



# Perception of Disasters and Land Reclamation in an Informal Settlement on Reclaimed Land: Case of the BASECO Compound, Manila, the Philippines

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**Abstract** Southeast Asia's coastal urban areas continue to grow, with land reclamation fast becoming an important option for megacities to address issues of economic growth and increasing population density. Experts are divided over the advantages and disadvantages of land reclamation, though this process continues unabated, exposing settlements to coastal hazards. The Bataan Shipping and Engineering Company (BASECO) compound is an informal settlement on reclaimed land in Manila, the Philippines. How informal coastal settlements view disaster risk and their more pressing socioeconomic needs is crucial to understanding the potentials and repercussions of land reclamation. Using a topographic survey, a questionnaire survey, and the protective action decision model, this study explored the perception of disasters and land reclamation of informal settlers who are living on reclaimed land. The study found that people are aware of disaster risks, but are more concerned with everyday needs. They are divided on the issue of further land reclamation. Residents on the original non-reclaimed land view it as a coastal defense, while those on reclaimed land fear potential eviction. Despite this, all locations in the community are concerned with the loss of jobs, economic opportunities, and eviction, rather than potential disasters.

**Keywords** Coastal hazards · Flooding · Informal settlements · Land reclamation · Philippines · Risk perception · Urbanization

## 1 Introduction

Coastal areas are vulnerable to both extreme hazards and the effects of climate change (Kron 2013; Neumann et al. 2015; UN-Habitat and UNESCAP 2015). At the same time, coasts provide economic opportunities that encourage people to settle along them. The combination of exposure to hazards and the influx of people makes coastal zones the most at-risk areas in the world (Kron 2013). Asia accounts for 54% of the world's urban population and has the highest number of people living in coastal areas (Neumann et al. 2015; Miller and Douglass 2016; Klein Goldewijk 2017; UN-DESA 2019). Rapid urbanization in developing countries typically leads to an increase in informal settlements, mainly due to issues of poverty and inequality (Davis 2007). Combined with the high natural hazard exposure, Asia's rapid development has led to an increase in disaster reports in the region (Douglass 2016; Guha-Sapir 2020). However, this has not deterred cities from reclaiming land from the sea, and there has been an increase in mega-reclamation projects in Asia (Martín-Antón et al. 2016; Chee et al. 2017).

There is a debate regarding the link between land reclamation and disaster risk. Reclaimed land can serve as a buffer zone for communities to coastal hazards, although it does not prohibit construction and development in the newly formed coastal areas (Wolf 2013; Lee 2014). Also, it can increase the risk of soil liquefaction during earthquakes—the 1995 Kobe Earthquake is a notable example (Martín-Antón et al. 2016)—and disrupt environmental

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processes in a coastal zone (Chee et al. 2017; Dedekorkut-Howes et al. 2020).

Despite this discussion on whether land reclamation increases or reduces risk, rapid urbanization continues unabated. Southeast Asian megacities such as Metro Manila are reclaiming coastal areas to address population density problems and take advantage of economic opportunities (Chee et al. 2017). The Metro Manila Integrated Flood Management Plan identifies three issues at the core of urban flooding: (1) the lack of an integrated plan to address flooding and other water disasters; (2) rapid urbanization and a lack of effective land use plans; and (3) illegal structures that encroach on waterways (Singson 2013). According to the Philippine Reclamation Authority (PRA), which oversees all reclamation projects in the Philippines, there are 22 pending proposals that include such work around Manila Bay (Roxas 2019). Though the PRA promotes reclamation as a coastal defense strategy (PRA 2016), informal settlements have long lived along dykes and reclaimed areas and have adapted to coastal flooding (Siriwardane-de Zoysa 2020). While the PRA in theory allocates resources to communities that will be affected by land reclamation projects, little is known about such interventions, and in actual fact authorities use the excuse of exposure and vulnerability to hazards to evict informal settlers from around the areas where land is to be reclaimed (Cheng 2012; Abad 2019). Due to such excuses, informal settlements fear eviction, though to date little research has been conducted on how living on reclaimed land shapes the awareness of residents, and their perception of disasters and land reclamation.

Thus, the present research explores the case of the Bataan Shipping and Engineering Company (BASECO) Compound, a poor urban community built on reclaimed land in Metro Manila, the Philippines. A vulnerability and capacity assessment study deemed that the settlements in the area are highly vulnerable to coastal hazards based on poverty, low education, and informality (Islam 2018). Although residents exhibit disaster awareness, they are mostly concerned about a potential repeat of disasters they have already experienced (Mercado 2016), and generally cope with them through community efforts (Navarra 2016). However, none of these studies specifically investigated how the experiences of informal communities that are spreading on reclaimed land shape their perception of risk. Further reclamation along the shoreline of this area is expected to take place in the future, as part of the BASECO Reclamation Project and the New Manila Reclamation Project (Kritz 2017; City Government of Manila 2018). These projects are facing opposition, as residents fear potential eviction and environmental damage (Abad 2019; De Vera-Ruiz and Fernandez 2019).

This study thus connects disaster perception and land reclamation issues related to informal settlements in urban coastal areas. Using disasters as a reason to relocate people away from hazard zones has failed, especially in rapidly urbanizing areas in Asia (Miller and Douglass 2016). Understanding informality along coastal areas that are earmarked for development provides alternatives that policymakers can pursue, particularly regarding relocation. The central theme of this article is to understand how coastal communities on reclaimed land perceive and act in response to disasters, and how they think reclamation may affect the risks involved.

## 2 Methodology

This study used a multidisciplinary approach to gather data and analyze the case of the BASECO Compound. This section discusses the theoretical framework, the case study site, and the data collection methods.

### 2.1 Theoretical Framework

This study adopted and modified the Protective Action Decision Model (PADM) by Lindell and Perry (2012) to understand the perception of informal settlers regarding reclamation, natural hazards, and their actions towards them. The PADM is a multistage series of processes on how a community perceives and chooses an action towards a threat (Lindell and Perry 2012):

- (1) Information about a threat (such as social and environmental cues and other warnings) is processed by an individual or a community and influenced by the context they are in.
- (2) Comprehension of this information, exposure to previous events, and attention to other warning information are pre-decision processes that influence how threats, protective actions, and roles of stakeholders are perceived.
- (3) The perception of threats, protective actions, and the roles of stakeholders influence the decision-making towards the protective actions the individual or community will take.
- (4) The protective action decision-making process will lead to behavioral responses that consist of information searching, protective responses, and emotion-focused coping. These behavioral responses are facilitated or hindered by situational contexts.
- (5) Feedback loop: the outcomes of the behavioral responses influence the first stage of this model.

