Case

Langtang, Nepal

JUSTIN W. HENCEROTH AND ASHLEY C. THOMPSON

Langtang is a high-mountain Himalayan valley in central Nepal. Located directly north of Kathmandu, the valley is accessible only on foot. The mouth of the valley is a six-hour drive from the capital city, and it takes three to four days to walk into the heart of Langtang. The largest settlement in the valley is also called Langtang, but multiple small villages dot the trekking routes both above and below the eponymous village. Historically, the valley has hosted varied agricultural practices, including seasonal grain, vegetable farming and yak herding. Due to the extreme condition of its location, families and individuals traditionally shifted locations throughout the seasons in order to take advantage of high-altitude resources during the summer months and remain at low elevations during the harsh winters.

A combination of stunning landscapes and proximity to Kathmandu led to the development of trekking-based tourism in the valley. As of 2014, the Langtang trek was the third most popular route in Nepal, attracting approximately 13,000 visitors per year. When the Ghorka earthquake struck on the 25th of April, 2015, Langtang was doubly devastated; the shaking not only caused damage to homes and buildings, but it also dislodged five different snow fields and hanging glaciers sitting two thousand meters above the village. A resulting landslide swept down the steep mountainside, picking up rock, ice, and snow along the way, until, fatefully, it took out the main settlement. While distinct in the size and scale of devastation, the Langtang landslide is symbolic of a new reality that continues to afflict communities throughout Nepal—the earthquakes and their aftershocks have destabilized ground repeatedly such that many villages now face chronic landslide risk.

In Langtang, the blast from the landslide is estimated to have been half as powerful as the Hiroshima bomb. It felled houses, walls, other structures, and trees in the surrounding area. Nearly 60 meters of debris buried the western part of the settlement where the primary tourist lodges were located, while the shaking and blast damaged or destroyed nearly all the remaining

Fig 1. White memorial prayer flags in honor of Langtang Village and those lost sit atop the rubble of the landslide. Photo credit: Dane Carlson

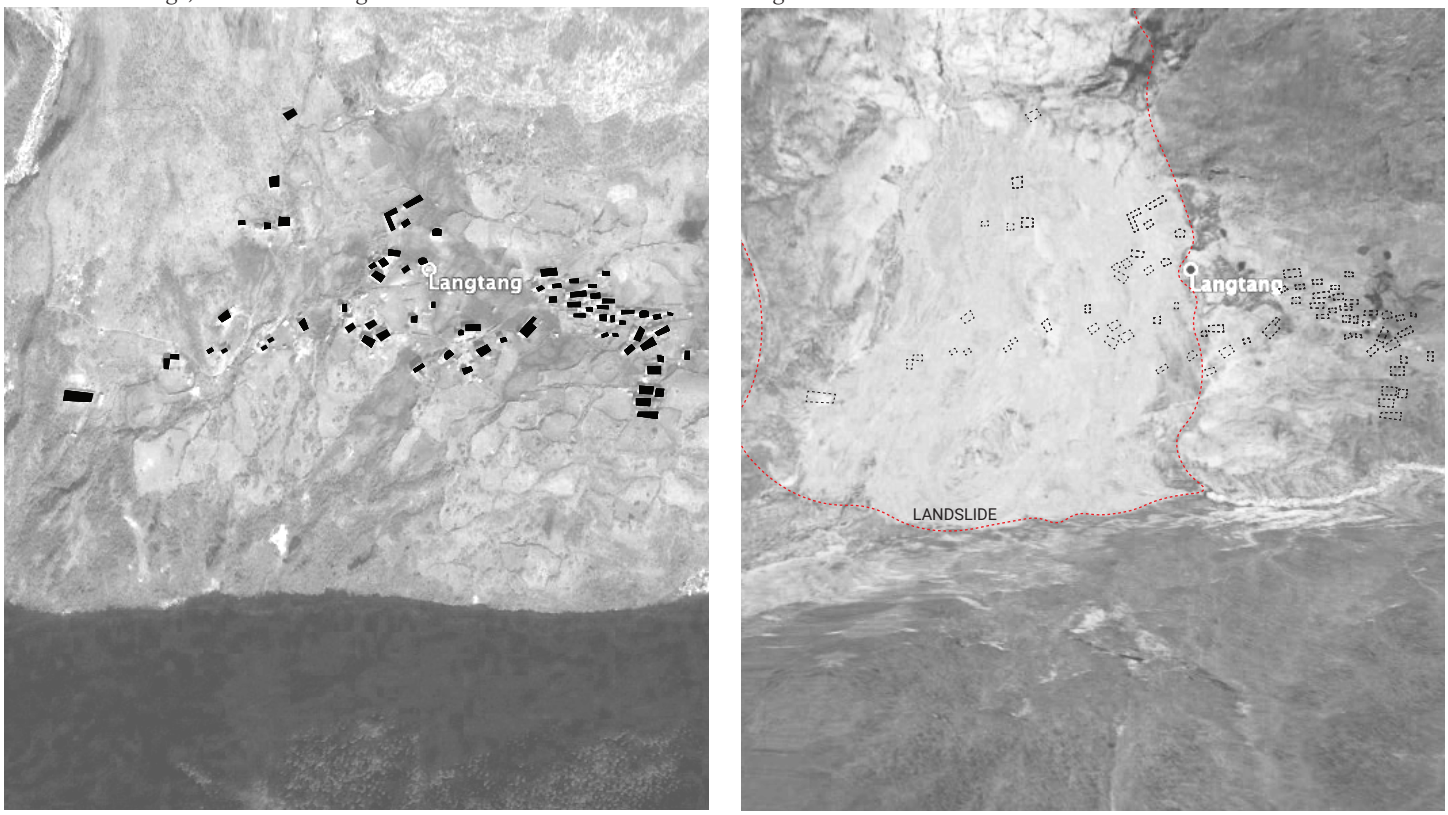
buildings. More than 300 people died, including almost 200 residents, 80 foreigners, and a number of mountain guides and army personnel. More than 100 bodies were never recovered. Moreover, the land was completely reconfigured by the force.

