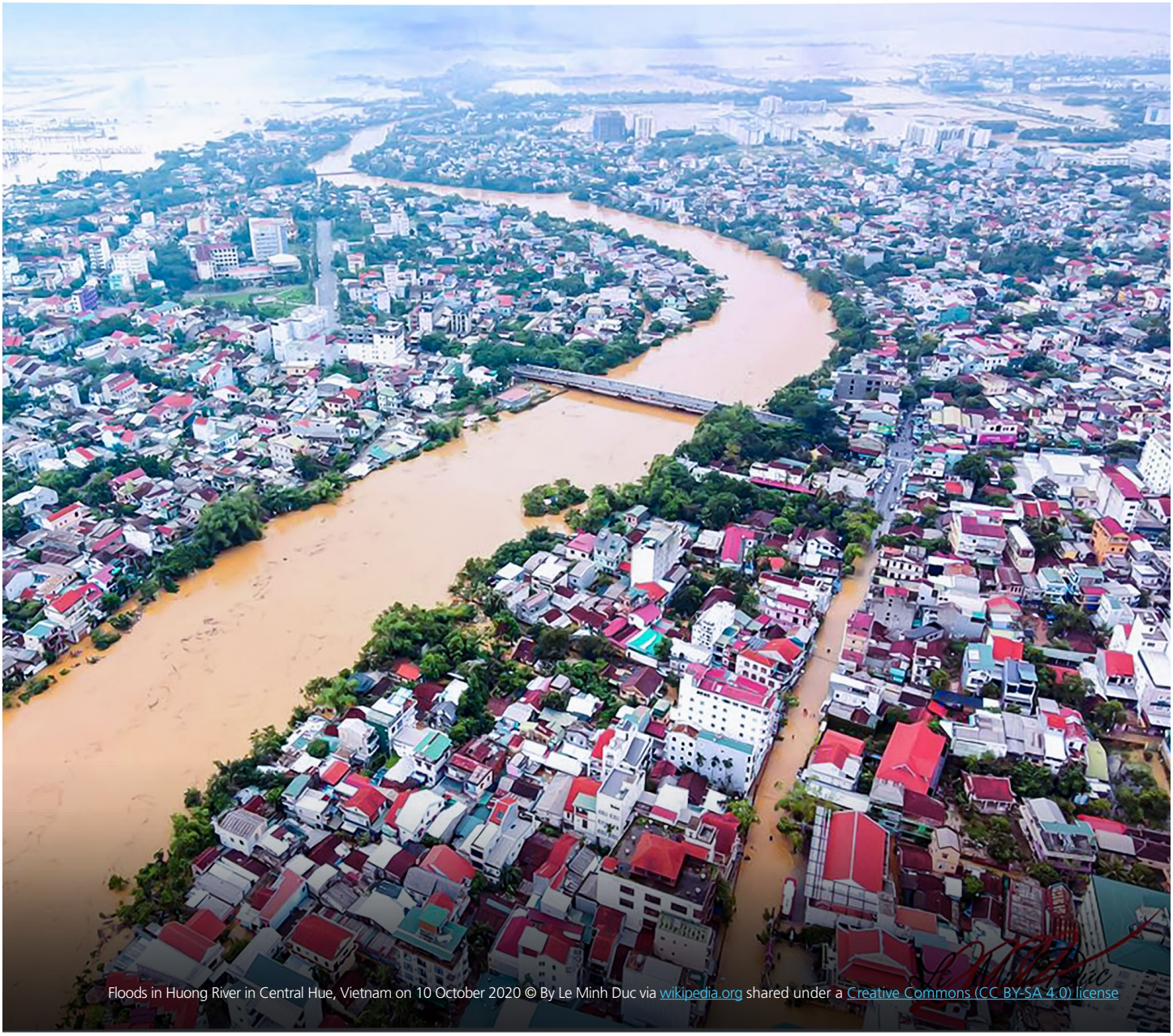
December 2024

New disaster patterns, new resilience needs

Lessons from the 2020 Floods in Central Vietnam



Floods in Huong River in Central Hue, Vietnam on 10 October 2020 © By Le Minh Duc via wikipedia.org shared under a Creative Commons (CC BY-SA 4.0) license

The Post Event Review Capability (PERC) methodology developed by Zurich Insurance Company Ltd., in collaboration with the Institute for Social and Environmental Transition-International (ISET-International or ISET) in 2013, provides a structured method for examining why a hazard becomes a disaster. PERC has been utilized to examine more than 20 cyclones, floods, and wildfires in different contexts around the world.

This report has been developed by ISET-International, a member of the Zurich Climate Resilience Alliance. The study focuses on a highly unusual 40-day period in October and November 2020 when Central Vietnam was impacted by heavy monsoon rainfall and a series of nine tropical depressions and storms. The associated flooding — a series of events with little time to regroup and prepare between them — taxed the country's Disaster Risk Management (DRM) system and highlighted resilience gaps in new and different ways. This report, based on discussions with households, community officials, and city and provincial government, and complemented by secondary source materials relating to this series of events and other historic events in the region, provides insights into four key resilience challenges illuminated by the flooding and practical recommendations for addressing those challenges.

An electronic copy of this brief and other materials from the study are available at: www.i-s-e-t.org/perc-vietnam-2020

Additional information about the PERC can be found at zcralliance.org/perc and additional information about climate resilience can be found at zcralliance.org and https://www.zurich.com/sustainability/planet/adapting-to-climate-change/tackling-climate-resilience

---

ACKNOWLEDGEMENTS

Authors: Vu Canh Toan, Karen MacClune

PERC team contributors:
ISET-International: Karen MacClune, Vu Canh Toan
Quy Nhon: Nguyen Van Nhung, Department of Natural Resources and Environment and Climate Change Coordination Office
Alliance Reviewers: Rachel Norton, ISET-International; Michael Szoenyi, Z Zurich Foundation
Layout: Thanh Ngo, ISET-International

Thanks to those who took the time to meet with us and to provide their insights; to those who provided feedback and reviewed drafts of the reports; and to those who helped us to refine our thoughts. This study would not have been possible without their input.

Back cover: 2023 flood in Phuoc Son commune, Binh Dinh Province © Do Minh Hung, Xuan Phuong village staff

Powered by: ZURICH Foundation

Table of Contents

Executive Summary

The 2020 Central Vietnam floods were the result of a highly unusual pattern of events. Nine tropical systems over a period of five weeks led to rapid and repeat flooding in areas of Central Vietnam; a type and frequency of flooding that communities were unaccustomed to. In some of the worst impacted communities, however, impacts weren't just because of the storm events; flood impacts were made worse because of poor planning and development, weak local Disaster Risk Management (DRM) preparedness and response, delayed or incomprehensible early warnings, or because of legal restrictions placed on communities that prevented them from taking autonomous action.

The impacts of the 2020 Central Vietnam floods are indicative of the broader DRM and development landscape; consequently, the lessons learned from select communities and one city that are identified in this report will be broadly applicable to much of the country. And learn we must. It is likely that events like the 2020 floods will happen more often in the future — as air and sea surface temperatures increase, the potential for increased intertropical convergence and tropical storm activity and intensity also increase (Seneviratne et al, 2021; Knutson et al., 2015). Consequently, these types of events are indicative of what Vietnam and many coastal regions globally can and should expect in the future. Learning from these events today can inform how we prepare for the disasters of tomorrow, which is where this post-event review comes in.

Our report shows that there is a clear need for improved flood risk awareness, preparedness, and risk reduction. Efforts to improve, however, should occur simultaneously across scales. The current government assumption is that community capacity to respond and limit flood impacts is based on flood risk awareness and financial flexibility; the reality, however, is more nuanced. Drawing on interviews with people from households to provincial government levels, complemented with secondary source information for this event in particular and other historic events in this region, this report finds that to build resilience and reduce losses and damages in Vietnam, we need to more deeply explore and more fully understand the factors affecting community resilience and vulnerability, both within the confines of the community and outside its boundaries.

This report examines how urbanization and suspended development increase community flood risk and vulnerability, how weak capacity and

financing undermine the full potential of local DRM planning, and how gaps in Early Warning System (EWS) messaging and dissemination are perpetuating avoidable losses and damages. We found that communities are doing what they can to reduce their risk with the resources and capacity they have, but they are being heavily impacted by development happening outside their community boundaries. As a result, they have only limited ability to effect the larger, more lasting changes needed.

Based on our findings, we have developed concrete recommendations for action, coupled with a description of the benefits that could be unlocked by implementing these recommendations. Within these recommendations, we have focused in particular on prospective and corrective risk reduction[1], on building human capacity and resourcefulness, and on building redundancy into societal systems. This is intentional – strengthening these characteristics and focus areas builds resilience, and with resilience comes an ability to address both known and expected shocks or stresses as well as to respond flexibly and successfully to unexpected and/or unanticipated shocks and stresses.

Unanticipated and uncertain events are, increasingly, what we need to expect in our future. With a now continuously changing climate causing both more frequent and intense events as well as events and impacts unseen in the historical record, communities in Vietnam, and around the world, need to be ready. We hope that this report will inform those preparations and that the insights and lessons highlighted here are merely the initial steps towards further building flood resilience in Vietnam.

Dap Da Bridge under the water in Hue City, October 10, 2020 © By Le Minh Duc via wikipedia.org shared under a Creative Commons (CC BY-SA 4.0) license

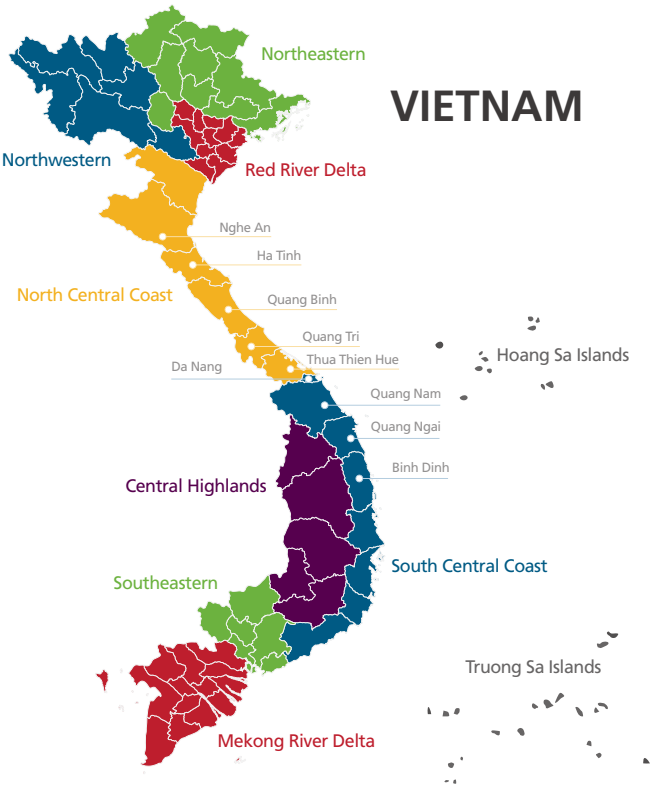
1 Disaster Risk Management (DRM) is a concept that refers to activities that can be taken to reduce and manage risk in different phases of a disaster. DRM consists of five different steps: preparedness, response, recovery, prospective risk reduction, and corrective risk reduction. Prospective risk reduction refers to actions taken to avoid creating risk, such as identifying and avoiding construction in the floodplain, or developing building codes designed to address known hazards and then strongly enforcing those codes. Providing timely and actionable early warning is also prospective risk reduction. Corrective risk reduction refers to actions taken to reduce risk to already at-risk assets, such as building levees, dikes, and seawalls. At the household or property scale, corrective risk reduction includes things like elevating structures, building rain gardens to capture and slow surface flooding, or weatherproofing homes so they remain cooler during heatwaves.