The PADM is initially geared towards understanding a community's perception of natural hazards and subsequent

responses, although in this study reclamation is treated as both a threat and a protective action. The study employed a multidisciplinary approach to understand coastal hazards. A topographic survey and a questionnaire survey were used, in addition to other secondary data collection techniques, such as the use of historical imagery and hazard maps. These methods provide information on the various social and environmental cues and behavioral responses of residents that would inform the perception of disaster risk.

## 2.2 The Bataan Shipping and Engineering Company (BASECO) Compound

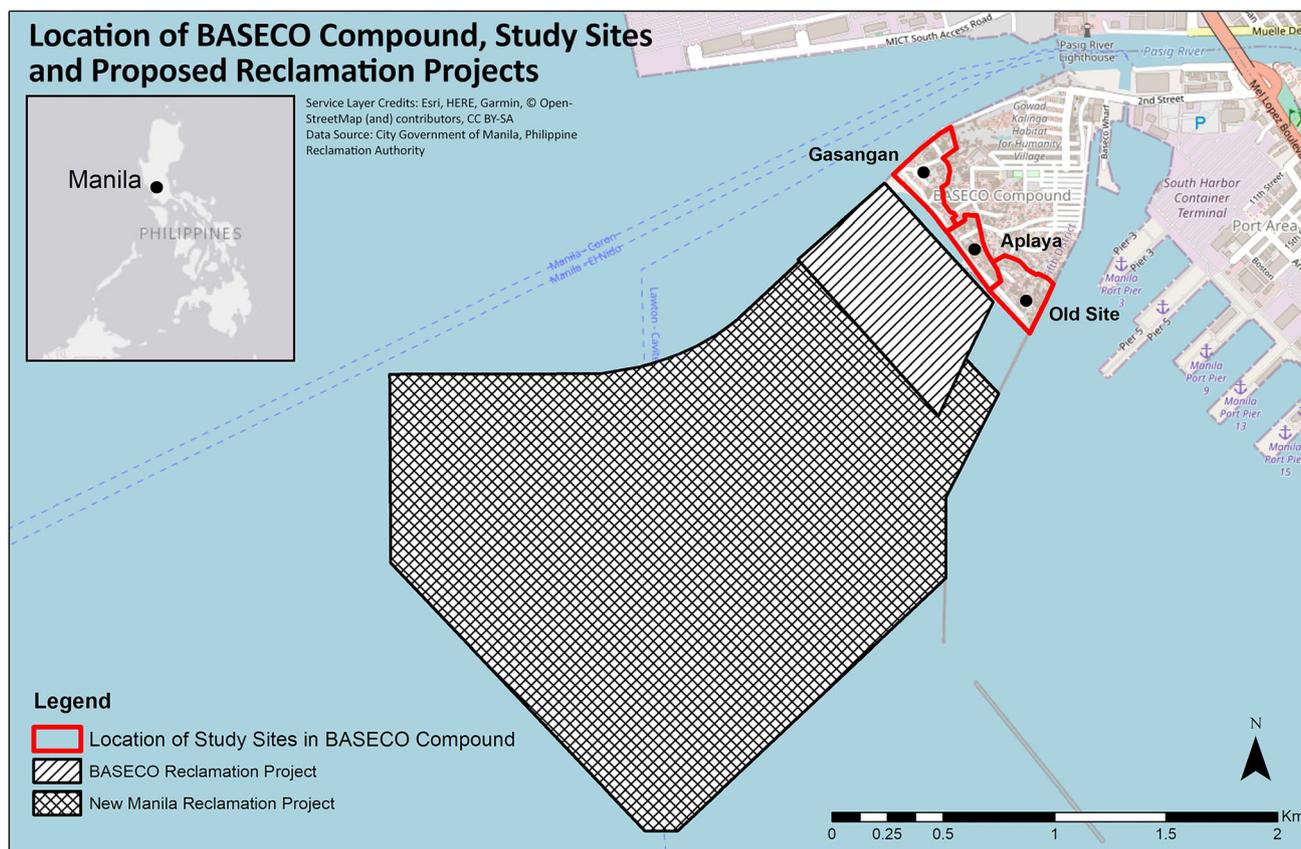
The BASECO Compound (see Fig. 1) encompasses 0.64 km<sup>2</sup> of reclaimed land located in a low-lying coastal zone at the mouth of the Pasig River (Steinberg 2011; Mercado 2016; Navarra 2016; Islam 2018; Porio 2019).

The area was declared a residential site in February 2002, making it officially part of Manila, although a fire razed 30% of the houses (particularly those built on stilts) a few months later, and the government then filled in the land where the houses used to stand (Murphy 2012). The population of the area grew from around 6700 in 1990 to at

least 60,000 at present (PSA 2016; PhilAtlas 2020). This population growth is partly explained by development programs the city aimed at the area (Cutini et al. 2020). While BASECO has formal residents, the area near the shoreline, which is the focus of this study, is defined by informal settlements that are characterized by the irregular spatial arrangement of the houses and residents without land titles (Navarra 2016).

Figure 2 shows the increase of land area in the BASECO Compound, as seen from satellite imagery, from 2001 to 2020. Based on government data, Fig. 2 shows the risk due to storm surges, tsunamis, and floods that can inundate the compound (JICA et al. 2004; Lapidez et al. 2015; Solidum Jr. 2019). The rapid change in land and population has increased exposure to coastal hazards.

There are two proposed future reclamation projects for BASECO. The 0.4 km<sup>2</sup> BASECO Reclamation Project builds on the existing reclaimed land, with the total cost yet to be determined (PRA 2018). The other is the 4.0742 km<sup>2</sup> New Manila Reclamation Project for mixed use development that would cost a total of PhP 57.3 billion pesos (USD 1.15 billion at 2020 rates) and would generate 50,000 jobs (Kritz 2017; City Government of Manila



**Fig. 1** Location of the Bataan Shipping and Engineering Company (BASECO) Compound in Manila, the study sites, and the proposed reclamation projects