The survivors in Langtang were evacuated to Kathmandu, where some lived for more than a year before returning to the valley to rebuild and restore their livelihoods. At the main settlement, the massive debris field lies as a marker to the destruction and loss. A memorial has been placed where the village used to sit—a ring of white prayers symbolizing death, loss, and memory. Facing a need for total reconstruction on land that bears little resemblance to its former state, community members retreated to the east of the landslide and started working to rebuild homes, teahouses, and shops. Local support from the international trekkers and travelers resulted in a flow of donations and aid that included, food, clothing, temporary shelter, and reconstruction materials.

Beyond re-locating themselves or retreating from the slide, many residents of Langtang are also changing the structures they build. Traditional buildings were one or two-stories tall and built from unreinforced stone masonry with timber floors and roofs. The stone was gathered from the surrounding fields, minimally carved to be roughly block-shaped, and piled to build walls. The wood was gathered from nearby forests. By contrast, new construction is largely using a mix of reinforced concrete and industrial timber. Felled trees from the landslide blast have provided a ready source of timber for local rebuild techniques, while building material donations—coming mostly from trekkers who had visited Langtang in the past—have included exported concrete, steel, and hardware such as nails and screws to build with timber.

Many families are using the rebuilding process in order to shift away from single-family and farmhouses, opting instead to build teahouses or lodges that cater to the tourist economy. This shift is not unique to Langtang. Throughout the country, tourism, one of the larger sectors in the Nepali economy, is replacing agriculture and livestock. However, this shift portends a stark change for the future of the Langtang valley, as it is complicated by other national trends, notably the steady migration of young people out of rural areas to domestic or foreign cities in pursuit of work and educational opportunities. An economy based on tourism has the potential to be more profitable and provide more opportunities, but it is also intimately and inextricably tied with global institutions and international demands that move people and goods around the world. Self-sufficient practices are replaced by complex market relationships and institutional systems. While much

Fig 2. These images show the change in Langtang before the landslide and earthquake in 2014 (left) and after in 2015 (right). The landslide buried much of the village, while the shaking and the blast flattened the rest of the village.



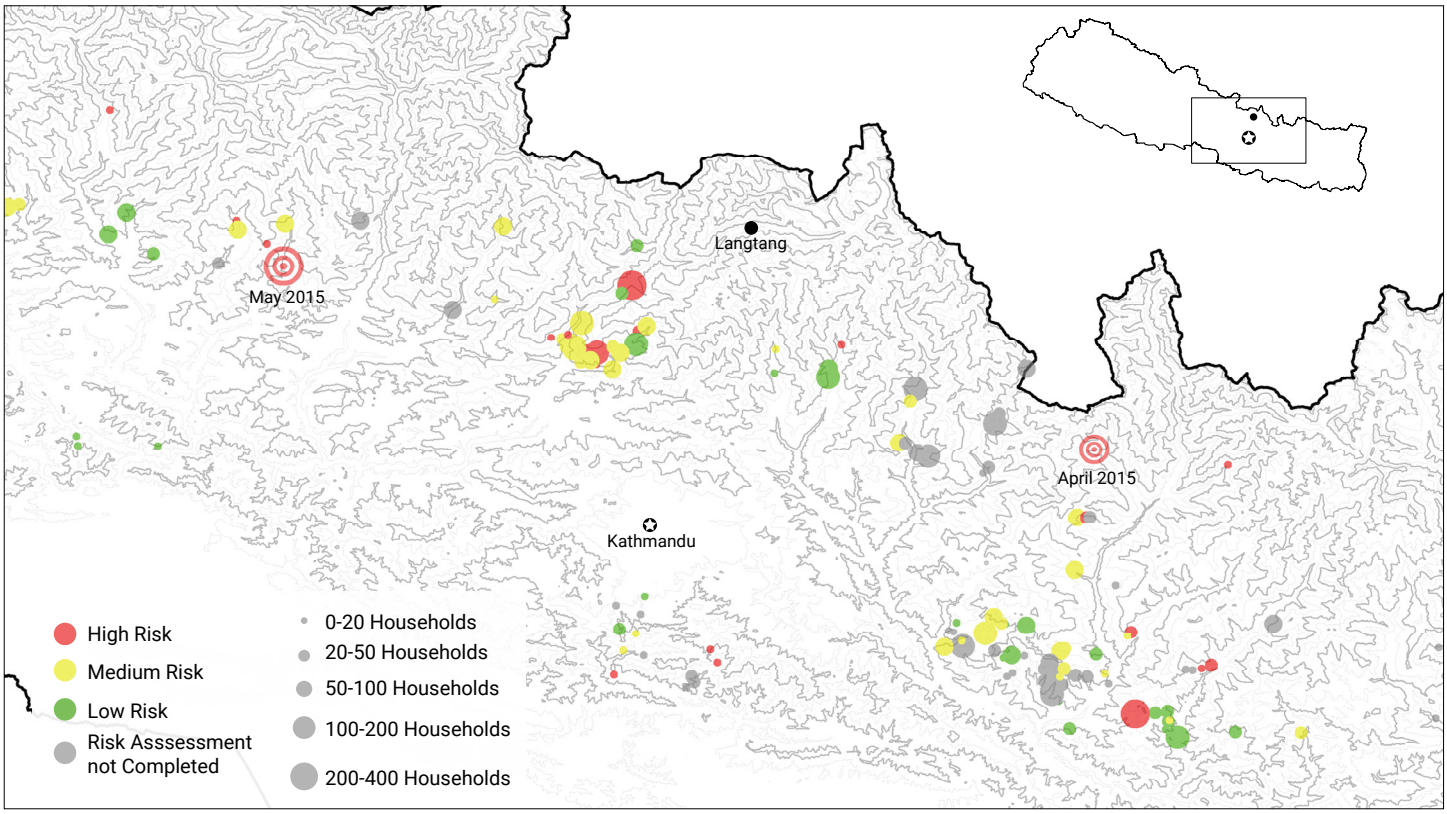
is written about the broad challenges with such a shift, in Langtang, this early focus on tourism has supported the valley's revival. By quickly rebuilding tourist infrastructure, the trekking routes throughout the valley were quickly reopened. Full access was restored for the fall 2016 trekking season, and tourists with local spending power are returning to the valley.