SECTION I
THE 2020 FLOODS

FIGURE 1

Vietnam provinces and regions

Provincial names are provided for provinces impacted during the 2020 floods



In the five-week period between 5 October and 16 November 2020, toward the end of the Vietnam monsoon season, a series of nine tropical systems made landfall in Central Vietnam bringing with them high winds and record-setting rainfall. The result was severe, widespread, repeated flooding along the entire length of the Central Vietnam coast – nearly 2,500 linear kilometers. Floods heavily damaged infrastructure, including highways, schools, health facilities, and community centers. Over 360 schools were flooded or destroyed, over two million cattle and poultry were killed, and 30,000 hectares of agricultural land were devastated. Distribution of aid was slowed due to damage to the transportation system; more than 165 kilometers of national highway, 801 kilometers of local roads, and three major bridges were severely damaged (Vietnam Disaster Management Authority (VNDMA)[2]).

Loss of electricity, in part due to the collapse or breaking of electrical poles in high winds, restricted communications in many impacted areas. Total losses were estimated around VND 30,000 billion (USD 1.3 billion).

2 The Vietnam Disaster Management Authority was renamed in early 2023 to Vietnam Dike Management and Disaster Management Department (VDDMA). The name of the Agency at the time of the flooding is used in this report.

While several of the storms would have been catastrophes on their own, the series of storms amplified the impacts of any one storm alone. Between 5 and 20 October, at the beginning of the five-week period, VNDMA reported that many areas in central Vietnam recorded a total rainfall of more than 2,400 mm; in some locations, flood waters exceeded the previous historical highs recorded in 1983 and 1999. By 20 November, nine of the 13 north-central and south-central coast provinces (see labeled provinces in Figure 1) were significantly impacted by repeat flooding and landslides (see Figure 2 and Box 1). The final storm in the series, Cyclone Vamco, made landfall on 15 November as a Category 1 storm with wind speeds of up to 100 km/h. Between 15 and 16 November, Vamco brought heavy rains, strong winds, and storm surge to those same areas already bearing the impact of earlier storms and floods.

BOX 1. THE 2020 CENTRAL VIETNAM FLOODS VS. THE 1999 PREVIOUS FLOODS OF RECORD

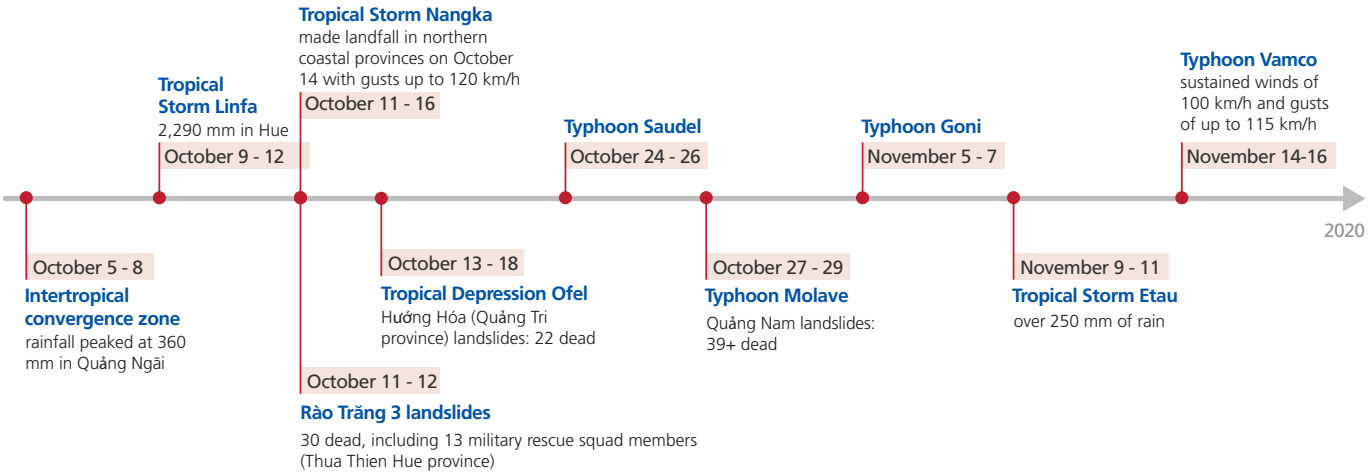
In 1999, Central Vietnam experienced one of the worst flooding events seen in a century (OCHA, 1999; BTGTU, 2019). A series of storms between 19 October and 6 November brought heavy rains. Tropical Storm Eve on 19 October and rainfall from 1-6 November caused two separate floods which together resulted in 793 deaths or missing people and left 55,000 homeless. Hundreds of thousands more had their homes seriously damaged and lost their livelihoods, and in all, 1.7 million people were affected out of the ~8 million inhabitants of the central provinces.

The 2020 Central Vietnam floods and landslides, though arguably more severe than the 1999 floods, resulted in fewer deaths and fewer lost homes. However, economic losses were greater due to increased buildup of assets over the intervening two decades. In 2020, 243 people were reported dead or missing, many in landslides and some in attempts to rescue landslide victims. In all, 31,637 homes were destroyed or required people to relocate, and of the nearly eight million people exposed to the storms, about 1.5 million people were directly affected (IFRC, 2020). In some locations, particularly Thua Thien Hue, Quang Binh, and Quang Tri provinces, flood waters in 2020 exceeded the highs recorded in 1999.

A study conducted by the World Weather Attribution Initiative (Luu et al., 2021) found that the 2020 flooding was not attributable to climate change. This may be because they only analyzed the October 6-26 period and they averaged events in that period over a large geography; Vietnamese experts have noted that rainfall over the heaviest 2-week period exceeded 2,400mm in some locations, far in excess of the average annual rainfall. Indeed, the 2020 flooding was the first time Vietnam issued a category IV disaster alert for heavy rainfall; prior to 2020, category III had been the highest alert level used. The pattern of rainfall and associated repeat flooding over the approximately five-week period was also highly atypical of the historic record.

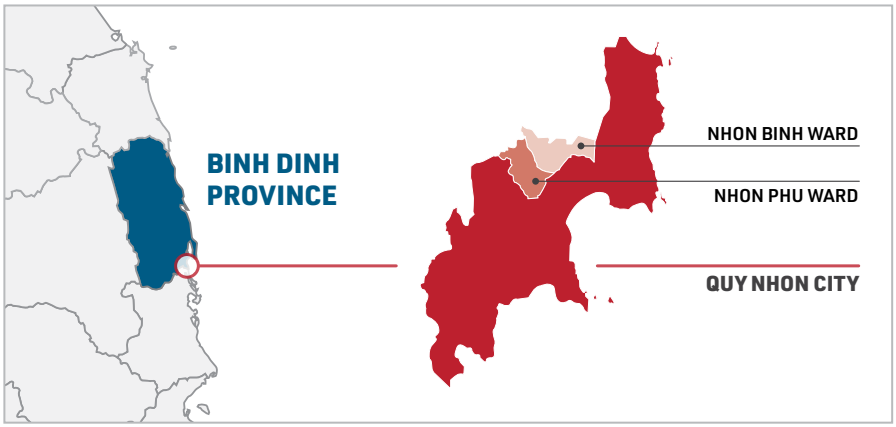
FIGURE 2

Timeline of the October-November 2020 storm events



While any one of the floods shown in Figure 2 would be valuable to study, we chose to focus this post-event review on the repeat nature of the flooding in the city of Quy Nhon in Binh Dinh Province, a location where ISET has a long history of engagement and could explore in depth how this series of events differed from previously experienced floods. To understand what happened, where preparation and response was resilient, and where there remain clear opportunities to build resilience, we talked with 21 community members and community heads. We also consulted commune level DRM staff of Nhon Phu and Nhon Binh wards in Quy Nhon city, leaders and technical staff of relevant local government agencies including the Provincial Climate Change Coordination Office, the Department of Natural Resources and Environment, the Provincial office for Disaster Risk Management, the office of Disaster Risk Management of Quy Nhon city, the Provincial Hydro-met Office, the Provincial Department of Construction and the Urban Management Division of Quy Nhon city (in charge of urban planning and urban drainage), and the Forestry Division.

There were five major rainfall events in Binh Dinh Province in 2020; three of these floods occurred in rapid succession in Quy Nhon over a period of about 20 days, revealing a new aspect



of flood risk for what are otherwise fairly flood-adapted communities. Unlike in Thua Thien Hue, where the 2020 flooding set new records, in Quy Nhon no single flood event in 2020 exceeded the flood of record (Typhoon Mirinae in 2009). Nonetheless, water depths were one to two meters in many locations, with water remaining for a few days each time. The repeat nature of the flooding resulted in impacts that were particularly problematic for affected communities and which revealed gaps in community preparedness and response.

TABLE 1
Five major rainfall events in Binh Dinh Province in 2020

Time	**Rainfall** (min-max across various locations in the province)
7-11 October, 2020	136 - 462 mm
27-28 October, 2020	88 - 301 mm
6-7 November, 2020	167 - 299 mm (in the northern part of the province)
9-11 November, 2020	136 - 594 mm
28 Nov – 1 Dec, 2020	110 - 277 mm

BOX 2. MULTI-HAZARD RESPONSE: COVID-19 AND THE 2020 FLOODS

The 2020 floods in Central Vietnam occurred nine months into the COVID-19 pandemic, well before vaccines were available and while the global community was still rapidly learning about how COVID-19 spread and how to best respond, e.g. with lock-downs, masking, etc. This influenced the severity of flood impacts and how the government responded to the floods.

