

Flood risks in urban areas

More than an act of nature



The October 2022 flood event in An Dong ward, Hue City

Photo: Thua Thien Hue Steering Committee for Natural Disaster Prevention and Control

Key findings

Flood risks have been escalating in urban and peri-urban areas in Vietnam. However, flood risk management in many of these areas has not received due attention or is not effective. Until now, disaster risk management in Vietnam has mainly focused on rural areas, yet in some cases, flood resilience of urban and peri-urban communities is lower than that of rural areas.

Extreme rainfall and flooding events are increasing in frequency, becoming more abnormal and not following the patterns of the past. In the future, this tendency is expected to intensify due to the impacts of climate change. But the increased flood risk and vulnerability in urban areas is not only the result of changes in rainfall and impacts of climate change; it is also a result of many other factors, especially improper urbanization and poor land use and urban development planning. These factors are often beyond the geographical boundaries of individual communities and require interventions that go beyond the capacity of those communities and their authorities. Typical examples include the loss of natural

permeable surfaces and water retention areas due to over-concreting; the obstruction of drainage flows and reduction of room for flood water storage due to ground leveling and construction in low-lying areas; and the blocking of floodways by new infrastructure, especially traffic works. These non-climate related causes are not being thoroughly considered and addressed in flood response and urban development planning.

Context

This document is prepared based on studies conducted under and findings of the "Flood Resilience Measurement for Communities" project implemented in Thua Thien Hue, Binh Dinh, and Can Tho, Vietnam, from January 2021 through December 2024. The project is funded by the Z Zurich Foundation through the Zurich Flood Resilience Alliance¹. A key task of this project is to assess and analyze the flood resilience of interested communities over time against the Flood Resilience Measurement for Communities (FRMC) Framework. This

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framework comprises two parts: the Alliance's framework for measuring community flood resilience, and an associated toolkit which includes software to support data collection and a web platform for study setup, data synthesis, analysis. So far, ISET has conducted two studies in each of 12 communities across the three provinces mentioned above, including seven urban/peri-urban communities and five rural communities.

Issues and findings

Extreme flooding, flood risks, and capacity in urban areas

Flood risks have been escalating in urban and peri-urban areas in Vietnam, partly because extreme rainfall events are becoming more frequent and more abnormal.

People living in many areas in Nhon Phu ward, Quy Nhon City, in central Vietnam shared that in the last 10 years, the number of extreme and abnormal floods has increased. According to community members, before, floods used to happen only when there was heavy rain. In 2020, however, a major flood occurred when the area only experienced light rain. In the same year, local communities had to deal with three flood events within less than a month.

In the Mekong Delta, record water levels have increased year-on-year in recent years, driven by rising sea levels. Specifically, the tidal peak in Can Tho in 2022 reached 2.27m, higher than former record tidal peaks of 2.25m in 2019 and 2.23m in 2018, just three and four years ago. This intensification of tidal flooding will continue into the future, posing an ever-growing challenge to communities and the city.²