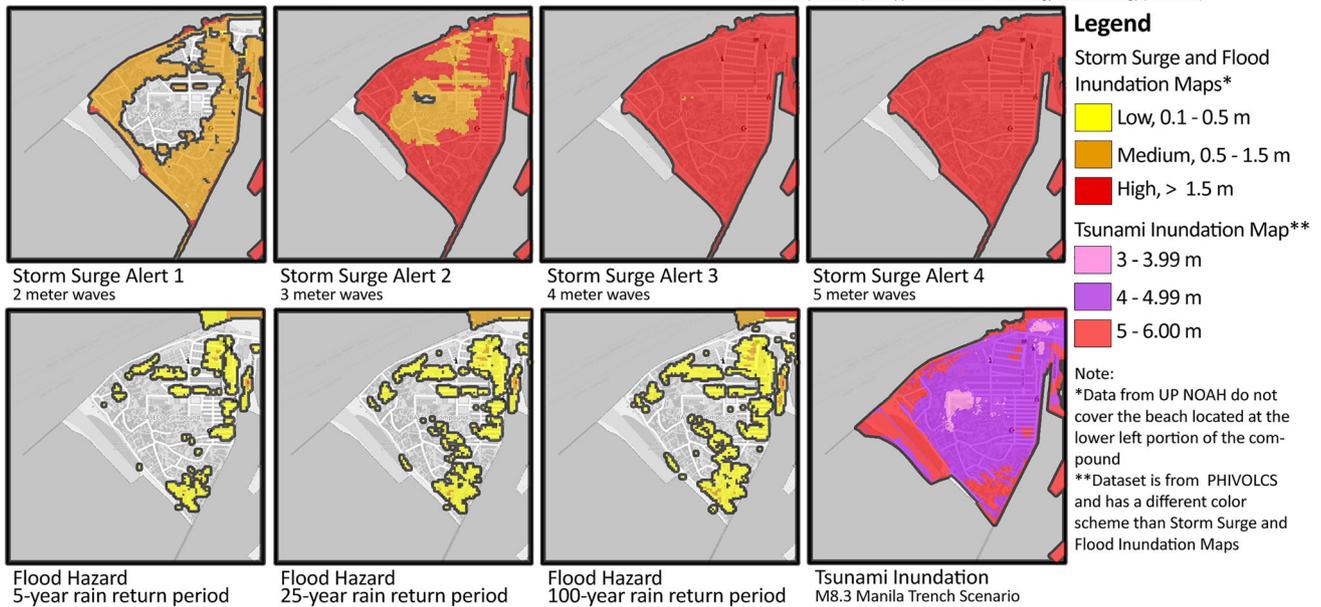
### Historical Satellite Imagery Showing Reclamation Progress

Map Source Credits: Google Earth Pro, © 2020 Maxar Technologies



### Storm Surge, Flooding and Tsunami Hazard Map

Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA  
 Date Sources: DOST-UP DREAM and Phil-LiDAR Program, U.P. National Observation and Assessment of Hazards (UP NOAH), Philippine Institute of Volcanology and Seismology (PHIVOLCS)



**Fig. 2** Historical satellite imagery and coastal hazard risk of BASECO Compound in Manila

2018). Both reclamation projects would reclaim land to a level of + 4.0 m above mean lower low water (MLLW). In terms of disaster prevention, the projects would integrate slope protection and dredging works that consider projected sea level rise, including highest high-water level (HHWL) and wave effects during the southwest monsoon. The environmental impact study discusses storm surges but does not consider any specific defenses against them. It also notes that tsunamis can affect the area, but that these are not expected to cause any significant damage (which is doubtful, as will be explained later).

This research investigated the settlements at the current shorefront of the BASECO Compound, roughly encompassing a section of about 200 meters from the shoreline. These areas are called “Old Site,” “Aplaya,” and “Gasangan” (as shown in Fig. 1), encompassing some of the lower-income communities within BASECO, which are the most vulnerable to the coastal hazards coming from Manila Bay (Islam 2018). Their locations are shown in Fig. 1. Old Site was the part of BASECO that existed prior

to the year 2000. Aplaya refers to the reclaimed land that is in the middle of the shorefront. Gasangan includes the area that is behind a beach reclaimed during the 2010s in the northeast of the compound.

### 2.3 Topographic Survey

Sea level rise, storm surges, and tsunami scenarios have been used by proponents and opponents of land reclamation (Lucas 2013; Rodolfo 2013, 2014; City Government of Manila 2018). To ascertain the veracity of such flooding scenarios, a validation of the ground level is needed. To do so, a topographic survey to measure the elevation of different parts of the compound was conducted, using a GPS device (GPSMAP; Garmin Ltd.), a laser range measuring instrument (TruPulse 360; Laser Technology, Inc.), and prism (Esteban et al. 2017a). The survey started measuring the water level at the sea, then moved on to survey different elevation points towards the nearest housing settlement, following six transects along BASECO’s coastline. The

survey results were corrected for tide levels using the XTide software. The survey was conducted on 20 November 2019 between 14:30 and 15:37. All results shown are for this corrected dataset, using Manila, Philippines tide station as a reference point. The datum point referenced by XTide is the MLLW. The highest high-water level (HHWL) for 2019 was + 1.47 m above MLLW.

## 2.4 Questionnaire Survey

The study employed two residents of BASECO Compound, who assisted in distributing the questionnaire to households living up to 200 m away from the coastline. The questionnaire was self-administered, but the researchers were nearby in case the respondents need assistance. The questionnaire survey combines questions from Mercado (2016) and Navarra (2016), which focus on BASECO Compound, and those of other authors who have done work in similar regions in the Philippines, Indonesia, and Vietnam (Mercado 2016; Anh et al. 2017; Esteban et al. 2017b; Valenzuela et al. 2020). While the disaster and climate risk perception part of the questionnaires was retained, the present survey also incorporated questions on whether respondents think that land reclamation can lead to disasters, their perception of potential future disasters due to urbanization, and possible relocation options.

A total of 102 household questionnaires were collected (Old Site, non-reclaimed (31); Aplaya, reclaimed (37); and Gasangan, protected reclaimed (34)). According to the 2015 census of population, Barangay 649 BASECO Compound has an estimated population of 59,847 people in 14,121 households, living in an area of 0.56 km<sup>2</sup> (PSA 2016; Islam 2018). Using ArcGIS, the survey areas of Gasangan, Aplaya, and Old Site are measured to have a land area of 0.14 km<sup>2</sup>. Thus, it is estimated that the survey areas would have a combined population of 14,962 people living in 3531 households. The compound is one of the largest slums in the city. The authors faced significant challenges in conducting the survey, particularly in navigating the narrow pathways within the settlement, identifying households, and venturing deeper into the compound due to safety concerns. The compound is locally known for its high crime rate, and to ensure safety, the assistants guided the researchers in conducting the research within BASECO. While conducting the survey, the researchers and their assistants exhausted all available respondents. The survey results were encoded using the Statistics Program for the Social Sciences (SPSS) 25, and statistical analyses using standard significance levels were applied ( $P < 0.1$ ,  $P < 0.05$ , and  $P < 0.01$ ). Chi square tests and one-way analysis of variance tests were used to determine statistical significance.