First, government staff at all levels were already stretched thin. Using an aggressive strategy of detect and contain learned from experience with SARS in 2003, and implemented by a strong central government, Vietnam limited the impacts of COVID-19 in 2020 to 1,465 laboratory-confirmed cases and 35 deaths[3]. However, this strategy relied on comprehensive testing, tracing, and quarantining, implemented at local levels by local government staff. Consequently, when the 2020 floods hit, government staff were overextended.

Second, to prevent the spread of COVID-19 into the country, disaster response teams from outside Vietnam were not allowed into the country to aid in flood response efforts. Responding to a disaster event of the scale of the 2020 flooding with only domestic capacity, and with that capacity already strained by the demands of the pandemic, was an extreme challenge.

Third, the pandemic and ensuing lockdowns eroded the coping capacity of already vulnerable households. The areas most severely affected by flooding were the same provinces that experienced a second wave of COVID-19 cases in July and August 2020. In response to this wave, thirty days of lockdown measures were implemented from 28 July to 5 September, which significantly constrained the income and livelihoods of many households in the region; a region which already has poverty rates above the national average. Community leaders of zones No. 2 and No. 3 in Nhon Phu ward in Quy Nhon, for example, shared that more than half of the people in their communities have informal jobs that they were unable to carry out because of the lockdowns.

3 https://ourworldindata.org/covid-exemplar-vietnam

SECTION II

THE ENVIRONMENTAL, SOCIO-ECONOMIC, AND POLICY LANDSCAPE

The Central Vietnam Coastal Region is accustomed to living with water; the geography of the region makes it highly susceptible to flooding. Strong disaster risk management (DRM) policies and policy implementation have contributed to reducing the death toll from floods over the years; however, demographic, environmental, and socio-economic trends are increasing flood risk for communities across the region. In particular, climate change is creating new challenges in the form of different timing of floods, repeated flooding, and more extreme flooding. At the same time, development is changing the pattern of water flow and drainage, making previously safe areas unsafe or unlivable.

As flooding changes due to both development and climate change, limitations in DRM planning and policy implementation are becoming clearer and more problematic. These limitations were evident during the 2020 floods as DRM systems were pushed well beyond their capacity.

The environmental landscape

The Central Vietnam Coastal Region is a series of low-lying river deltas located between the Vietnamese Central Highlands to the west and the South China Sea to the east, making the region highly susceptible to flooding. Larger cities are located along rivers and the coast, particularly where there are harbors; small villages and communities are scattered across the floodplain alongside multiple sinuous rivers that crisscross the region. These rivers are aggrading over time, increasing the exposure of both villages and larger cities to flooding. The narrowness of the Central Vietnam coastal strip – 70 km from the mountains to the sea in some areas – combined with very steep mountain slopes, enables floodwaters to move very quickly. Heavy rains can result in downstream flooding within five or six hours, leaving very little time for action. This has been further exacerbated by deforestation in upstream areas. In particular, there has been a conversion of natural forests into production forests. The five-to-seven year cycle of production in these forests coupled with dramatic reduction in undergrowth results in faster runoff and more water flowing downstream.

Urbanization patterns in this region are also increasing flood risk. Urban development around growing cities occurs preferentially on relatively inexpensive agricultural and aquaculture land. While its lower cost makes this land attractive to developers, because it is low-lying and prone to flooding an amount of fill, often one meter or more,

2023 flood in Phuoc Son commune, Binh Dinh Province © Do Minh Hung, Xuan Phuong village staff

is mandated in the provincial master plan to create a foundation for construction. The infill protects structures built on top of it, but displaces the water that land previously conveyed or stored, creating new flood risk in surrounding areas.

Because there is a cultural preference for living near water, areas along rivers and the coast are developed first, which restricts drainage into those water bodies. The scale at which drainage is planned also contributes to how water flows in urbanizing areas. Rather than drainage being considered at the scale of the entire urbanizing area, drainage is considered per site. Consequently, there is little consideration for how water that used to flow through building sites during extreme events will now behave and how it will impact surrounding sites. The result of these development patterns is elevated transportation corridors and elevated multi-hectare construction sites that act as dams, blocking water flow.

The depth of flood waters in many communities can be anticipated by looking at new downstream construction and the depth of fill it has been built on. Roads and railways are particularly problematic. Water flow across the coastal floodplain is primarily from the mountains in the west to the sea in the east. However, major transportation corridors are primarily north to south, following the coast and connecting the Central Vietnam cities to Ho Chi Minh City in the south and Hanoi in the north. This means transportation corridors effectively act as long, linear dams. Embankments along rivers, though they can protect from lower-severity riverine flooding, when overtopped during severe events further contribute to the challenge by trapping water in the lower-lying areas they are designed to protect.

Taken together, these factors are resulting in increased flood risk, not just in urban areas but also in peri-urban and rural areas. However, the full implications of how land use is exacerbating flood risk are not widely recognized in Vietnam, and as a result efforts to integrate DRM, land use planning, and socio-economic development are still evolving.

BOX 3. HOW CLIMATE CHANGE IS CHANGING FLOODS IN VIETNAM

In the October 2018 IPCC report on the potential impacts of a 1.5C rise in global temperatures above pre-industrial averages, Vietnam was named among nine countries where at least 50 million people will be exposed to impacts of rising sea levels and more powerful storms, among other dangers.

"The most pressing threats facing Vietnam over the next couple of decades is that Vietnam is among the top countries vulnerable to climate change," said Dao Xuan Lai, head of the Climate Change and Environment Unit at the United Nations Development Programme's Vietnam office, in an interview. "There will continue to be extreme weather events as present, but coming faster than anticipated, more intense, more frequent and more difficult to predict." (Tatarski, 2018)

Vietnam's geography leaves it vulnerable to natural hazards. Most of the country's more than 3200 km of coastline is exposed to the annual tropical storms and typhoons that traverse the East Sea. The mountainous north and west are prone to landslides and flash flooding. And the Mekong Delta in the south – home to nearly 70% of the country's agriculture and aquaculture and its largest city – is among the most vulnerable regions in the world to rising sea levels.

Yet, as highlighted in this study, it is not simply the intensity of natural events that is a problem. Changes in timing, frequency, and variability are as, or more, problematic.

In 2020, the impact of rapid, back-to-back tropical storms exceeded existing coping and preparedness strategies. In 2022 and 2023, also in Central Vietnam, there were rare floods in the middle of the dry season that resulted in 100% crop loss for some rural communities.

This highlights the importance of learning from these new and unusual events, and using that learning to adapt and improve DRM, DRR, and development. As we do so, we need to keep in mind also being prepared for the unexpected. To be truly resilient, Vietnam needs to be ready not just for regular floods, or extreme floods, but also unexpected, unusual, never-before-seen floods.

The socio-economic landscape

The majority of the population of Vietnam lives on the coastal floodplain or in the Mekong Delta (in the southern part of the country). This means that 70% of the Vietnamese people live under threat of flooding. As a result, Vietnamese communities have historically been quite flood-adapted. Construction materials and construction methods, such as concrete houses with concrete or tile floors, water resistant furniture, and elevated living spaces and storage areas (where people can afford them) allow for flood waters to rise and recede with minimal damage. Provided with advance notice and mild to moderate flooding, historically households have known what to do to keep themselves and their assets safe and had the knowledge, coping skills,

relationships, and the financial resources they need to do so; only the most extreme floods would have been highly impactful.

However, this picture is rapidly changing, particularly in urban and peri-urban areas but also in many rural areas. Changes in upstream runoff, coupled with changes to drainage due to construction, are resulting in dangerously deep (half-meter plus) and sometimes quickly moving floodwaters, even in more moderate storms. Faced with changing and intensifying flood risk, the communities we spoke with, and particularly the vulnerable householders within those communities, are finding it increasingly challenging to prepare and respond effectively.

Vulnerability to disasters is exacerbated by poverty. At the same time, disaster impacts often exacerbate poverty because vulnerable households[4] are typically both more exposed and have weaker coping capacity. For example, Lan Huong et al. (2022) found that repeat disasters at a frequency of once in five years can push 30% of the households in vulnerable communities in Vietnam into extreme poverty. This is particularly concerning given the increases in both household exposure and extreme climate events in Vietnam. Flooding in urban and peri-urban areas affects the most vulnerable communities most strongly because they are the communities that both have high hazard exposure, in part because newer development around them is on fill, and low levels of adaptive capacity due to constrained socio-economic options. Female-headed households are particularly vulnerable due to entrenched patterns that tend to constrain economic opportunities even as they are more likely to also be responsible for dependents. Poor rural communities can face additional risk if ecosystem functions are damaged, as these communities are usually the most dependent on natural resources and ecosystems to maintain their livelihoods. Moreover, the erosion of ecosystem services from development and climate change impacts – though difficult to quantify – changes how and at what cost communities can adapt to increasing flood risk.

The policy and institutional landscape

Vietnam has been very successful at reducing deaths from natural hazards over the past several decades. The 1999 flood in Hue resulted in hundreds dead. In the 2020 floods, which were of similar or larger scale, the number of deaths was much smaller, though property damage and impacts to livelihoods are a growing challenge. The success in reducing storm and flood deaths is due to strong DRM policies and structures that have strengthened short-term preparedness and response actions.

The foundation of the current DRM system was laid in 2007 when the National Government issued the National Strategy for Natural Disaster Prevention and Mitigation to 2020. This strategy mobilizes resources specifically for disaster prevention, response, and mitigation; the new strategy, until 2050, was endorsed in 2021. In 2008, this national DRM strategy was complemented by a policy to address climate change; the first National Target Program to Respond to Climate Change (NTP-RCC) to 2020 under Decision No. 158/2008/QD-TTG was approved in 2008 and then extended for the period 2016-2020 in 2017. A broader National Strategy on Climate Change to 2020 was approved by the national government in 2011, and in 2022 was revised and renewed for the period until 2050. Together these provide a strong foundation for DRM

4 Vietnam uses a multi-dimensional index to define vulnerable households. The index takes into account income, access to basic social services like job opportunities, medical services, education, housing, and access to clean water and sanitation.

2023 flood in Phuoc Son commune, Binh Dinh Province © Do Minh Hung, Xuan Phuong village staff

and identify the need to consider climate change adaptation (CCA) as part of DRM.