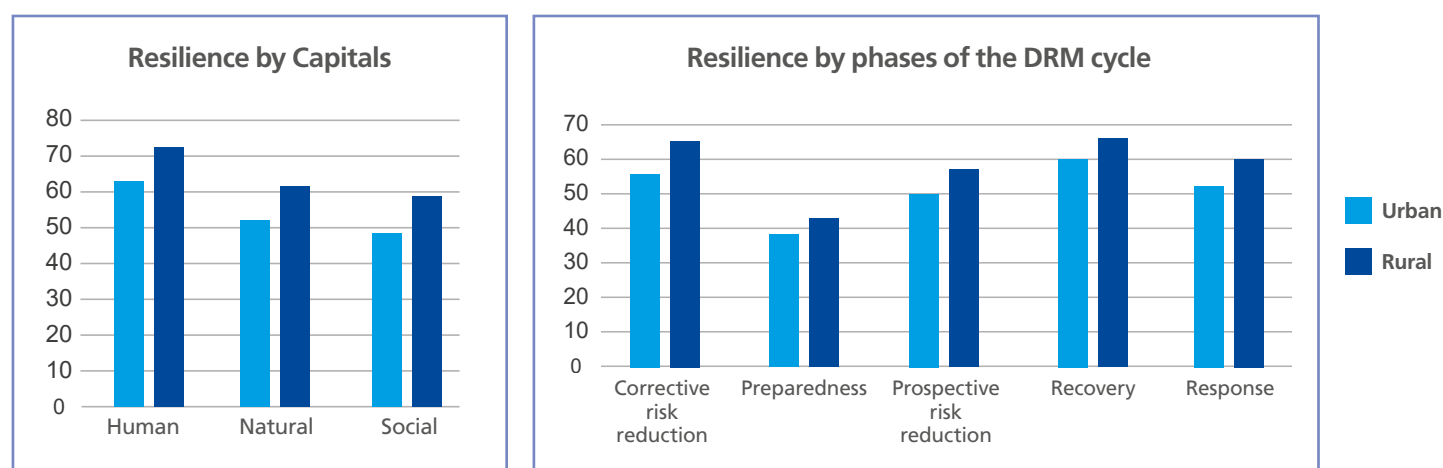
² The latest national climate change scenario report projects the South China Sea will rise by 24 to 28 cm by 2050 and by 56 to 77 cm by 2100.

Until now, disaster risk management (DRM) in Vietnam has mainly focused on rural areas; DRM, and particularly flood risk management, in urban areas has not received due attention. This is partly because rural areas are often seen as more vulnerable. However, study results from the 12 FRMC communities in Can Tho, Thua Thien Hue, and Binh Dinh revealed that rural areas perform better than urban and peri-urban areas for many indicators of flood resilience. For example, human capital (represented by capacity and skills to respond to floods such as knowledge and skills in first aid, safe evacuation, property protection, clean water and sanitation in floods, etc.), social capital (represented by a number of factors such as community and stakeholder participation, relationships and cohesion within the community and between social groups, support from social organizations, etc.) and natural capital (related to the existence and quality of natural ecosystems and the protection, restoration, and conservation of natural resources and natural habitats) in rural areas are better than in urban and peri-urban areas (Figure 1). Similarly, for the stages of the disaster risk management cycle, the resilience of urban and peri-urban communities is not as high as that of rural areas (Figure 1).

Impacts of urbanization on flood risks

According to study results in the FRMC project communities, compared with rural areas, the risk of flooding in urban areas is greatly influenced by non-natural factors such as land use and urban development planning. For example, the community of Nhi Dong quarter, An Dong ward, Hue city (area circled in red in Figure 2) has been significantly impacted by urban development projects in its surrounding areas. Specifically, three roads surrounding this area, especially Vo Nguyen Giap and To Huu roads, have been built and upgraded to a very high elevation. In addition, many nearby areas,

Figure 1 Flood resilience of urban and rural areas



Source: Compiled by the author from the results of flood resilience studies in 12 communities conducted by ISET and partners

Figure 2 Urban development and infrastructure projects surrounding Nhi Dong Quarter

originally low-lying fields, have been leveled and filled to build new urban areas (Figure 2). These development projects have impeded water flow, reduced the natural water retention space, and turned Nhi Dong quarter into a sink during heavy rains. The community doesn't just flood; it has effectively become a retention pond which drains out slowly after events, resulting in prolonged flooding for residents. According to local people, in recent years this area floods even when there is no heavy rain, flood water recede more slowly than before, and the depth of flooding is increasing. We can see this in data collected in collaboration with the province; during major flooding in 2020, both the water level at Kim Long station on the Perfume River³ were higher than in the flood in October 2022. However, flood depths in Nhi Dong quarter corresponding to these two floods are almost identical (side picture).