## 3 Results

This study recognizes reclamation as both a protective action and a threat, which were analyzed through the Protective Action Decision Model (PADM). This section provides the results of the elevation survey and the questionnaire survey.

### 3.1 Topographic Survey

The topographic survey provided insight on the physical defenses present in the BASECO Compound, which can influence the perception of residents regarding natural hazards and land reclamation. These defenses were either built by the community, or due to the land reclamation.

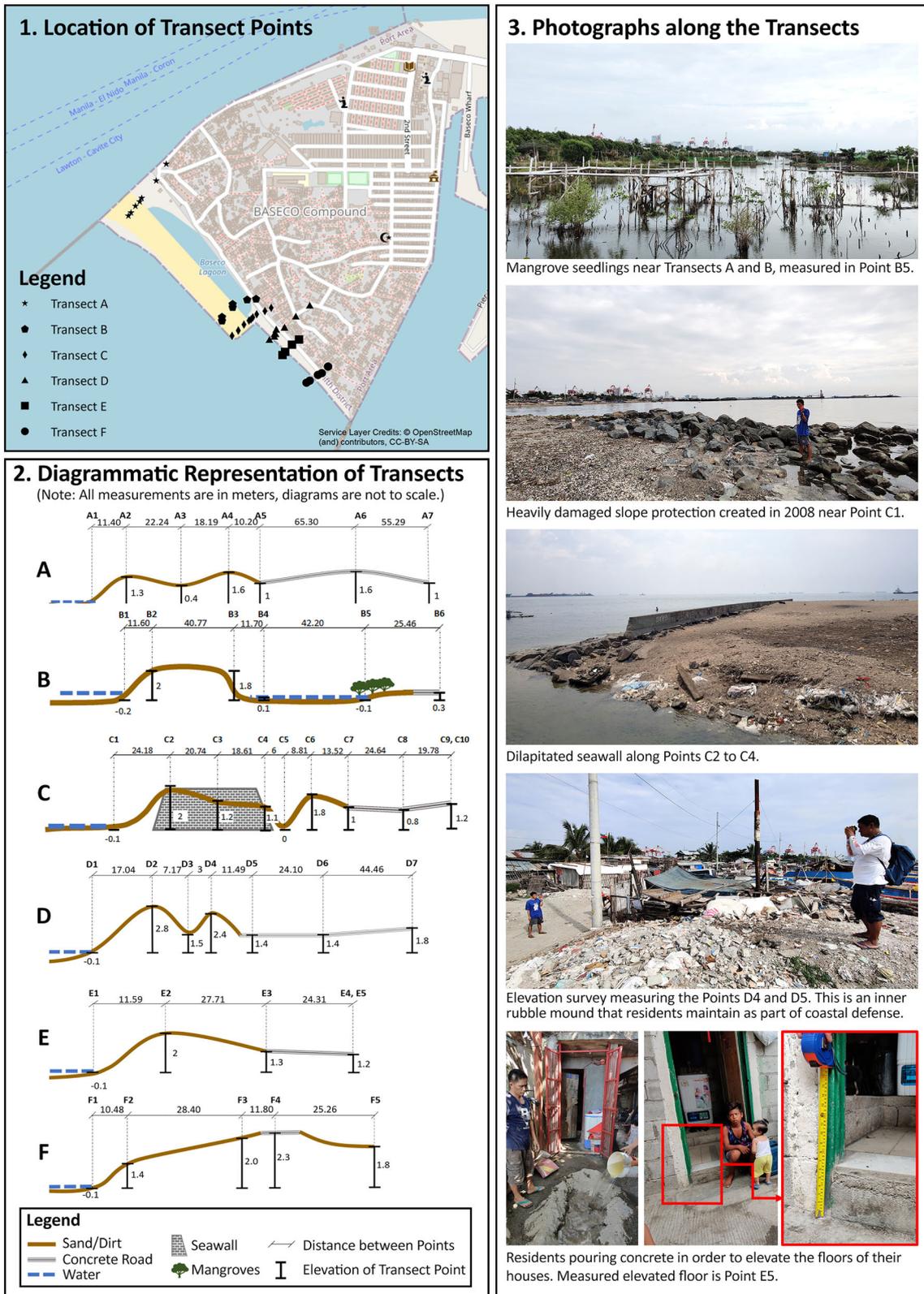
The topographic survey was conducted along six transects on the coastline of BASECO Compound. The elevation of the land where the houses are built ranges from + 0.5 to + 1.8 m, with most of them situated behind a sand mound or an eroded seawall. The height of the sand mound ranges from + 1.3 to + 2.8 m. Figure 3 shows photographs taken during the topographic survey, including floors that were elevated above ground (possibly as a countermeasure to flooding) and a mangrove buffer zone donated by a local politician (though mangroves are struggling to grow due to a lack of proper maintenance). The seawall, seen in Transect C, is not in a good state of repair, and thus its effectiveness is uncertain. While these defensive measures provide some sort of protection against 2–3 m high storm surges, a combination of high tide and a relatively strong tropical cyclone would nevertheless flood the entire community. Figure 3 shows the detailed summary of the topographic survey and photographs taken in the study area.

### 3.2 Questionnaire Survey

The questionnaire survey gauged the risk perception of the respondents in different areas regarding natural hazards and the benefits and consequences of land reclamation. It addressed the following topics: demographics, residency, and migration; flood experience; disaster prevention and preparedness; disaster risk, land reclamation, and relocation.

#### 3.2.1 Demographics, Residency and Migration

Of the 102 households, 72.7% were represented by females, 23.2% by males, and 4% did not indicate their gender. While conducting the survey most people who were willing to participate in the survey were women, and even the men who were willing to respond often would ask



**Fig. 3** Summary of topographic survey, transect points, and photographs of BASECO Compound in Manila. Photographs taken by Ven Paolo B. Valenzuela, 20 November 2019

their wives to answer. Most respondents were within the working ages of 18–35 (34.3%) and 36–50 (33.3%), with about half indicating they were either housewives (30.4%) or self-employed (20.6%). Most had a relatively low educational level and 58.8% were living with an estimated monthly household income of less than PhP 12,000 pesos (around USD 235 at 2020 rates). The minimum wage per person in Metro Manila as of 2020 is PhP 500/day (USD 10) or roughly around PhP 12,000 (USD 235) per month (NWPC 2018). All of this can be considered typical for informal settler families in the Philippines.