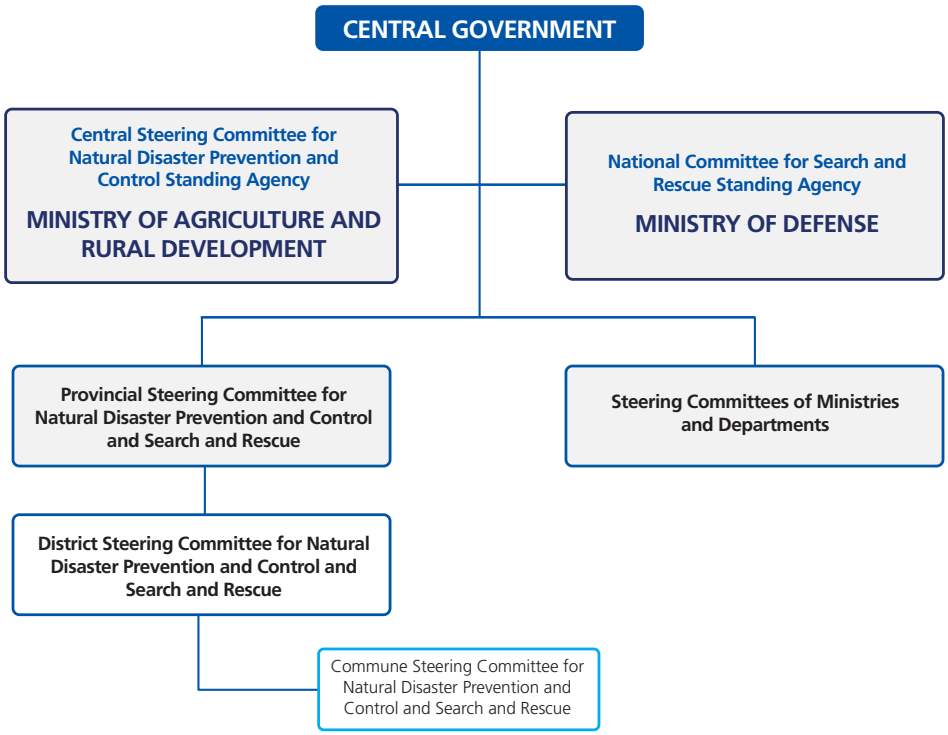
These policies show the strong commitment of the Vietnamese government towards DRM and CCA. As a result of these strategies, significant funding has been mobilized for DRM and CCA and all provinces in Vietnam have developed and implemented both DRM plans and climate change response plans/ strategies. In addition, although implemented by different agencies, both DRM and CCA policies emphasize the need to integrate disaster risk and adaptation into development policies.

The next major step forward was in 2013 when the National Assembly passed the Law on Natural Disaster Prevention and Control (LDPC). This is the first law on DRM in Vietnam and it outlines the core principles and components of the nation's DRM system. As regulated in the law, DRM activity consists of prevention, response, and remediation of the damages and consequences of disasters. The law also assigns roles and responsibilities among ministries, local authorities, domestic stakeholders, and other key actors in DRM, especially in disaster prevention and response. This was complemented, in 2020, by the National Adaptation Plan (NAP) for the period 2020-2030 and vision to 2050. The NAP marked an important milestone for Vietnam in its commitment to the implementation of the Paris Agreement.

The LDPC, the National Strategy for Natural Disaster Prevention, Response, and Mitigation, the National Strategy on Climate Change, the National Adaptation Plan, and the NTP-RCC are the most important legal documents in disaster risk prevention and management in Vietnam. They describe in detail issues relating to DRM and promote the integration of DRM and CCA into plans at national, sectoral, and provincial levels. The result of this policy and legal structure is an operational and administrative system with clear tasks and operational regulations.

FIGURE 3

Overview of the hierarchy of DRM organization in Vietnam



The hierarchical structure includes four levels (national, provincial, district and commune levels) as shown in Figure 3.

The challenge for Vietnam, then, lies not in DRM structures and the policy landscape, but in the ability to implement these structures and policies. There is good capacity to do so at the national level, more constrained capacity at the provincial level, and weaker capacity at the district level. At the commune/ward level[5] DRM is particularly challenging; there are no full-time staff addressing DRM issues, there is limited capacity and knowledge in dealing with extreme events and uncertainty, and there is not yet a specific legal requirement for district- and commune-level governments to address CCA.

At the provincial and national level, DRM and CCA are often addressed separately from spatial and development planning and economic planning; this means new development often builds in new risk and is not adapted for the expected impacts of climate change. And, though provincial to commune level governments are supposed to conduct risk assessments as part of DRM planning, this is not happening due to lack of tools, resources, and capacity. As a result, there is little to no clear understanding of current risk, let alone how the risk landscape is changing over time. Where it can be clearly seen that risk is increasing, there is often poor or no understanding of why. This makes it both difficult to anticipate how risk might continue to

5 Communes and wards are the smallest unit of governance in Vietnam. Communes are in rural settings; wards are in urban settings. Communes and wards both consist of 2-20 individual communities and up to 50,000 people.

change, and equally difficult to see entry points for reducing risk.

It is in this environment that communes are required to develop annual DRM plans. Commune DRM Committees are chaired by the Chairman or Vice-chairman of the commune People's Committee and include multiple actors and representatives including the Red Cross, Women's Union, Fatherland Front, Youth Union, police, local military force, and staff of the people's committee office in charge of different sectors. The commune-level Peoples' Committee prepares a DRM plan for the commune both annually and on a five-year planning cycle. In practice, the plan is mainly prepared by one or two people before being circulated to other members of the committee for consultation and sign-off. Key informants we spoke with noted that over time, the quality of commune-level DRM plans has improved, but they remain limited. A review of DRM plans for several communes impacted by the 2020 flooding indicates the plans focus primarily on short-term preparedness (i.e., food storage and other tangible preparedness activities) and response actions. DRM actions typically focus on preparedness, for example what equipment will be needed and the division of responsibility when a flood happens. These plans are developed using a business-as-usual approach with no or only limited consideration of unexpected situations, such as the series of consecutive floods that happened in 2020 (or the unusual dry season floods that occurred in 2022 and 2023). Corrective risk reduction, prospective risk reduction, and long-term recovery actions are rarely addressed.

Commune-level DRM committees are expected to review experiences and lessons from previous floods. However, these reviews are often superficial with no real updates incorporated into plans. Indeed, the annual plans we looked at tend to have significant sections that are just copied and pasted from previous plans. More importantly, there is no comprehensive analysis of the main causes of damages. National guidelines outline how Vietnam provinces, cities, districts, wards, and communes are expected to develop local DRM plans, including an expectation that detailed risk, vulnerability, and capacity assessments related to natural hazards will be conducted as part of DRM plan development. However, this requirement was not met despite the challenges posed by a substantially new type of flooding in 2020. A review of the 2021 DRM plans for both Quy Nhon city and some of the wards that were most affected during the 2020 floods showed no comprehensive analysis or specific lessons drawn from the 2020 flood experience.

According to local DRM staff, this was because of lack of capacity, personnel, and financial resources. For example, there is often only one part-time staff working on DRM at the commune level and this person oversees many other sectors such as economy, land use management, agriculture, and construction. In addition, staff often lack proper training[6] related to DRM and have very limited understanding and knowledge about climate change adaptation. Budget availability and flexibility is reduced with each step down in governance from the national to the commune/ward level. Interviews with several commune level officers revealed that there is no clear budget dedicated to DRM activities in their communes. Funding is made available when disasters happen, but even then, the local government can mobilize only VND 30 to 60 million (USD 1200 to 2400) from the contingency budget. Given that a commune may consist of 10 to 20 communities and a total of up to 50,000 people, this funding is quite small.

6 E.g. a university degree or similar technical training

2023 flood in Phuoc Son commune, Binh Dinh Province © Do Minh Hung, Xuan Phuong village staff

SECTION III

WHAT HAPPENED

Exposure and DRR

Following the 2020 floods, community residents told us that it took flood waters longer to recede than in previous floods. Residents located on the coastal floodplain several tens of kilometers inland from the coast accurately attributed this to downstream urbanization which effectively blocked the water from draining. Over the past 10 years, there has been substantial urbanization downstream in areas that were previously aquaculture ponds and rice fields. In particular, new roads that run perpendicular to the predominantly west-to-east water flow have been constructed; these roads are built on fill with only small, elevated areas or culverts allowing for drainage. As a result, in larger flood events they act as dams, as has been documented both empirically and via modeling studies (DiGregorio and Huynh, 2012).

Figure 4 shows the impacts of development on drainage (Quy Nhon in 2010 on the left, and Quy Nhon in 2020 on the right). The yellow circles show the areas of new development; these areas were prepared with 2-3 meters of fill prior to being developed. Previously these areas experienced overland flow and served as floodwater storage; the fill is disrupting this functionality. This was a key reason for increased flooding in communities inland of this development during the 2020 floods.

Previous reports and case studies have documented the impact of urban development on flood risk (DiGregorio and Huynh, 2012; Tyler et al., 2016; Tyler, 2017). Yet, as the 2020 floods demonstrate, urban planning and development practices in Quy Nhon are still not sufficiently addressing flood risk and drainage requirements. The result is that new construction, often but not solely on the periphery of the city, frequently increases the damage from flooding in nearby areas. This increases costs for local government, businesses, and residents, and reduces the resilience and sustainability of the city.