Outside of Langtang, the earthquake and its aftershocks unleashed more than 10,000 landslides in the ensuing weeks and months. The frequency of landslides have risen throughout the region, a trend that is significantly greater than historical patterns. Slopes, destabilized and cracked from earthquakes, are more susceptible to rain and flowing water which can permeate and increase the risk of landslides. Many communities find themselves facing fractured ground, localized slides, and slumps, which they interpret as a sign of danger warning against rebuilding in place. One year out from the Earthquake, internal displaced persons in Dhading District said that the possibility of continued landslides was their primary reason for not returning home.

With this phenomenon playing out throughout the affected region, the Government of Nepal has initiated a multi-hazard risk assessment survey to examine 590 of the most vulnerable communities. The survey looks across a range of geologic and geomorphological factors, including recent and historical landslide activity, cracks in the ground, flash-flooding risks, and community exposure to make a qualitative determination of risk for each village. As part of the survey, potential sites for retreat or relocation are also being identified. This survey will inform efforts by The Government of Nepal to identify the communities that are most at risk from chronic geological instability and to help those communities retreat and resist the pressure to rebuild. In the first phase of the survey, more than 150 villages were surveyed and 56 were identified as at high-risk and are to be moved immediately. Once all the villages have been surveyed, the data will be used to create a comprehensive list of the most at-risk villages. The Government of Nepal and its partners are in the process of developing plans to support resettlement, relocation, or innovative reconstruction of the identified communities.

Chronic landslides, triggered either by the earthquakes in 2015 or as a result of newly destabilized ground, have fundamentally altered the risk patterns for Langtang and settlements throughout Nepal. Incorporating understandings of this new chronic risk into recovery, reconstruction, and long-term development planning is critical to ensuring success, but it will require expanding the notion of how success is evaluated, which may include retreating to other sites and rebuilding with materials that reflect local resilience.

Fig 3. Preliminary data from the Multi-Hazard Risk Assessment being conducted by the Government of Nepal. Langtang valley has not yet been surveyed. Collected by Nepal National Reconstruction Authority (NRA) using FieldSight mobile application.



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Case

Tacloban, Philippines

JUSTIN W. HENCEROTH AND ASHLEY C. THOMPSON

Tacloban, a city of about a quarter million people, is the capital of Leyte province and the regional center for the Eastern Visnayas region, the central collection of islands in the Philippines. Located on the eastern edge of Leyte Island, the city is 560 kilometers southeast of Manila and due to good airline connections is the main hub and regional connection point. Because of this, it is also the economic center for the region, hosting media, cultural, and government institutions. Historically the site of a fishing village, the arrival of Augustinian and Franciscan monks 300 to 400 years ago led to the development of an important city center. The exact date when the municipality was first incorporated is not known; in a sign of troubles to come, the files with that information were destroyed in a typhoon.

When Typhoon Haiyan (locally known as Typhooon Yolanda) struck the Philippines in 2013, Tacloban was one of the most devastated cities. While the wind and rains were strong, the most damage was inflicted when a powerful 24-foot high storm surge swept ashore, destroying more than 40,000 homes. The ferocity of the storm surge, the low-quality construction of many homes, and the fact that many informal settlements had no land tenure, demonstrated the precarious nature of living so close to the shore.

Recognizing the long-term risk associated with the coast, risk that is heightened by sea level rise and climate change, the government looked at options for restricting development in dangerous areas. Three months after the storm, the National Department of Environment and Natural Resources (DENR) enacted a 40 meter "No Build Zone" in all areas affected by Yolanda. This new policy banned the reconstruction and construction of any buildings within forty meters of the shoreline. While sweeping in its scale and intentions, the rigid, one-size-fits-all nature of the ban made it highly impractical in reality. The legal justification for the No Build Zone came from the 1976 Presidential Decree #1067, The Water Code, which declared that up to 40 meters of along the banks of waterways "are

Fig 1. Damaged and rebuilt homes sit behind a sign that marks Tacloban's No Build Zone. Photo Credit: Joseph Cataan