Of the respondents, 83% were not born in the BASECO Compound. There is a significant difference in the average years of residence at each location in the community. The mean number of years the respondents lived in the Old Site was 21.7 years, compared to 11.41 for those in the Aplaya and 11.27 for those in the Gasangan. The number of years living in each place explains the differences in the perspectives of the people in the compound. People living in the Old Site, which sits on non-reclaimed land, would have experienced more changes over time and have a different view on the proposed developments in BASECO.

### 3.2.2 Flood Experience

The respondents were first asked about their perception of flooding in their vicinity and its general sources. Around 50% of the respondents think that flooding poses a slight danger to them, with no significant difference among locations. Most respondents indicated that floods come from the sea (71.3%) and from rain (62.4%). Other sources include high tides. The date of the worst flood-related disaster significantly varies by location, with most respondents in Aplaya indicating 2009 as the worst event. However, the respondents in Old Site and Gasangan stated that the worst flooding was in the past two years.

Most respondents in Aplaya and Old Site stated that the duration of both the worst floods and regular floods was at least 12 h, although flooding can last more than a day (see Table 1). The respondents also stated that the 2009 event lasted at least 3 days. However, for those in Gasangan, which is protected by a breakwater, the worst flooding was less than 6 h. The results of the height of the regular flood and the worst flood are the same at each location, with the highest level usually going up to the waist of the respondents.

The worst flood was typically caused by heavy rainfall (71.6%), tropical cyclones or storm surges (46.1%), and coastal flooding (26.5%). The causes of regular flooding are similar to the worst ones, and are mainly due to rainfall (68%), tropical cyclones (40%), and coastal and river flooding (22%). During the survey, the respondents stated a

mixture of heavy rain, tropical cyclones, and high tides as the most typical cause of flooding.

Most respondents (71.6%) stated that they had experienced damage during their worst flooding event: 36 respondents suffered minor damage, 30 major damage, although only 8 had their houses destroyed. Of those who experienced minor damages, 55% were in Gasangan. The respondents who experienced damage were also asked if they had received any assistance, and 58.9% stated they had not received any.

The frequency of regular flooding significantly varies according to location, with Gasangan experiencing less frequent flooding. Among those who experienced flooding 2–3 times a year, 23.5% were from Gasangan, 27% from Aplaya, and 41.9% from Old Site. Of the respondents, 62.7% could still go to work during regular floods, irrespective of location.

### 3.2.3 Disaster Prevention and Preparedness

The respondents were first asked about their knowledge of storm surges and tsunamis and if they know how to evacuate if these hazards happen (see Table 2). People in Gasangan knew significantly more about storm surges than those in the other two locations. There is high awareness about tsunamis and storm surges, and how to evacuate in the event of a storm surge. However, over half of the respondents were unsure as to how to evacuate in the event of a tsunami.

The perception of the danger related to storm surges, tsunamis, and coastal or river flooding is shown in Fig. 4. For storm surges and tsunamis, most people perceive the danger to be strong or very strong. However, there was a significant difference in the perception of flooding danger, and most respondents living in Aplaya think that flooding poses little to no danger to them.

The respondents were asked what their household and community do to prevent disasters. More than half of the respondents (66%) raised their furniture, and close to half cleaned their drainage (45%), and preemptively evacuated (42%). Evacuation drills (60%), cleaning of drainage (48%), and early warning and preemptive evacuation (45%) were the community activities respondents identified as taking place. Given the prevalence of evacuation drills, 53% of the respondents had participated in an evacuation drill in the past 5 years, while 50% stated they have an emergency disaster preparedness bag, 42% stated that they do not have one, and 8% were unsure (54% of those who stated they did not have any emergency bag came from Aplaya).

Almost all respondents stated that they obtain information through the TV or radio (93%), followed by information from the local authorities (46%). Disaster

**Table 1** Comparison between duration of worst flood and regular flood ( $N = 102$ ) in BASECO Compound in Manila

	Location in BASECO							
	Gasangan ( $n = 34$ )		Aplaya ( $n = 37$ )		Old site ( $n = 31$ )		Total ( $N = 102$ )	
	<i>F</i>	%	<i>F</i>	%	<i>F</i>	%	<i>F</i>	%
<i>Length of time of the worst flood*</i>								
I don't know	1	3%	2	5%	6	19%	9	9%
0–3 h	11	32%	3	8%	1	3%	15	15%
3–6 h	5	15%	5	14%	2	6%	12	12%
6–12 h	5	15%	2	5%	2	6%	9	9%
12–24 h	5	15%	8	22%	4	13%	17	17%
More than 24 h	7	21%	17	46%	16	52%	40	39%
<i>Length of time of regular floods</i>								
I don't know	4	12%	6	16%	3	10%	13	13%
0–3 h	8	24%	4	11%	3	10%	15	15%
3–6 h	4	12%	7	19%	4	13%	15	15%
6–12 h	6	18%	0	0%	6	19%	12	12%
12–24 h	9	26%	10	27%	6	19%	25	25%
More than 24 h	3	9%	10	27%	9	29%	22	22%

