.V.; Writing—review & editing, V.P.V. and M.E.

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Availability of data and materials

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Competing interests

The authors declare they have no relevant financial interests. Dr. Valenzuela is a Fellow of Future Earth Coasts, and he does not receive any compensation for the fellowship. The present study is a contribution to the activities of Future Earth Coasts. Future Earth Coasts had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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