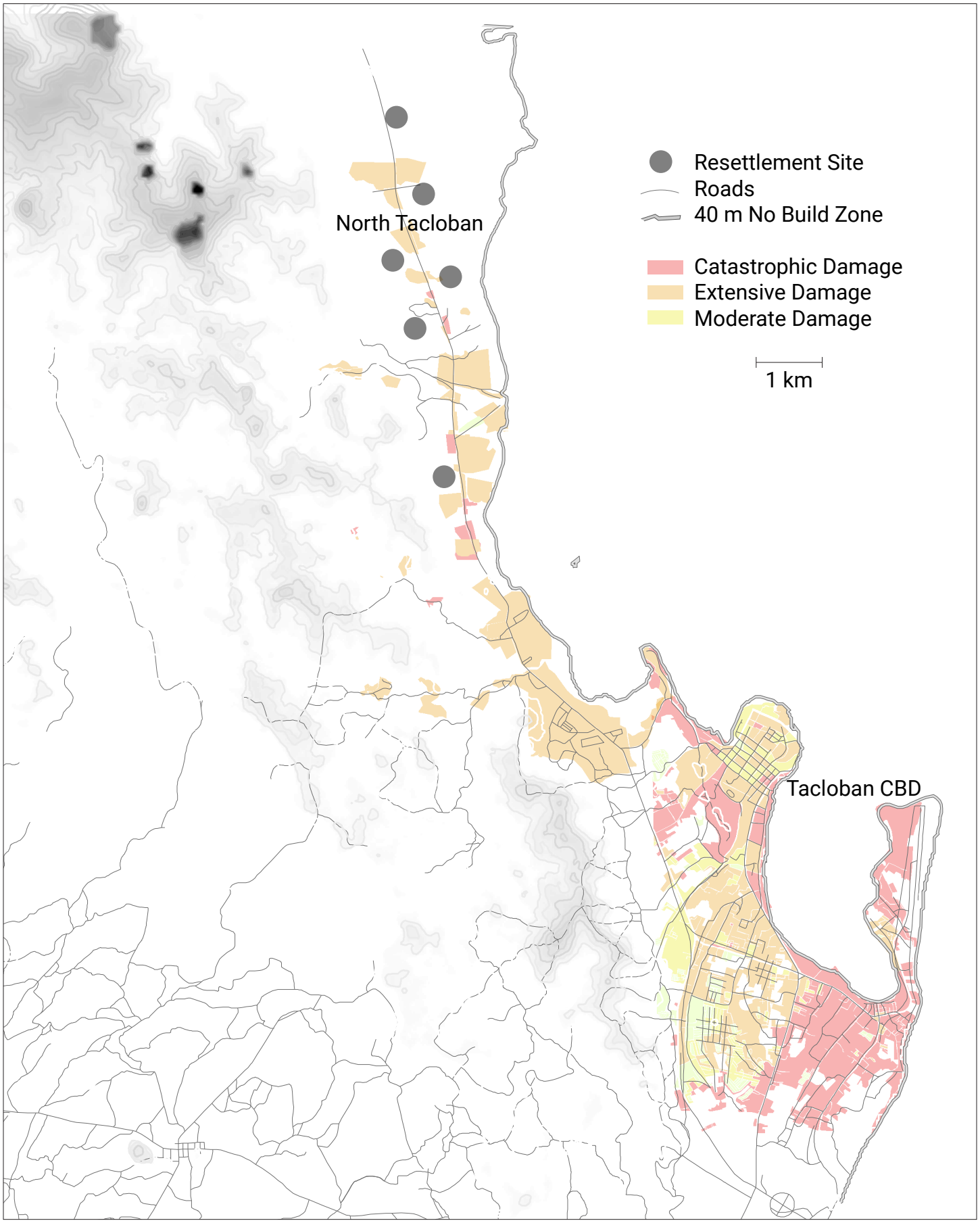

Fig 2. Map of Tacloban, showing storm damage, road infrastructure, and the proposed No Build Zone. The most catastrophic damage extended throughout the city and was not confined to the 40 meter zone. At the same time, many of the proposed resettlements, while located in areas that experienced less damage in the storm, are far from the city center and have limited infrastructure access.

subject to the easement of public use in the interest of recreation, navigation, floatage, fishing and salvage. No person shall be allowed to stay in this zone longer than what is necessary […] or to build structures of any kind" (Article 51). The code was originally intended to maintain public access and reduce development along important waterways, but in the post-typhoon context it became a tool for the government to use in guiding reconstruction. Enacted nationally by DENR with the support of President Benigno Aquino III, the National Department of Highways and Public Safety installed signs along the coast throughout the affected region. Local government officials were tasked with implementing and enforcing the ban.

From the outset, the No Build Zone met significant opposition from both local government and local populations. Arguments against the No Build Zone included that the policy did not adequately address coastal risks, did not account for the needs of current and historical residents, and was inconsistently implemented throughout the region. The mayor of Tacloban, Alfred Romualdez, was highly critical of the broad nature of the policy, stating, "[The No Build Zone is] a misinterpretation of the Water Code. It gives the wrong message that when you are beyond 40 meters of the coastline, you are already safe. Elevation is a better measure of protection. You cannot build a structure that will withstand a storm surge or tsunami - the only way is up." Many local agencies and political figures called for a mapping and zoning exercise which would identify the safe and unsafe zones for reconstruction and development. Coastal Tacloban was home to tens of thousands of people before Typhoon Haiyan. Livelihoods that depended on the ocean, such as fishing and aquaculture led people to settle on the shores, and for many of the displaced, those plots of land on the coast were the only home they had ever known.