Destruction of natural drainage further exacerbates this issue. Despite regulations to the contrary, natural drainage networks, flood channels, and natural flood retention areas are often filled by both authorized, official provincial development projects and unauthorized activity. For instance, we observed that part of Phu Hoa lake – an important retention lake in Quy Nhon that helps regulate flood water from the Ha Thanh river – has been legally encroached upon and filled in the nine years between 2011 and 2020 to allow for development around the edge of the lake (Figure 5). This increases the risk of flooding in

FIGURE 4

Urban development in the downstream of Ha Thanh River in 2010 (left) and the situation in 2020 (right)

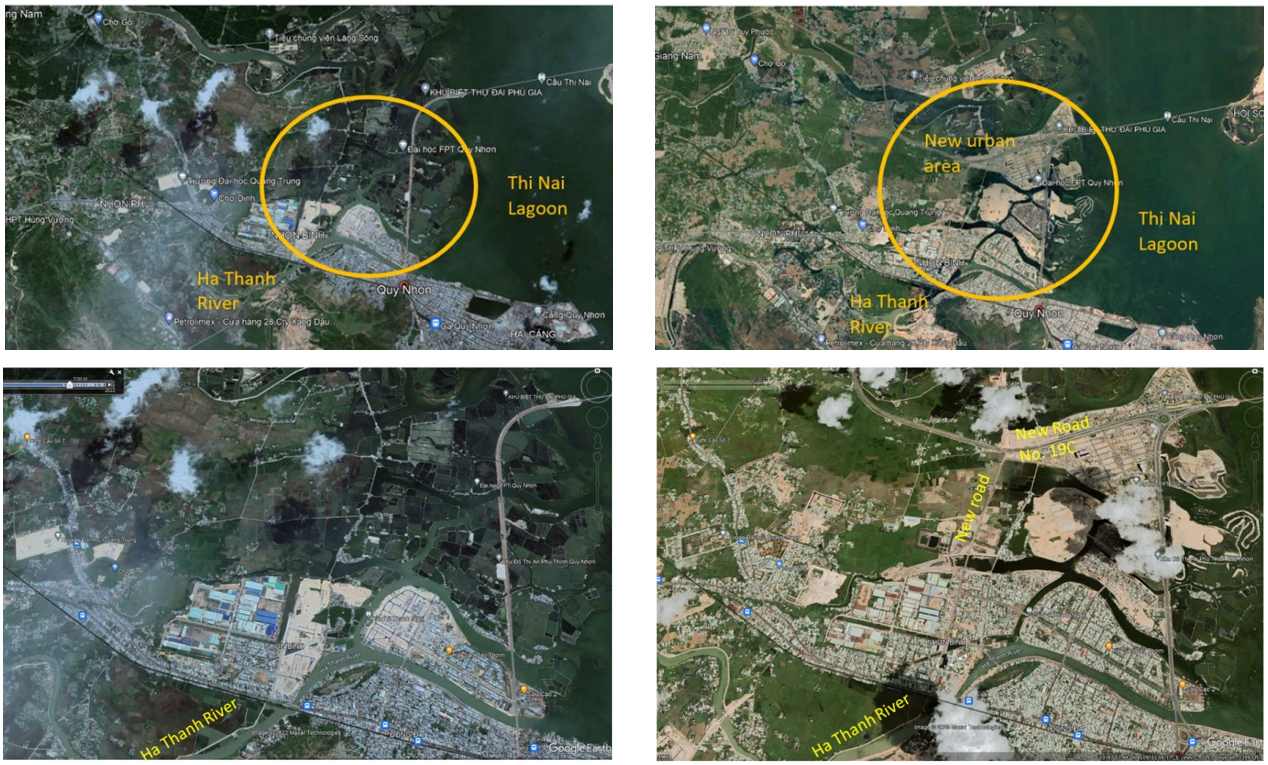


FIGURE 5

Phu Hoa retention lake in 2011 (left) and in 2020 (right)

Source: Background images captured from Google Earth

FIGURE 6

Flood water levels in the 2009 and 2020 floods in some households in Nhon Phu ward

other parts of the city during extreme events, as water which the lake used to retain no longer has anywhere to go except to neighboring, built-up areas.

Exposed householders directly felt these impacts of development during the 2020 floods. For example, the community leader of Area 3 of Nhon Phu ward and a resident of Nhon Phu for more than 60 years (since he was a child) – noted that in the last 10 years, including during the 2020 floods, flood water has discharged much more slowly (three to six hours) than before (often less than 3 hours). He said that recently a series of urban projects have filled in low-lying areas in the lower Ha Thanh River for construction. In addition, a series of roads – including Hung Vuong, an extension of Dien Bien Phu, and National route 19 – have been built that block the water flow. He believes this is one of the main reasons for increasing flood risk in Nhon Phu.

Other stakeholders in Quy Nhon such as the ward level DRM officer and Quy Nhon city DRM officer shared similar observations about the impact of urbanization on flooding in Nhon Phu ward. As a result of this development and its associated blockage of rainfall runoff, though the rainfall associated with the 2020 floods was lower than that of the historic 2009 flood, flood water depths were similar. This is illustrated in Figure 6, which shows the

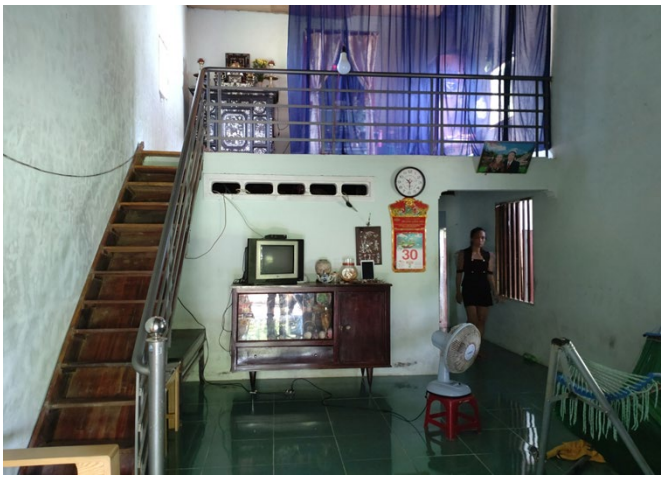
TABLE 2

Measured rainfall at Van Canh and Quy Nhon meteorological stations associated with peak flooding in 2009 and 2020

	November 3-4, 2009	October 9-10, 2020
Van Canh met station	842mm	610mm
Quy Nhon met station	368mm	174mm

FIGURE 7

Households (household 1 left and top right; household 2 bottom right) that have had to raise the floor multiple times since 2009 to deal with flooding.



very similar water levels in Nhon Phu households in 2009 and 2020, despite rainfall levels in 2020 that were substantially lower than in 2009 (Table 2).

In response to rising flood water levels, individual householders with the means report having elevated their homes, often multiple times since 2009. Increasingly, as even this becomes insufficient, they are resorting to building small lofts (Figure 7, top-right) that can be used as household emergency shelters for people and key assets during extreme floods. Unfortunately, elevating floors, building lofts, and/or evacuating during flood events are among the only activities households and flood prone communities can take, given that the cause of their intensifying flooding is occurring beyond their boundaries. Long-term solutions to the worsening flood risk must be implemented by the provincial government via planning and land use decisions.

An additional complication that emerged during the 2020 floods was the impacts of suspended

FIGURE 8

Housing conditions in area no. 2 in Nhon Phu ward, where households are prevented from upgrading due to suspended development. Note that both homes are single story and not elevated at all, as opposed to the homes shown in Figure 7 which have elevated repeatedly in response to increasing flood depths.

development on the actions people could take to mitigate their flood risk. A number of urban development projects in Nhon Phu ward have been approved in the last 10 to 15 years. While some have been completed or are under construction, many others have been on hold for nearly a decade. However, because these communities are earmarked for development, they are prohibited from building new houses or upgrading their existing homes to protect themselves from rising floodwaters. For example, the whole Area no. 2 of Nhon Phu ward was designated for the development of Go Tu new residential project more than 10 years ago. Normally, households living in new development areas are relocated to other areas and are compensated to move. However, the Go Tu development has stalled, for unknown reasons. As a result, community members have not been bought out by the government and they continue to reside in their homes, yet cannot take actions to protect themselves.

Communities Area no. 2 of Nhon Phu ward, with its suspended development project, defies demographic vulnerability assumptions; the suspended development effectively represents a 'hidden' vulnerability. Area no. 2 in Nhon Phu ward, which is frequently affected by flooding, highlights this issue. In the 2020 floods, flood water levels reached 1-2 meters in many areas of the community and community residents and local authorities reported that flooding in the community is becoming more severe. There are about 315 households and 1100 people in Area no. 2, and the average monthly household income is around VND 2 million (or 90 USD). This is sufficient money that, were they allowed to, many households would have elevated their homes, added a second story, or otherwise mitigated their risk. However, unable to take action, the percentage of single-story, temporary and poor-quality houses in this community is very high, around 80%[7] (Figure 8). From a DRR perspective, where financial resources are often considered as one of the most important factors in community capacity to respond to flood risk, this is a key finding that undercuts these assumptions.

7 According to the community leader

STORY BOX

Mr. Vo Van Kheo has lived in Area no. 2 of Nhon Phu ward since he was young. He has experienced many big floods in the community in the past, including the floods in 2009, 2013, and 2020. During the 2020 flood event, flood water levels in his home – a single story dwelling that has not been elevated – reached 1.2m.

Mr. Vo and his family live in an area that has been slated for redevelopment, but that development has been suspended for over a decade. They have requested permission to upgrade their house multiple times without success. With no knowledge as to when the planned development will start, and unable to upgrade their house to reduce their flood risk, they are left to live in constant fear of floods.

Recently, Mr. Vo did receive permission from the ward-level government to build a very small garret in which he and his family members can shelter when it floods. However, it is too small to store valuable assets and food, so though the family can protect themselves, each flood threatens to further erode their household well-being.

Top photo: Water depth in Mr. Vo's house during the 2020 floods
Bottom photo: The small garret in Mr. Vo's house

Wooden boards and iron shelves are prepared for use to elevate belongings when floodwaters enter a house in Nhon Phu ward © Tuan Nguyen, CCCO Binh Dinh

Preparedness

The communities and households we spoke with for this study indicated that during the first flood of the series that hit in October and November 2020 in Quy Nhon, they were well prepared. However, they were taken by surprise for the second and third floods and were consequently unprepared for those floods. The government advises that residents of flood-prone communities store enough food and water to last them seven days, but in 2020, as is typical, many households stored only three to four days worth of food. As a result, and with only a few days between flood events, community members lacked the time and awareness of the need to restock and re-prepare between events. Community members reflected that under-stocking initially and then being unable to restock resulted in greater impacts than they typically experience during floods.

This is indicative of a broader pattern occurring across Vietnamese communities; there is a lack of redundancy in current household preparedness practices. Sundries like rice and noodles are good for a long time, yet the households we spoke with typically only have a few days' worth of food on hand. With flood water levels attaining depths of 1 to 1.5 meters, and many homes with no second floor, people's ability to cook may be compromised. Yet, people do not always stock sufficient food that can be prepared without cooking. In addition, there is little consideration for how community members will communicate or receive communications if the power is out for several days; interviewees indicated that once mobile phone and radio batteries are drained, there is typically no way for people to send or receive communications.

Early warning

For the 2020 floods, we found that when the communities we talked with had a clear sense of possible flood impacts (e.g. in terms of water depth and duration) and received information in a timely manner, they were well positioned to act, and there is strong social support for preparedness and evacuation. However, many community members that we talked to for this study shared that during the 2020 floods they did not understand the warnings

they received; messages were too complicated and used technical hydrometeorological jargon.