\* $P < 0.05$

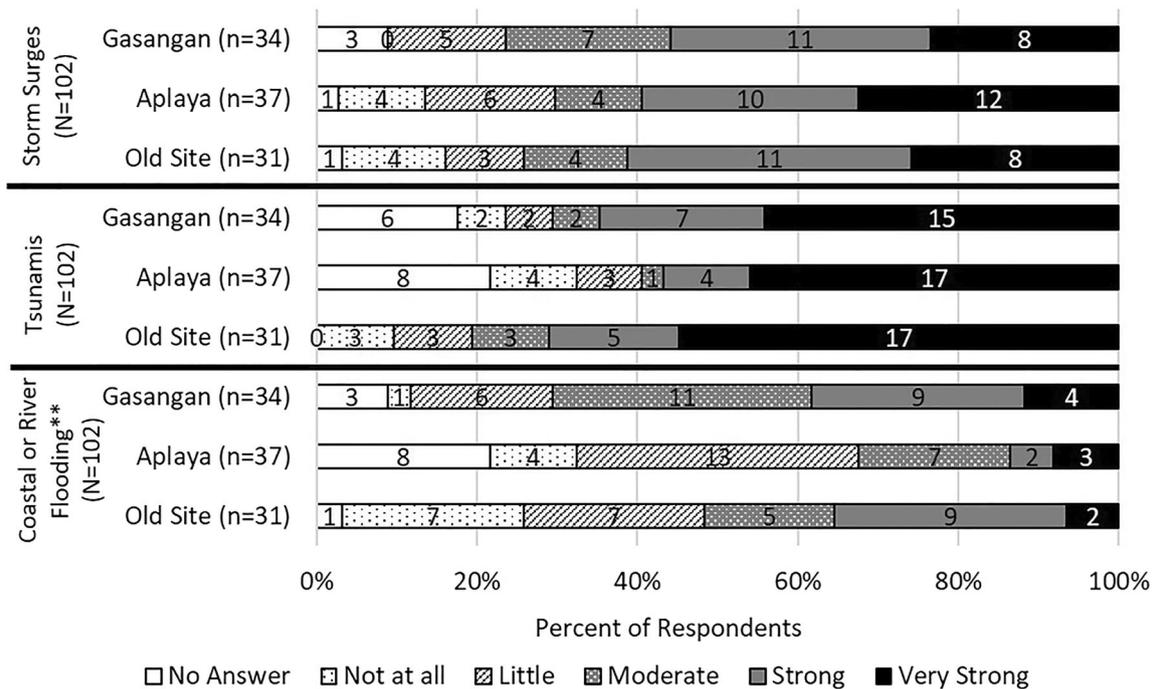
**Table 2** Summary of storm surge and tsunami knowledge and evacuation by location within the community ( $N = 102$ ) in BASECO Compound in Manila

	Location in BASECO							
	Gasangan ( $n = 34$ )		Aplaya ( $n = 37$ )		Old site ( $n = 31$ )		Total ( $N = 102$ )	
	<i>F</i>	%	<i>F</i>	%	<i>F</i>	%	<i>F</i>	%
<i>Storm surge knowledge*</i>								
Yes	26	76%	21	57%	21	68%	68	67%
No	7	21%	16	43%	10	32%	33	32%
No answer	1	3%	0	0%	0	0%	1	1%
<i>Storm surge evacuation</i>								
Yes	26	76%	28	76%	22	71%	76	75%
No	7	21%	9	24%	9	29%	25	25%
No answer	1	3%	0	0%	0	0%	1	1%
<i>Tsunami knowledge</i>								
Yes	26	76%	27	73%	27	87%	80	78%
No	6	18%	10	27%	4	13%	20	20%
No answer	2	6%	0	0%	0	0%	2	2%
<i>Tsunami evacuation</i>								
Yes	23	68%	18	49%	15	48%	56	55%
No	10	29%	17	46%	15	48%	42	41%
No answer	1	3%	2	5%	1	3%	4	4%

\* $P < 0.1$

information relayed through television or radio typically consists of typhoon signals and the suspension of work or classes. Most respondents stated that there is either no tsunami warning system (38%) or they do not know (22%)

if their area has such a measure. In fact, Manila Bay has a tsunami monitoring system in place and could provide residents warning if a tsunami from the Manila trench were to occur (Acosta 2018).



**Fig. 4** Perception of danger of coastal hazards according to location (\*\* $P < 0.05$ ) in BASECO Compound in Manila

### 3.2.4 Disaster Risk, Land Reclamation, and Relocation

The respondents were asked what they think causes disasters: 71% stated that a lack of proper drainage is a factor, followed by natural hazards and climate change effects such as sea level rise (41%), strong storms (40%), and strong rains (35%). General climate change and a lack of proper coastal defenses (such as seawalls or dykes) were tied in 5th place, at 33% each. Societal issues like poor governance and population increase are not seen as causes by most respondents, nor are land reclamation or land subsidence. Most respondents think that disasters will not worsen (47%) or have no opinion about the future (43%). This validates Mercado's (2016) findings that people in BASECO are more concerned about the types of disasters they have already experienced. However, there is a significant difference between respondents at each location, with most of those who have no opinion about the future being from Gasangan, while those who do not think that future disasters will worsen live in Old Site.

The respondents were asked about their perception of the ongoing land reclamation projects in Manila Bay (see Table 3). This yielded significant results, with those in Old Site being more inclined to agree with further reclamation, while those in Aplaya being strongly opposed to reclamation (people in Gasangan were somewhat neutral). Despite the differences in perception, 56% of the respondents preferred in-city relocation over other options, including

relocating anywhere (11%) and no relocation at all (12%); 19% had no opinion on the matter.

The respondents were asked to explain their answers and what they think will happen if land reclamation does proceed. Those who agreed thought that further reclamation in the BASECO Compound would reduce flooding, reduce trash, and enhance beautification efforts in the area. These developments, together with the installation of coastal defenses, provide the residents with a sense of security if the project does continue.

Those who disagreed thought that reclamation would lead to even more flooding, and increased vulnerability to storm surges and tsunamis. They stated that either sea level will rise, or drainage will be blocked by the reclaimed land, making floodwater flow backwards towards their houses. This perception of land reclamation is superseded by the fear of eviction, which would lead to a loss of jobs and economic opportunities.

Those who neither agreed nor disagreed (neutral) requested more information, as the costs and benefits of the project were unclear to them. Fatalistically, they stated that it would be useless to resist once building commences, given their low socioeconomic status and lack of ownership of the land they occupy.

The respondents were asked about what policymakers should consider. Those who agreed with the land reclamation stated that reclamation should be done properly (including established evacuation routes, building coastal defenses and drainage lines, and beautification of the area).

**Table 3** Perception of ongoing land reclamation in Manila Bay according to location within the BASECO Compound and preferred relocation options ( $N = 102$ )

	Location in BASECO							
	Gasangan ( $n = 34$ )		Aplaya ( $n = 37$ )		Old site ( $n = 31$ )		Total ( $N = 102$ )	
	<i>F</i>	%	<i>F</i>	%	<i>F</i>	%	<i>F</i>	%
<i>Perception of ongoing land reclamation in manila bay*</i>								
Strongly disagree	5	15%	15	41%	2	6%	22	22%
Disagree	6	18%	10	27%	6	19%	22	22%
Neutral	15	45%	7	19%	6	19%	28	28%
Agree	7	21%	5	14%	11	35%	23	23%
Strongly agree	0	0%	0	0%	6	19%	6	6%
<i>Relocation choices of respondents</i>								
No answer/No opinion	10	29%	5	14%	4	13%	19	19%
In-city relocation	12	35%	27	73%	18	58%	57	56%
Off City Relocation	2	6%	1	3%	0	0%	3	3%
Relocation anywhere	4	12%	0	0%	7	23%	11	11%
No relocation	6	18%	4	11%	2	6%	12	12%
Others	0	0%	0	0%	0	0%	0	0%

\* $P < 0.01$

They stated that authorities should consider creating housing for the informal settlements that will be evicted. Those who disagreed with the land reclamation also shared similar sentiments regarding the need to provide adequate housing and economic opportunities.