The government did make arrangements to develop new homes to support relocation of residents; however resettlement at scale was unsuccessful. Most of the relocation sites were located in North Tacloban, many kilometers from the central business district. Accessing the main city center, in order to work in traditional jobs, would require hours of travel by foot or bus. These new settlements lacked access to key infrastructure, including water and roads. The government was also slow to build these new homes. Plans called for nearly 200,000 homes throughout the area affected by Haiyan, but three years out barely 10% had been completed. Some efforts to relocate people just inland but still within the city, through urban densification, have been more successful, but are also small in size.

As a result, many families have stayed and rebuilt in the No-Build Zone, constructing homes out of whatever donated goods (such as tarpaulins), scrap, and reclaimed materials they could gather. That many people had informal claims to the land fuelled their suspicions of being treated fairly in relocation. One resident, when asked why she refused to leave, said that if she left her house, she wasn't sure if she would be allowed back or given anything in return. Concerns that wealthy families in Tacloban were positioning themselves to use the clearing of the No-Build Zones to further business interests in tourism or industrial fishing hardened resident opposition, with protests occurring in both Tacloban and Manila.

Responding to pressure, in 2015 the government released new guidance for No-Build Zones that called for mapping coastal areas and marking zones as safe, un-safe, and 'no-dwelling'. This approach may create a process that is more in tune with landscape processes, but the establishment of No Dwell Zones will continue to require the moving of people out of some areas. Yet, despite increased awareness of the risks, informal settlements on the coastal areas have grown, not shrunk, since Typhoon Haiyan. While the original residents rebuilt homes and worked to restore their livelihoods, the availability of water, food, and high-quality temporary housing provided by aid organizations has drawn relatives and friends to Tacloban from other affected parts of Leyte and nearby islands where aid has not been as common or plentiful. Some communities have more than doubled in size in comparison with pre-typhoon levels, creating urban slums that are as exposed as ever to future typhoons and tsunamis.

In Tacloban rebuilding in ways that incorporates the reality of chronic landscape risks can help reduce disaster risk in the future, but large scale plans to retreat or relocate from currently used land has conflicted with residents, their livelihoods, and their cultures. The demand and desire of residents to rebuild in ways that restore their ways of life has caused them to return to the areas they know, while resettlement plans have not satisfactorily presented an alternative future. Rebuild and retreat that aims to reduce the footprint of the built environment on chronically at-risk lands must recognize the autonomous rebuilding that arises from people's desires to return to lands and livelihoods that they know and understand.

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Case

Sankhu, Nepal

JUSTIN W. HENCEROTH AND ASHLEY C. THOMPSON

Sankhu is the oldest planned settlement in the Kathmandu valley; according to local legend it was established over 3,300 years ago. Part of the Shankharapur municipality in the northeastern part of the valley, Sankhu is 17 kilometers south of Kathmandu city center. Sankhu is characteristic of the common settlement form that dominated the Kathmandu Valley for much of its history. A small but dense core settlement ensures shared access to and maintenance of services such as water supply, sewage, and irrigation, while surrounding fields support the agriculture that historically sustained communities. As the Kathmandu metropolis has grown, the lives of the community's more than 4,000 residents have shifted to become more urban. While still supporting some farming activities, increasingly the residents of Sankhu are working in businesses and factories in Kathmandu, or are traveling abroad to pursue education and secure employment.

Over the years, Sankhu developed into a place of pilgrimage and penance, attracting Hindu and Buddhist pilgrims from around the world. Religious and cultural elements ranging from the famous Vajrayogini temple complex to the ever-present small puja (shrines) infuse the community with a sense of the sacred. Traditional Newari (major local ethnic group) architecture features engraved stone blocks and carved wooden windows, doors, and beams that prominently feature religious and mythical figures. The close connection between the classic architecture, the religious sites, and the cultural history have led to the consideration of both Sankhu and the Vajrayogini temple complex as potential UNESCO World Heritage Sites. Beyond the three main Durbar (palace) Squares, Sankhu has long been considered one of the most important cultural sites in the Kathmandu Valley.

When the earthquakes struck Nepal in April and May 2015, Sankhu suffered some of the worst devastation in the Kathmandu Valley. More than 90% of the homes and buildings were partially or completely destroyed and 115 people lost their lives. Beyond the pure

Fig 1. The remnants of Newari architecture, especially the carved wood windows, lie in the ruins of Sankhu. Photo Credit: The Himalayan Times