For instance, an urgent flood warning message at 17h30 on November 10, 2020 provided only information about water levels at Dieu Tri and Van Canh stations in Ha Thanh river, predicting the water level in the next six hours and indicating that those water levels would be above the warning level III. This warning message gave community members no sense of what to expect in terms of flood water depth in their community, possible impact, most affected areas, and what they should do to prepare to avoid negative impacts. As a result, many community members were reluctant to take action when they received information about the first flood event in 2020, and were taken by surprise when subsequent floods arrived days later. One staff member of the provincial Steering Committee for Disaster Risk Prevention and Control (SC-DPC) admitted that the warning messages are compiled for the use of government agencies, but not the average person.

Warnings also were not timely. For the 2020 floods, flood early warning information was communicated hierarchically — from the provincial to the city level via fax, and then to the district level and commune/ward level via Idesk software[8]. From there, information was delivered to communities in each commune/ward via a loudspeaker system. This way of communication is quite time-consuming; our analysis indicated it took between two to four hours for information to reach local communities. In Nhon Phu ward, the ward leaders received the warning only about two hours before floodwaters arrived.

Moreover, even when the commune/ward level SC-DPC receives the information, the delivery of this information to local people can still be disrupted or delayed. The 2020 floods in Nhon Binh and Nhon Phu wards clearly highlighted these limitations. In Nhon Phu, nearly 50% of the community's loudspeaker systems and portable loudspeakers were unavailable due to a lack of maintenance/funding to maintain or replace them, which hindered the delivery of warnings to local people. Even when the loudspeakers were working, a number of local households shared that they received the warning late or not at all either because they live far from the community loudspeaker, they were hard of hearing and could not hear the announcement very well, or because they were outside the community for work and learned about warnings only once they were back home.

EWS was even more problematic for the second and subsequent flood events in 2020 because the electricity system failed or was turned off by the government to avoid water damage to equipment. This led to the disruption of communication channels such as public loudspeakers and mobile phones. The households and local DRM members in Vietnam we talked to have mobile phones, but most of them do not have portable power banks; so, though in theory mobile phones can be used as a backup for obtaining information, in the 2020 flooding mobile phones went dead after a few days leaving people with limited information about hazard conditions. This lack of redundancy in communication capacity of both the local DRM task force[9] members and households is a significant barrier to allowing households and communities to effectively prepare and respond.

At the provincial level, though forecasts have improved, forecasting challenges remain that

8 Software used to support government units to send and receive digital documents.

9 A group of six to eight community volunteers for each village or commune/ward area.

affect the province's ability to develop and quickly disseminate the type of clear warning information needed. The rainfall, flood level, and flow monitoring systems needed to support early warning are limited (BD-PPC 2020b). In particular, hydro-meteorological monitoring stations are managed and operated by many different agencies, so data are housed in many different places. The province does not have the tools or software they need to collect, synthesize, combine and process that data and information in a systematic way to ensure quality warning information (BD-PPC 2017, 2020b). These gaps have been filled in a few provinces, but typically with international technical support and funding.

Evacuation

Even when people receive early warnings, they sometimes fail to act. For example, we talked to people who received warnings, but the forecasts were unclear and they underestimated potential flood water depths and duration and so chose to remain in their homes. Once flood waters are rising it is often too late to evacuate, leaving households to find ways to keep themselves safe until floodwaters recede or help can reach them. In 2020, though the local government told people to evacuate based on the severity of the flood forecasts, and communities reported receiving warnings from the local government to evacuate before the floods, very few people did so. People did not think the flooding would be high enough to be a problem and they preferred to remain at home to protect their properties. However, because floodwaters were deeper than communities expected, many people became trapped in their homes.

An added complication was the lack of equipment of the community DRM task force. Especially in areas with deep water and strong currents, such as areas no. 4 and no. 2 of Nhon Phu ward, with the equipment they had the community DRM task force could not get in to assist households. However, even if equipment had been available, and even though one of the main tasks of the DRM task force is to mobilize when flood or storm events happen and to help vulnerable people evacuate before and during events, some DRM task force members reported that they were not ready to go out because they did not want to take the risk. DRM staff also indicated there is no formal plan specifying, for example, who needs to evacuate, to where they should evacuate, and how much lead time is needed to safely evacuate. In many communes/ wards we spoke with, there is a functional plan, but typically only because the leader of the task force or the community leader knows who is vulnerable, knows what actions need to be taken, and knows how to do this with the time available. These actions are typically not written down, so institutional knowledge is not passed on when these leaders step down; this can leave significant gaps in capacity.

While there were both formally designated places for people to evacuate to – schools, local hospitals, flood shelters (in some areas) – and informal places like family members with higher houses or a second floor, in 2020 many households only evacuated when they were in trouble, at which point the government needed to come in and assist. In addition, by the time people did decide to evacuate, they found there was no longer space in shelters or the evacuation locations were too far away. This left people effectively fending for themselves. For instance, in area no. 4 of Nhon Phu, people stayed in their homes as long as possible and then evacuated to the railway tracks. This put them on elevated ground, safe from floodwaters, but without shelter.

One of the consequences of failing to evacuate was sanitation problems. In the 2020 floods, people stayed in homes that were deeply flooded to the extent that toilets no longer worked; often, they

were without sanitation facilities for several weeks. This results in significant impacts to households and to the environment. Though the 2020 flooding in Quy Nhon did not result in disease outbreak because of contaminated floodwaters, if flood depth, duration, and extent continue to increase as they have been, the potential for disease outbreak will also rise.

Impact assessments

Post-flood, communes are required to collect and report (to district, city, and provincial level) flood related losses and damages, and to collect this data beginning at the community level. However, people we spoke with and secondary research indicated that data collection is neither systematic nor comprehensive, and is not recorded nor stored in ways that allow it to be used to assess risk over time. Currently, most commune-level loss and damage data is managed manually, is classified by commune/ward but not by community so there is a significant loss of granular information, and data is not disaggregated to track important information on the vulnerability of specific groups by gender, age, and social group. This represents a significant DRM and resilience gap; the ability to learn from current events to address future events more effectively is a key resilience characteristic.

BOX 4. VIETNAMESE FLOOD ADAPTATION

The Vietnamese people have been adapting to floods for centuries. Traditional, autonomous practices have included building homes on raised foundations or stilts, building temporary flood shelters, adapting cropping calendars, and developing sophisticated aquatic agriculture practices. These have been accompanied by institutional mechanisms and coordination for planning and response, and by individual and community risk awareness and preventative action.

With modernization and development, these traditional practices have been complemented by the construction of large-scale dykes, sea walls, and other water control and flood protection infrastructure. More recently, the "Đổi Mới" (Renewal) period post-1986 led to increased local government involvement in flood management, which enabled more community-based adaptation initiatives. And following the 1999 floods and other major floods since, the government has made major investments in both infrastructure and adaptation strategies.

However, there is now growing recognition that climate change is resulting in an increase in the frequency, intensity, and unpredictability of extreme floods, challenging the effectiveness of current practices, particularly hard infrastructure solutions that are often designed based on fixed protection standards. This is leading to new thinking and strategies such as the *Living with flood* strategy for the Mekong Delta, a government policy that recognizes flooding as a natural part of the region's ecosystem and encourages flood-tolerant lifestyles and adaptation at the property level; the *Four on the Spot* mechanism for disaster response where from the commune level up there are a designated commander, human resources, means and materials, and logistics to enable rapid local action; and increased interest in disaster resilience, including new practices such as nature based solutions to complement hard infrastructure measures.

SECTION IV

KEY INSIGHTS AND RECOMMENDATIONS

Vietnam is no stranger to water. The country has historically been quite flood adapted (see Box 4) and DRM policies and institutional structures created over the past several decades have been effective in reducing deaths. Yet even with this level of preparedness and adaptation, the repeat nature of the 2020 floods highlighted that there are lessons that can be learned even in the most flood adapted of places. As the impacts of climate change intensify – changing rainfall patterns and altering the types of floods that people are used to – learning from today's unexpected floods will be critical for building resilience to future climate hazard events.

The novel nature of the serious, but not extreme, repeat floods in 2020 revealed several key challenges and insights related to reducing flood risk. Here, we explore four of these challenges and provide concrete recommendations for addressing them. If implemented, these recommendations would benefit flood prone communities, Binh Dinh province, and the nation.

1. Problematic development is increasing flood risk

Across Vietnam, existing and new development is being built with very limited consideration for drainage at the city-scale. Because construction and particularly north-south roads are built on fill and typically only address drainage on-site, many new construction areas end up functioning as dams, preventing floodwater runoff and resulting in deep, extended flooding. This was also true in the 2009 Typhoon Mirinae flooding in Quy Nhon (the local flood of record), yet problematic development continues and has accelerated. Poor urbanization is an important factor contributing to the creation of new risks and the exacerbation of existing flood risks, yet improving urban development planning has never been considered as a solution in Disaster/Flood Risk Reduction.

Recommendations

- Conduct flood risk assessments before making decisions on major urban development plans and projects and identify and implement appropriate corrective and prospective actions to avoid or minimize the assessed impact those developments will have on flooding conditions and risks in the city. Ensure these risk assessments look beyond

the boundaries of just the proposed development and include an evaluation of how the project will affect nearby and upstream areas.

- Develop and run a comprehensive flood model at the city/river basin scale taking into account current and future rainfall conditions, existing and future urban development, land use, and infrastructure construction. Use model results to revise the existing urban development master plans and existing major urban development projects in the downstream area of Ha Thanh River, and to identify and protect river channels, floodways, surface water drainage systems, and flood retention areas so that these cannot be filled and developed in the future. Update and use this model into the future as a decision-making tool to support flood risk-informed urban planning.
- Provide technical support and capacity building to key stakeholders such as the provincial Department of Construction, city Urban Management Division, and DRM agencies and staff from the provincial to commune level to ensure there is a shared understanding of resilient, integrated, and flood-risk informed urban planning concepts, standards, and tools. Couple this with an expectation or mandate for planners, builders, and other urban development stakeholders to look for and clearly identify the potential negative impacts of urban development in new projects and recognize and reward stakeholders that come forward with potential solutions to those challenges.
- Develop local policies and land use plans to preserve and support the recovery and restoration of flood protection ecosystems in the city and surrounding areas and ensure these are implemented in coordinated fashion by the multiple agencies involved.
- Promote the application of blue and green infrastructure to support urban flooding risk reduction by learning from Vietnamese and global examples, experimenting locally with solutions, and studying and documenting the economic and risk reduction benefits.
- Monitor how flood risk in and flood resilience of the city changes over time, especially during extreme flood events, and update plans for flood protection and urban development as more experience and flood risk data becomes available.
- Integrate DRM and CCA planning with development and economic planning at the provincial and national levels. As long as DRM and CCA are addressed separately, and following development and economic planning, a system that allows for and often even incentivizes building new risk will remain in place, along with associated escalating disaster impacts and costs.