#### 4 Discussion

Disaster risk reduction strategies that rely heavily on infrastructure can fail to address the root causes of disasters in Southeast Asian countries, as they collide with immediate development needs such as economic growth and development (Miller and Douglass 2016). Reliance on awareness raising as a motivator to demand expenditure on defense infrastructure by the government does not capture the intricacies of vulnerability prevalent in impoverished coastal communities, such as the need to care for everyday needs (Ballinger 2015; Douglass 2016; Chan et al. 2018). Informal settlers live in a constant state of risk, and using future potential disasters (which is another form of risk) as a reason for relocating them to a safer place cannot compete with more urgent everyday needs. The BASECO Compound's rapid change in the last 20 years showcases the problem that local governments face when they attempt to use the threat of disasters to relocate informal settlements.

#### 4.1 Disaster Experience, Hazard, Exposure, and Vulnerability

The increase in informal settlements, especially near or in land reclamation zones, increases exposure to coastal hazards. However, extreme shock events that provide residents the disaster experience that drives awareness are few to nonexistent in the span of time during which rapid urbanization occurs.

Typhoon Ketsana in 2009 certainly boosted disaster preparedness in the community. As a result, the effects of regular yearly floods have been addressed by the community through countermeasures such as elevation of floors and furniture, building makeshift seawalls, decluttering drainage lines, and evacuation drills. This validates the findings of Navarra (2016), who indicates that such activities tie the community together. The community may be poor, given that most of the respondents' households earn less than the minimum wage per person in Manila (around PhP 12,000 or USD 235 per month), but they can still address frequent and regular flooding. However, these activities would be completely ineffective against extreme shocks such as a significant storm surge or a tsunami from the Manila Trench—both a real future possibility in the area.

It is important to highlight that 53% of the respondents had participated in an evacuation drill in the last 5 years. This represents a higher participation than in other communities in Southeast Asia such as Pluit, Jakarta, Indonesia

(19%) (Esteban et al. 2017b), Dongala Regency and Palu, Sulawesi, Indonesia (2%) (Harnantaryari et al. 2020), Puerto Princesa City, the Philippines (35%) (Valenzuela et al. 2020), and Phu Trinh, Phan Thiet, Vietnam (36%) (Esteban et al. 2017c). However, the lack of foresight with respect to extreme shocks is shown in the community's perception of threats and future disasters. Most respondents are aware of storm surges and tsunamis but are unaware of future disaster risk, validating the findings of Mercado (2016).

In areas that are at risk to disasters, disaster risk reduction is a component of sustainable development. However, investing in disaster prevention in megacities such as Manila and Jakarta competes with more immediate needs such as economic growth and addressing overpopulation. Reclamation is seen as a solution to ease overcrowding, with cities such as Manila and Jakarta addressing development issues first, and then accommodating disaster risk as an afterthought. This is reflective of the people living in BASECO who are not really concerned about future disasters and cannot clearly understand what will happen in terms of disaster risk when land reclamation happens.

There is a clear knowledge gap with respect to the effects of land reclamation. Despite this knowledge gap, there is a sense of community among the residents of the BASECO Compound. If the project does continue, residents request the authorities to provide proper relocation that includes access to basic services and economic opportunities for those who will be affected.

The topographic survey shows the context of how residents based their perception on experience. Gasangan is protected by a reclaimed beach. Aplaya is exposed to coastal hazards and the ill-maintained seawall in the area offers little protection. Old Site, considered the non-reclaimed area of BASECO, may be exposed to Manila Bay but claims the land reclamation that was conducted from the mid-2000s to the 2010s as their main coastal defense. The respondents located in the Old Site are in favor of further land reclamation due to the perceived positive effects, with most stating that there would be reduced flooding (as they would be further away from the coast). This is due to the people living and seeing the changes brought about by experiencing additional land added to their community. The people in Gasangan, who are in an area with recent infrastructure developments that may serve as protection, are still undecided. Residents in Aplaya, who mostly reject land reclamation, have not experienced any of its potential benefits. Thus, the perception on reclamation and disaster risk was dependent on where the respondents of the questionnaire survey are located, with residents mentioning the potential benefits

and consequences of reclamation based on their experience.

The concept of disaster risk, when seen in the context of informal coastal communities living on reclaimed land, entails a deeper understanding of the underlying risk drivers such as poverty and unplanned and rapid development. The lack of land ownership, the rapid environmental change, and the need to survive are what residents in the BASECO Compound struggle with daily. For them, the threat of disasters and climate change appears to be a distant reality.

#### **4.2 Protective Action Decision Making (PADM) and Behavioral Responses to Disasters and Reclamation**

Using the PADM the authors illustrate how the residents of the BASECO Compound perceive land reclamation and disasters in a reclaimed area that is experiencing rapid urbanization, highlighting how poverty influences their choice of protective actions. Figure 5 shows the PADM using the information gathered in the study.

Poverty shifts the concern of residents towards present problems rather than future disaster scenarios, as economic needs are prioritized over disaster preparedness (in this sense, it is worth noting how the topographic survey indicated that some of the protective responses of the community are in a state of disrepair, and are likely to be destroyed by an extreme event). Land reclamation is seen as a detriment to the job security and housing of those who may be affected (with residents fearing relocation, something they feel powerless to resist due to poverty and the lack of ownership of land). Knowledge of disasters and land reclamation is drawn from experience, with the threat of eviction and job insecurity pushing residents to seek more information on reclamation (with some long-term residents drawing on their experience on the benefits and consequences of prior reclamation). Protective action generally takes the form of in situ adaptation against frequent hazards, and the perception of land reclamation as a viable countermeasure varies among residents of the various waterfront areas.