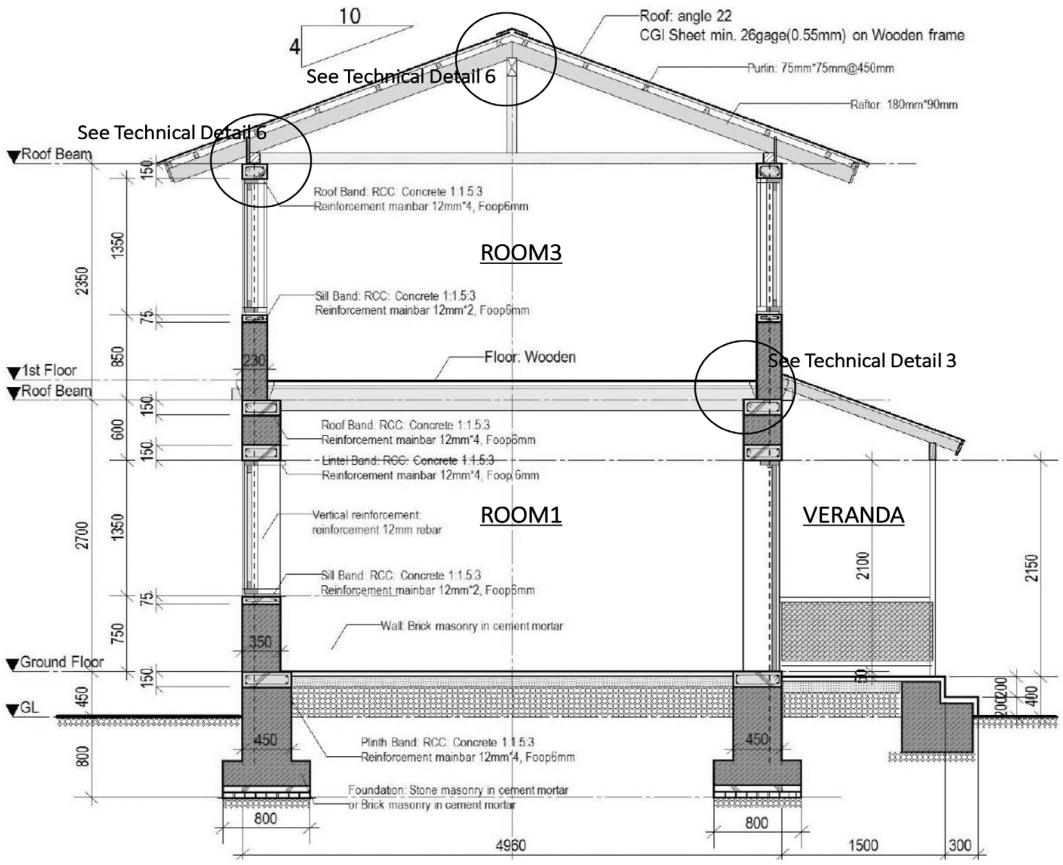


Fig 2. Government plans for reconstructed houses include a number of design and engineering elements to improve seismic resistance, such as reinforced concrete and concrete banding (top, from Government of Nepal Design Catalogue). However, these styles of houses are quite different in form from the traditional houses that have historically been built in Sankhu (bottom, Photo Credit: Franziska Porges Hosken, Loeb Library Special Collections).

devastation to lives and homes, many of the cultural elements that made Sankhu distinct lay in ruins. With more than 4,000 people living in temporary structures cobbled together from tarps, tin, wood, and other found materials, reconstruction is necessary to restore normal life and a sense of safety and security for residents. However, as Sankhu has started to rebuild, there is emerging tension between the demands, needs, and interests of institutions and actors across scales.

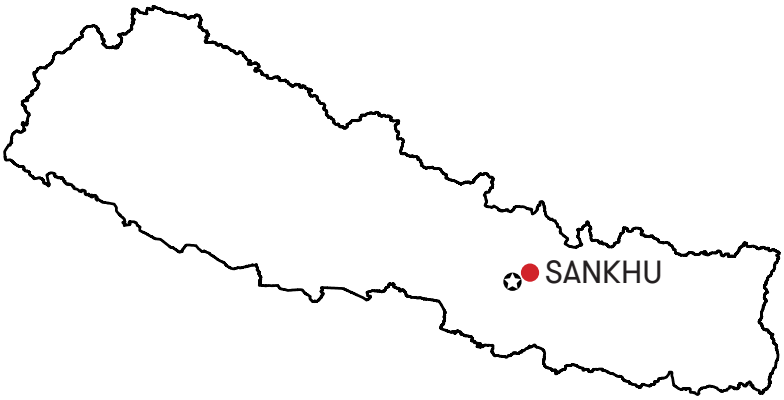
To help families whose homes have been destroyed, the National Reconstruction Authority (NRA) is providing three lakh (300,000) rupees (~$3,000 USD) for home construction (which covers much, but not all, of the cost of a new home which runs between $4,000 and $8,000 USD). As part of this national reconstruction strategy, the Government of Nepal has adopted a "Build Back Better" methodology that aims to integrate earthquake resistant and resilient elements into reconstructed housing and infrastructure. The NRA has released seventeen approved housing designs that include key features to increase the ability of structures to withstand future seismic activity. These measures include simple things such as ensuring the use of tie-stones or bricks at corners to more complex additions such as reinforced concrete pillars or bands. In order to ensure compliance with the approved designs, the housing reconstruction grants are released in three tranches. The release of each tranche is tied an approved inspection of construction quality and seismic resistant features that is conducted by local Department of Urban Development and Building Construction officials.

However, for many homeowners in Sankhu, and elsewhere, the release of these designs and the associated housing grants has come too slowly. It was more than a year after the earthquake before improved housing designs were released, and more than a year and a half before the housing grants started to flow to affected households. In the meantime, families who were able to access resources, either through their own savings or via loans from friends or relatives, began to rebuild. While small in number, some families in Sankhu have already finished rebuilding their homes. Similar unaligned regulations are taking place throughout Nepal. However, individually managed processes, taking place without access to government housing designs and lacking oversight from government inspectors, are resulting in houses that do not include seismic resistant features. As a result, even though homes are being completed in a timely manner—allowing families to return to normal life—they are not likely to meet the government standards and will not qualify for the housing reconstruction grants, making financial recovery difficult at the local scale.

At the same time, community leaders are aiming to restore the important cultural character of Sankhu, hoping not only to reconnect to the past, but to also capture part of the important tourist market as a development opportunity for the community. In order to do this, they are preparing plans for a community planning and reconstruction effort that would restore cultural sites and rebuild the community using traditional Newari architecture. The community has prepared materials to support fundraising efforts to support this process; however, as this effort sits apart from the standard processes set forth by the NRA, which most large donors such as USAID, DFID, and the INGOs are committed to supporting, little money has been raised.