Expected results

- Existing drainage features are preserved;
- City-scale drainage considerations are incorporated into new development, including through the use of blue and green infrastructure;
- Space for water is preserved or re-established, including through the use of blue and green infrastructure;
- The flood risk of the city is reduced.

These results would limit city flood risk to the existing level of risk, rather than also building in new risk or exacerbating existing risk. It would also provide the structure needed to develop approaches to reducing existing infrastructure-caused risk.

The up-front cost of this work will be significantly less expensive than paying for flood response and recovery repeatedly into the future and will put the city on a more solid development trajectory.

2. Suspended development is increasing household flood risk and flood damages

In peri-urban and urban contexts in Vietnam, when households are affected by increasingly deep flooding, owners who can afford to elevate their homes. It is only the households who cannot afford to upgrade that remain vulnerable and grow more vulnerable over time. Consequently, it is broadly assumed that if households are financially stable, they will manage their flood risk.

In conducting this study we learned, however, that this is not true for communities identified for urban development projects. Under the Vietnamese system, when an area is slated for development, it automatically puts a hold on any other development in that area. The government will not allow residents to upgrade their homes because it would change the estimated buy-out costs for the land and dwellings. In cases where buy-outs come quickly, this is a minor issue. However, if development becomes delayed, residents are trapped; they have neither been bought out, nor can they make needed upgrades to protect themselves. This puts even relatively well-off households in a position of growing risk. Unable to upgrade their homes, but also unable to move, residents are trapped in conditions that erode their resilience. In areas where development remains suspended for years, this can be economically crippling for individual households and communities as a whole.

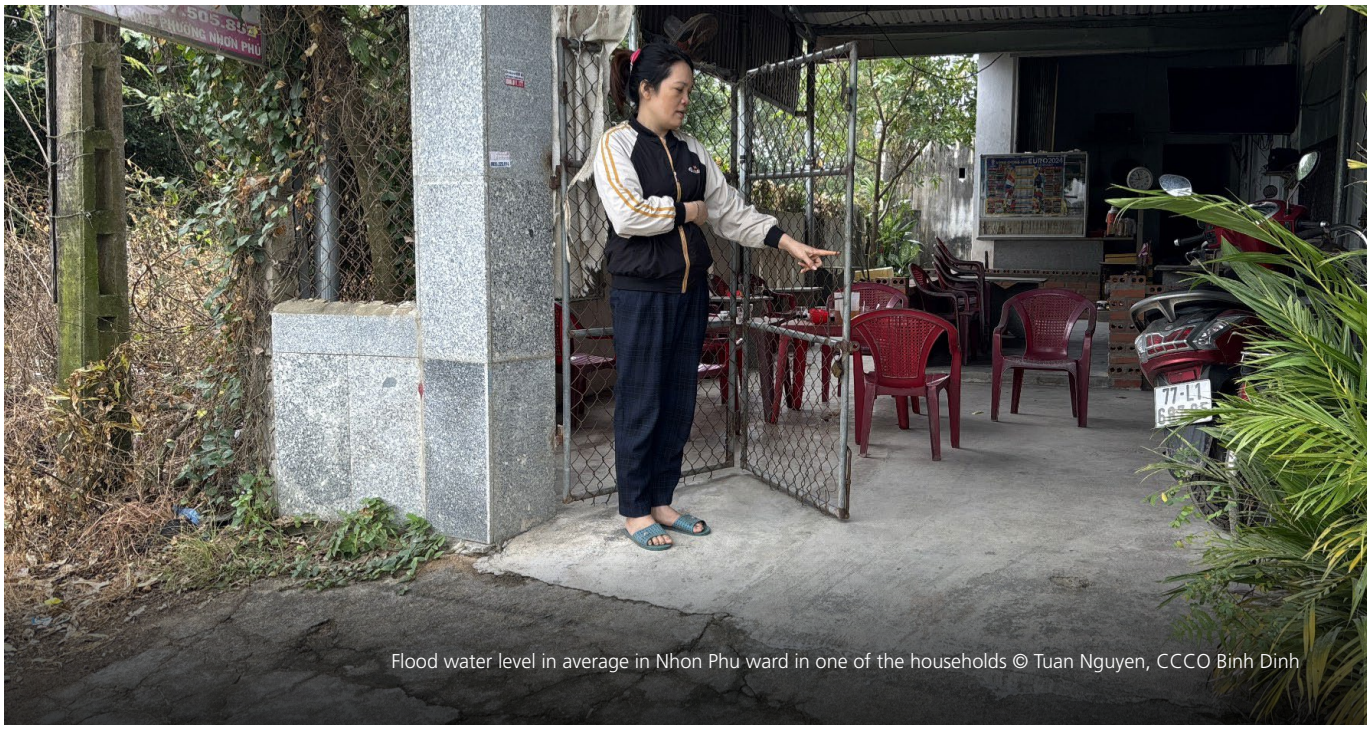
There are multiple reasons for suspended development that are beyond the scope of this analysis to address. There are also multiple reasons why highly flood-prone lands are being redeveloped; these reasons and challenges are discussed elsewhere in this document. Here, we explore the challenges posed to individual households and their communities by suspended development and provide concrete recommendations.

Recommendations

- Regularly assess how suspended development is influencing community flood exposure and risk.
- Provide immediate, targeted support to improve resilience and reduce losses to people and communities in areas where exposure to or risk of flooding is increasing due to suspended development projects. Examples could include building a community flood shelter, providing emergency equipment and food, and ensuring end-to-end, effective flood early warnings. Flood damages, if any, should be compensated appropriately.
- Review all suspended development plans in the city to identify the causes of the delay and take actions to either start project implementation, minimize the impacts of the suspension, or cancel projects that have reached an impasse.

Expected results

- Affected households and communities are moved to safe resettlement areas or receive appropriate support from the local government so that their flood exposure and vulnerability is reduced.
- Households and communities have greater ability to address increasing risk, thereby improving their financial security and strengthening their coping capacity.
- Urban development plans are improved and adverse impacts on local communities are minimized.



Flood water level in average in Nhon Phu ward in one of the households © Tuan Nguyen, CCCO Binh Dinh

3. Commune-level DRM is weak at both household and DRM committee levels

Though Vietnamese households and commune-level DRM committees are well aware of storm and flood risk and take action when necessary, there is significant room for further improvement.

At the household level, Vietnamese households prepare for floods, but typically only to the minimum they consider necessary. As a result, if floodwaters are deeper than expected, remain longer, or floods arrive in rapid succession, household preparations can quickly be exhausted. Simple solutions such as stocking more than just a few days of food, stocking food that can be prepared without cooking, and having backup plans for communications should the power go out for several days could dramatically improve household flood resilience. In addition, as flooding becomes more unpredictable and severe, households may want to reconsider evacuation as a flood response. Decisions to shelter in place can become life-threatening if floodwater depth exceeds forecasts and evacuation becomes impossible.

At the commune-level, DRM committee members, and especially members of the community DRM task force[10] that we spoke with, indicated that they do not receive enough training in DRM planning, specific DRM skills and knowledge such as for climate change, and in conducting vulnerability and risk assessments. Coupled with the reality that there are few DRM staff and DRM staff often lack adequate DRM training, the structure for DRM planning at the commune-level is very weak. As a result, the mandatory annual and five-year commune DRM plans are in need of improvement. DRM plans

10 A group of six to eight community volunteers for each village or commune/ward area.

primarily outline short term action immediately before, during, and after hazard events; they do not take a longer-term perspective of what could be done to reduce risk and address the root causes of vulnerability. This gap is exacerbated by a lack of staff and the absence of a mandate to implement climate change adaptation, and further exacerbated by the disconnection between DRM planning and social-economic development planning.

In addition, the commune level government has very limited financial resources for regular DRM activities. The available budget often falls under the 'emergency' category and therefore can only be used in times of disaster. Due to financial limitations, there is also insufficient emergency equipment such as life vests, flashlights, and raincoats at the community level. The lack of equipment and training means the commune DRM task force members often are unable to provide the support needed by their community. Further, community DRM task force members work on a volunteer basis or with only a very small stipend and do not have insurance in case something happens to them. This disincentivizes them to take action; if they try to rescue someone and are injured or killed, their family could be severely impacted. When rescues are attempted, commune and community DRM task force members lack first aid knowledge and skills.

Recommendations

Human capacity/personnel

- For community members, strengthen communication about flood preparedness, including why households need to stock at least a week of dry goods that have long shelf lives and can be prepared without cooking.
- Plan for and communicate plans for how communications will be transmitted in the event of multiple days of power loss. Such planning will need to happen both at commune and household levels.
- Adopt new policies and mechanisms for commune level government to enable:
  - Either one full-time staff working on DRM and CCA or several part time staff working on DRM and CCA;
  - Purchasing accident insurance for DRM committee and DRM task force members so if they are injured or killed during a disaster their families are supported;
  - Providing a better allowance for DRM committee and DRM task force members;
  - The institutionalization of knowledge.

Technical capacity

- Provide capacity building activities on a regular basis for commune level DRM committee members and staff on DRM and disaster resilience planning. Capacity should be built specifically around how to conduct risk and vulnerability assessments and how to use that information to strengthen DRM plans.
- The commune and community level DRM task force should invest in evacuation planning. This should include documenting who will need evacuation support under what conditions, where they will be evacuated to, and how much lead time is needed to accomplish evacuation safely.
- Provide DRM task force members with regular first aid training and support them in running practice drills for water rescue and household storm preparedness and strengthening.
- Provide community leaders with better tools to support learning and record lessons from previous floods, and support them to use the resulting data in community planning and management.

2023 flood in Phuoc Son commune, Binh Dinh Province © Do Minh Hung, Xuan Phuong village staff

Financial capacity

Allocate regular funding for DRM to commune level government so that they can:

- Acquire sufficient basic DRM/emergency equipment such as boats, life vests, torches, raincoats, portable loudspeakers, first aid kits, etc.;
- Organize regular awareness raising and capacity building activities for local communities and DRM personnel;
- Financially support commune-level DRM committee members to conduct vulnerability and risk assessments to inform the annual and five-year DRM plans.