#### **4.3 Challenges to Disaster Risk Governance in Rapidly Developing Cities**

Investments in disaster risk reduction must address the root causes of vulnerability in an area (Wisner et al. 2004). However, there have been multiple cases in Southeast Asia where governments have focused more on evacuation drills than addressing underlying risk drivers such as poverty, which would reduce communities' exposure and vulnerability to disasters (Esteban et al. 2017b; Takagi et al. 2017;

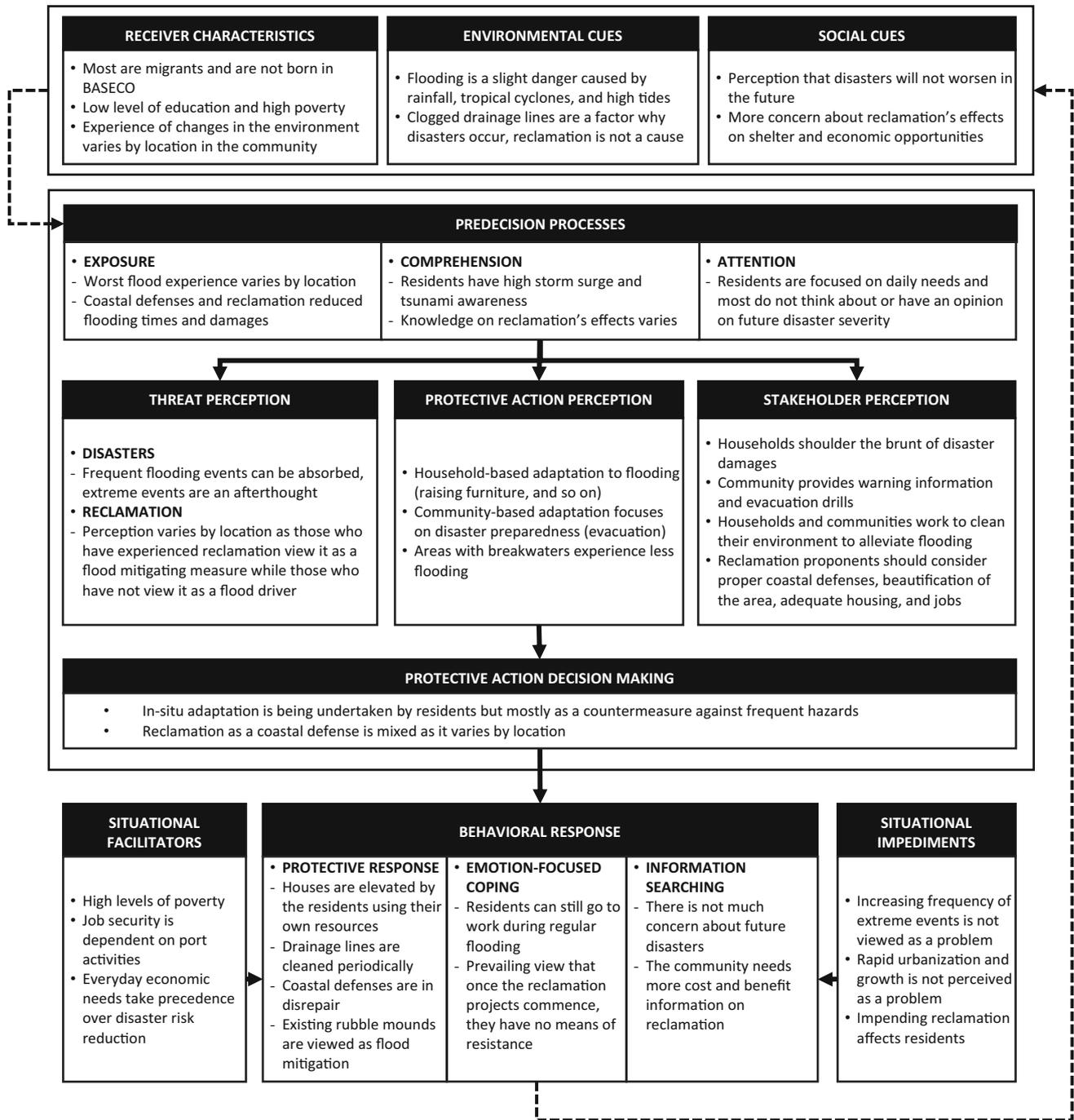


Fig. 5 The Protective Action Decision Model (PADM) for disaster perception in the BASECO Compound in Manila

Valenzuela et al. 2020). This experience is repeated in the BASECO Compound, with evacuation drills being one of the more frequent activities the government has promoted. However, when it comes to communities that are both highly exposed to hazards (as in the case of the BASECO Compound) and are also facing land reclamation in their vicinity, this latter threat may pose a greater danger to their socioeconomic well-being than environmental stressors.

Socioeconomic and political factors play a big role in increasing the exposure of people to hazards. Rapid unplanned development that does not consider risk holistically could lead to more vulnerable communities (Mileti et al. 1995; Wisner et al. 2004; Fordham 2007). The BASECO Compound and other informal settlements are willing to relocate if their inhabitants are provided economic opportunities and housing. However, this is not

addressed by current disaster prevention strategies (Balgos 2015; Morin et al. 2016). Disaster risk reduction approaches that cannot cope with growing urban complexities—such as population dynamics, economic needs, and intensifying hazards due to human interventions—could compound existing vulnerability (Takagi et al. 2014; Miller and Douglass 2016). Evicting informal settlements with the pretext of building resilience does not address underlying societal factors that create impoverished communities in the first place (Alvarez and Cardenas 2019). Implementing infrastructure solutions such as land reclamation as disaster prevention strategies, but not addressing socioeconomic issues, may result in higher levels of poverty that are unable to counteract future hazards (Douglass 2016).

## 5 Conclusion

The study highlights a growing concern in Asian megacities involving the marginalization of informal settlements while governments aim to balance urban growth and reduce disaster risk. Land reclamation presents an opportunity to reduce the consequences of future disasters, as new developments can include coastal defenses. Although disaster risk reduction should be an essential component in land reclamation as it can mitigate coastal hazards, this is not one of the main reasons why megacities in Southeast Asia pursue this intervention. Instead, governments often use disasters as a pretext to evict informal settlements from the areas they occupy.

Using the PADM, the present study shows that this course of action will generally not work, as communities have already adapted to their surroundings. Such communities will refer to their experience and adaptive capacity as a reason not to fear future hazards. Furthermore, people living in informal settlements would rather worry about how to address present needs than future hazards. In that sense, this research indicates the need for future work to clarify and elaborate on what drives authorities to use the threat of disaster risks to evict informal settlements.

To curb increasing exposure and vulnerability through land reclamation, local governments must first address the underlying socioeconomic problems present in informal coastal settlements. Informal settlers who live on reclaimed land and are at risk for both disasters and potential eviction also show a willingness to cooperate if they are given a platform where their needs can be heard.

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