However, in the few homes that have been rebuilt, the individual preparations of homeowners, and within the plans released by the government, there is an emerging preference for what are perceived as stronger materials, especially reinforced concrete. People throughout Nepal worry that traditional architecture, designed before modern engineering practices, is not seismically resistant. The visible strength of reinforced concrete has proven appealing to many, even though the resulting buildings are a departure in form and function from classic Nepali style. This preference, is not grounded in material reality. Traditional building styles, which incorporate wood banding and flexible mud mortar have the capacity to be as earthquake resistant as concrete. Large stone temples in Patan Durbar Square made entirely of stone attest to this. In Sankhu and other Newari settlements, building failure was not inherent in traditional design, but stemmed from a failure to maintain key structural elements, including letting wood and mortar dry out. This made the buildings more brittle and prone to failure.

In Sankhu, and in communities throughout Nepal, different ideas and preferences for the future of the community arise from individuals, community leaders, the government, and national experts. These differences can lead to conflict between national priorities, community plans, and individual actions. How these conflicts are mediated and resolved will affect the reconstruction and development of Sankhu, with the results being reflected in generic rebuild formulas.



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Case

Cagayan de Oro, Philippines

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Cagayan de Oro, home to nearly 700,000 people, is a first-class city on the northern coast of Mindanao, the largest island in southern Philippines. The capital of Misamis Oriental province, the city is home to trading markets, local and national industry, and corporate offices of many multi-national corporations including Del Monte, Nestle, and Philip Morris Tobacco. As a regional seat of both Spanish and American colonial governments, the area has seen significant strife, but after Philippines Independence in 1946 and the declaration of Cagayan de Oro as a chartered city in 1950, growth and development in the city have placed it at the center of valuable trade and transportation routes linked to the rest of the highly-populated Mindanao and nearby islands.

The name Cagayan de Oro means River of Gold. Cagayan, meaning 'river', comes from a proto-filipino language that pre-dated colonialism, while the "de Oro" ('of Gold') was appended by the Spanish. A large river in the center of the valley where the city sits fed rich, fertile floodplains, and the delta created the conditions to develop a port accessing nearby islands and international trade routes. However, that same river has also been the source of chronic flooding, with annual monsoon and typhoon rains causing the river to overflow its banks, inundating nearby settlements.

On December 16, 2011, Tropical Storm Washi, locally known as Sendong, made landfall in Northern Mindanao. In Cagayan de Oro, heavy rainfall overnight swelled the main Cagayan de Oro River to more than ten times its normal size. Used to regular rain and habitual flooding, many residents had chosen to stay in their homes, ignoring evacuation instructions. With waters rising in the early morning hours, many people were caught unaware and were swept up in the floods. In Cagayan de Oro alone, nearly 900 people were killed by the floods. 40% of the city's population, some 228,000 people were displaced as more than 5,800 homes were destroyed and another 12,500 damaged. 86% of the affected households were informal settlers residing on

Fig 1. This resettlement site in Calaanan includes houses, public space, and connections to infrastructure. Photo Credit: Unilab Foundation