Expected results

- Strengthening the support and training provided to commune and village level DRM committees and task forces will increase their ability to perform successfully during emergency and unexpected situations, preventing many situations from becoming disasters or from escalating and requiring responses from higher levels.
- Increasing the knowledge and planning capacity of committee members will allow them to develop better plans that incorporate broader thinking about pre- and post-event risk reduction.
- Stronger plans, coupled with action by households and communities to reduce their risk, will save assets and reduce impacts.

4. Flood early warning needs simpler, actionable messaging, increased redundancy and rapidity of dissemination, and increased community capacity to respond

Over the past several decades, Vietnam has paid increasing attention to flood and storm early warning systems (EWS). In recent years, forecasting technology has strengthened and the government has established clear processes and mechanisms for dissemination of flood and storm forecasts. However, though forecasts for tropical storms are quite accurate, timely, and actionable, the dissemination of flood forecasts is slow, and messages are overly technical and fail to convey possible impacts. As a result, households do not take timely and appropriate action, which leads to higher response and recovery costs for both households and the government.

At the community level, flood forecasts and early warning messages are too complicated for lay people to understand because they are disseminated primarily as precipitation amounts and/or water levels in rivers. As a result, people may receive warnings, but there is a gap in understanding how those messages translate to impacts to specific areas or communities, what actions to take, and how long there is to act. Instructions about what people should do to prepare for and respond to different levels of warnings are limited. Additionally, because the dissemination of forecasts is slow compared to the speed with which floods manifest in this part of Vietnam, there is little time to act. There are also no or poor backup systems for disseminating early warnings in case of power shortages; if the power goes out, communities are at risk of receiving no further warnings.

External to the community, there is a lack of redundancy in the system. EWS communication is carried out mainly via fax (to city level) and Idesk software[11], and data is housed in different places and managed by different agencies. This dispersed system both slows dissemination during events and also makes it difficult to do post-event assessments to inform future improvements. There is also a lack of effective tools/software to support collecting, synthesizing, combining, and processing data and information in a systematic way, which both weakens flood impact forecasting and the ability to assess and strengthen the system over time.

Recommendations

- Develop clearer, simpler, and actionable content for early flood warning messages so that local communities can easily understand and act on warnings. Early flood warning messages need to contain not only information about potential flood conditions but also about what impacts to expect and recommendations on specific actions that communities should take corresponding to different levels of warning.
- Raise awareness and build capacity of local communities on emergency response, early warning, and flood risk management, particularly for new/emergent hazards (e.g. repeat flooding, severe flooding, heatwaves, disease outbreaks following floods, etc.). Specific attention should be given to disadvantaged groups such as the elderly and households living far from public loudspeakers and in highly exposed areas.
- Increase the redundancy of the early warning and communication systems both at the commune and household levels. Specifically, in addition to

11 Software used to support government units to send and receive digital documents.

existing official communication channels[12], the local government should use new communication channels such as direct SMS messages to mobile phones, Facebook, and Zalo (a software similar to WhatsApp). These communication channels will help local people receive flood early warning information more quickly. Having multiple channels also makes it more likely that at least one channel will work if others fail. In addition, it is highly recommended that the local government, government DRM staff, and communities be equipped with a mobile power generator for the public loudspeaker systems and with power banks for personal mobile phones so that communication is not disrupted in case of power failures during floods.

- Improve, maintain, or upgrade communication equipment to support early warning at the community level. Community radio via loudspeaker systems and portable loudspeakers are often used to disseminate early warning information. However, many vulnerable communities do not have or do not have enough loudspeaker systems and portable loudspeakers.

Expected results

- Improved redundancy and rapidity of the early warning system thanks to the use of new communication channels such as direct SMS messages to mobile phones, Facebook, and Zalo and to new/upgraded communication equipment such as loudspeakers, portable loudspeakers, and backup power options. People and households receive warnings in a timely fashion.
- Improved early flood warning messages are disseminated and received. Local communities can easily understand these messages and use them to take appropriate actions to protect themselves and assets.
- Impacts and losses caused by floods to households are reduced, thereby saving households and the government time and money.

12 We would like to clarify that, though we are recommending the development of additional message transmission options, we are not proposing changes to the existing formal early warning system regulated by the national authorities and policies. In our understanding, this system was developed with consideration of Common Alerting Protocol (CAP) principles. Some trainings on CAP have also been provided by WMO in Vietnam.

BOX 5. STRENGTHENING EWS IN QUY NHON

Recently, the province of Binh Dinh and Quy Nhon city have tried to improve the dissemination of flood early warning with support from international donors. Specifically, a system to send early flood warning messages via SMS and Zalo (a Vietnamese app like WhatsApp) has been tested. Information is sent by the provincial DRM agency to leaders and members of the Quy Nhon city and ward/commune DRM teams; Heads and Deputy Heads of villages and urban residential areas; and community level disaster First Responder groups (in pilot wards). These community members and leaders act as Weather Ambassadors; they are trained to understand the alerts and warnings and commit to transferring warning messages to other members of their communities.

EWS messages in this system are currently in the experimental stage. They are not the same messages that are sent via conventional channels, which are based on technical legal requirements, e.g. gauge levels in the river or amount of precipitation. Rather, they are more contextualized and impact focused. The goal is to experiment with dissemination pathways and also to explore better, additional methods for communicating risk.

The expectation is that this system will be refined and eventually adopted by the province and city. The list of people who receive SMS and Zalo messages will be updated annually by the city DRM office and submitted to the provincial DRM office.

2023 flood in Phuoc Son commune, Binh Dinh Province © Do Minh Hung, Xuan Phuong village staff

REFERENCES

Ban Tuyên Giáo Tỉnh Ủy (BTGTU) và Văn phòng Thường trực Ban chỉ huy Phòng chống theine tai Thừa Thiên Huế. (2019) Kỷ niệm 20 năm lũ lớn tại Thừa Thiên Huế, 1999-2019. (The Provincial Committee of Propaganda and Education and the Standing Office of the Steering Committee for Disaster Risk Management of Thua Thien Hue (2019): Commemorating the 20th anniversary of the major flood in Thua Thien Hue, 1999-2019.

DiGregorio, M. and Huynh C. V. (2012). *Living with Floods*. ISET-International, Boulder, CO, USA. https://www.i-s-e-t.org/publications-and-resources-1/living-with-floods%3A-a-grassroots-analysis-of-the-causes-and-impacts-of-typhoon-miranae

IFRC, 2020. Vietnam: Floods - Emergency appeal n° MDRVN020 Operation update n°1 (1 December 2020). https://reliefweb.int/report/viet-nam/vietnam-floods-emergency-appeal-n-mdrvn020-operation-update-n-1-1-december-2020

Knutson, T. R., Sirutis, J. J., Zhao, M., Tuleya, R. E., Bender, M., Vecchi, G. A., Villarini, G., & Chavas, D. (2015). Global Projections of Intense Tropical Cyclone Activity for the Late Twenty-First Century from Dynamical Downscaling of CMIP5/RCP4.5 Scenarios. *Journal of Climate*, 28(18), 7203-7224. https://doi.org/10.1175/JCLI-D-15-0129.1

Lan Huong TT, Van Anh DT, Dat TT, Truong DD, Tam DD (2022). *Disaster risk management system in Vietnam: progress and challenges*. Heliyon. 2022 Sep 25;8(10):e10701. doi: 10.1016/j.heliyon.2022.e10701. PMID: 36203906; PMCID: PMC9530841.

Luu, L.N., Scussolini, P., Kew, S., et al. (2021). Attribution of typhoon-induced torrential precipitation in Central Vietnam, October 2020. Climatic Change 169, 24 (2021). https://doi.org/10.1007/s10584-021-03261-3

OCHA, 1999. Viet Nam - Floods OCHA Situation Report No. 1. 7 December 1999. https://reliefweb.int/report/viet-nam/viet-nam-floods-ocha-situation-report-no-1-1

Seneviratne, S.I., X. Zhang, M. Adnan, W. Badi, C. Dereczynski, A. Di Luca, S. Ghosh, I. Iskandar, J. Kossin, S. Lewis, F. Otto, I. Pinto, M. Satoh, S.M. Vicente-Serrano, M. Wehner, and B. Zhou, 2021: Weather and Climate Extreme Events in a Changing Climate. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1513–1766, doi:10.1017/9781009157896.013.

Tatarski, M. (October 2018). *New climate change report highlights grave dangers for Vietnam*. Mongabay.

Tran, Bach X., and others (2020). *Impact of COVID-19 on Economic Well-Being and Quality of Life of the Vietnamese During the National Social Distancing*. In Frontiers in Psychology, vol. 11, p. 565153. DOI: 10.3389/fpsyg.2020.565153

Tyler, Stephen (2017). *Reducing Flood Risk in Quy Nhon City*. Policy Brief. ISET-International, Boulder, CO. https://zcralliance.org/resources/item/quy-nhon-reducing-flood-risk-in-quy-nhon-city/

Tyler, S., Tran, V.G.P., Nguyen, T.K.H., Huynh, V.T., Tran, V.D., Nghiem, P.T., Nguyen, N.H., Nguyen, T.A.N., Tran, T.N.H., Le, T.T., Tran, K.D., Nguyen, T.T., Dang, H.L. (2016). *Urban Development and Flood Risk in Vietnam: Experience in Three Cities*. Report prepared for the Rockefeller Foundation. Hanoi, Vietnam: Institute for Social and Environmental Transition-International. https://www.preventionweb.net/files/55652_isetperiurbanwpdec2016.pdf

This report presents a snapshot of what happened in Quy Nhon city during the 2020 Central Vietnam flooding. While the goal of the PERC is to present a birds-eye view of an event, it is not comprehensive – much more could be said about the 2020 floods and on the degree of resilience of Vietnam's preparation for, response to, and recovery from the series of storms, floods and landslides. What this report does provide is a review of some of the systems and actions that helped to reduce damages, while also delving into the factors that constrained people and systems' resilience. It highlights lessons learned and points towards opportunities for increasing resilience to future hazards.

This publication has been prepared by ISET-International. It has been produced solely for informational purposes and the opinions expressed herein are those of the authors. All information contained in this publication has been compiled from reliable and credible sources, but no representation is made by ISET-International as to their accuracy or completeness.

December 2024

Published by:

Institute for Social and Environmental Transition-International, Boulder, CO USA

Citation recommended:

Vu, Canh Toan and MacClune, Karen (2024). *New disaster patterns, new resilience needs: Lessons from the 2020 Floods in Central Vietnam*. Boulder, CO: ISET International and the Zurich Flood Resilience Alliance. For a downloadable PDF of this report, please visit: https://www.i-s-e-t.org/perc-vietnam-2020