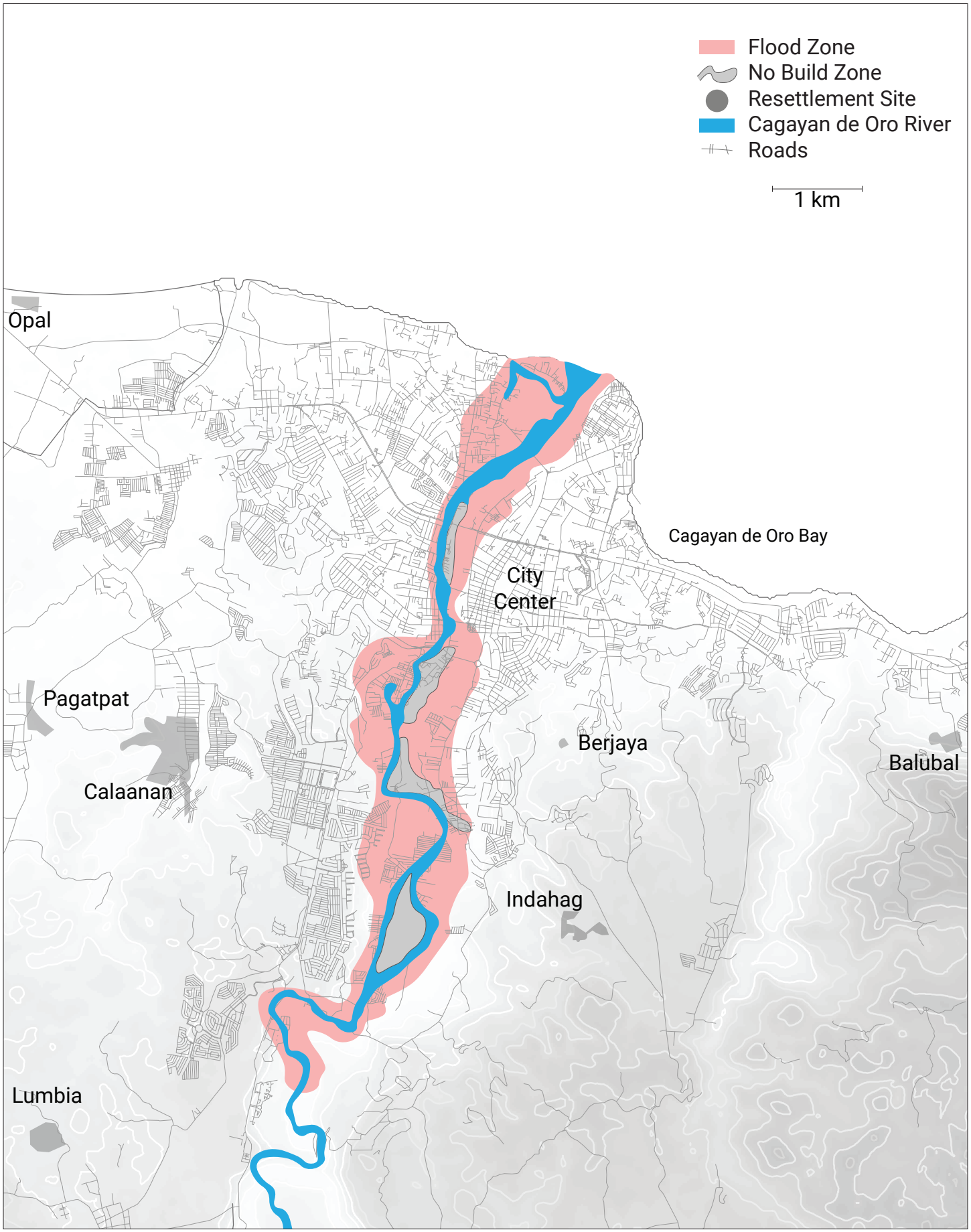

Fig 2. Map of Cagayan de Oro, Philippines showing the extent of the flood damage from Tropical Storm Washi in 2011, the No Build Zones that existed prior to Washi, and the location of resettlement sites throughout the city.

public land with no land tenure, and many of these homes were built within a pre-existing 3-meter easement that restricted development along riverbanks. For the local government and many of these residents, the small, chronic risks associated with informal land had been tenable, but the scale of damage wrought by Washi began to dramatically change perceptions in ways that facilitated considerations of retreat and resettlement.

Informal settlements along the Cagayan de Oro River had been targeted as a high-risk and priority area for resettlement by a 2006-2008 vulnerability assessment and a 2011-2016 Master Development Plan. Many residents, though, who had invested money and time in building homes and establishing businesses were initially resistant to moving. At the same time, the local government was slow to start resettlement and relocation efforts. Following Washi, resettlement efforts were imbued with a new sense of urgency. In January 2012, a plan was announced to permanently resettle more than 8,500 households in safer locations within one year. Construction began quickly and the first batch of houses was completed and transferred to beneficiaries in April, 2012. In order to ensure that people would stay in these new settlements, heads of households were compelled to sign a waiver giving up rights to any land or housing along the river. A feasibility study and master plan outlining the long-term scope of the project was released in June, 2012. Throughout Cagayan de Oro, this plan called for 25 different housing projects at 7 different locations.

Resettlement was initially managed by a local inter-agency committee which was chaired by the Mayor of Cagayan de Oro and the National Housing Authority. This committee was responsible for decision making and the coordination of local and national government, humanitarian, and private sector resources. By August 2012, this responsibility was transferred to a more permanent Shelter and Housing Multi-Sectoral Task Force. The Task Force set out broad guidelines and minimum design standards for resettlement, and implementation was carried out in partnership with local agencies and committees.

Most new homes were constructed using conventional masonry with metal roofing; however some sites utilized prefabricated materials. The construction of new settlements was supplemented by a number of flood-risk mitigation actions. Structural elements including retaining walls, gates and drainage outlets, and road and bridge improvements were constructed along the 12km stretch of the river that runs through the city; while the establishment of riparian and mangrove forests improved ecosystem capacity for flood mitigation. These physical and environmental measures were accompanied by institutional efforts including hazard mapping, land-use regulation planning, and information and education campaigns. New resettlement locations were located between 5 km and 20 km from the city center. Upon first moving in, many residents experienced some problems with the new settlements. Water and other infrastructure did not reach all settlements at the time of initial occupancy, although connections were added over time, and transportation was an issue for some people working in the city center.

Almost exactly one year after Washi, on December 7, 2012, while recovery was still underway, Super Typhoon Bopha (locally known as Pablo), the strongest cyclone to ever make landfall on Mindanao, passed through Cagayan de Oro. Throughout the Philippines, 1,067 people lost their lives. But in Cagayan de Oro, only one person was killed. Throughout the city, a number of people had already been moved out of high-risk areas, thus reducing the overall exposure to the storm. At the same time, with memories of Washi still fresh, most residents heeded evacuation orders, thus leaving very few people in areas that were impacted by floods or landslides.

In response to Bopha, resettlement efforts, including the master plan, were revised and accelerated. With back-to-back incidences of severe storms, local residents are increasingly willing to work with government authorities in resettlement efforts. By July 2014, 7,952 homes out of a planned total of 11,225 had been constructed throughout Cagayan de Oro. 6,421 were occupied with new residents moving in as more services were connected. In July 2015, the Housing Development Multi-Sectoral Task Force initiated plans to acquire 700 hectares of land and resettle an additional 35,000 households.

In Cagayan de Oro, resettlement planning has worked to move tens of thousands of people out of chronic high-risk zones. Exceptional damage from back-to-back storms helped instill a sense of urgency and willingness to move among local residents, while government efforts to quickly mobilize local and national resources helped ensure that new settlements could be built in time to capitalize on these public attitudes. In this way, Cagayan de Oro has been able to effect a large-scale retreat away from high-risk lands in order to improve the overall resilience of communities and the city.

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