Similar to An Dong, communities in Nhon Phu ward, Quy Nhon city are also being affected greatly by urbanization. Flooding in this area is mainly influenced by floods from the Ha Thanh river. When flooding occurs, water flows from upstream through Nhon Phu ward, into tributaries in Nhon Binh ward, and eventually into Thi Nai lagoon before draining into the sea. According to information collected during the baseline FRMC studies, besides extreme rainfall, the increase of



*Flood level in October 2020 and October 2022 at Nhi Dong community house, Hue
Photo: ISET-International*



³ Flood risk in Nhi Dong community is mainly influenced by the water level in the Perfume River

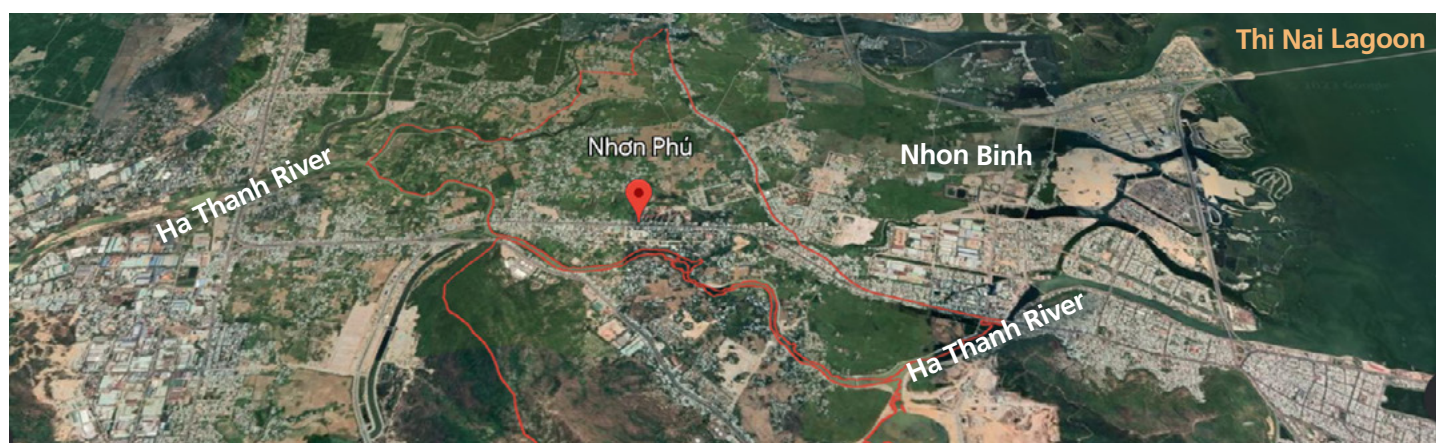
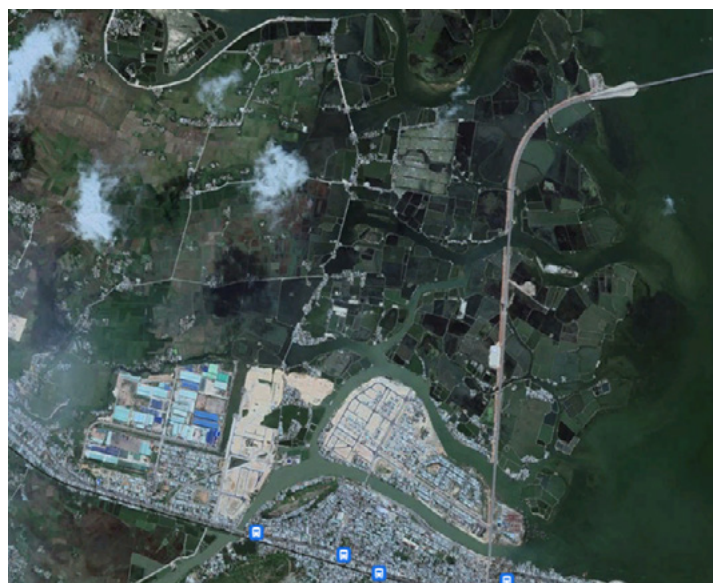
Figure 3 Location of Nhon Phu ward

Figure 4 Downstream area of Ha Thanh River (Nhon Binh) in 2010 and now

Source: Google Earth

flooding in Nhon Phu is also driven by several other factors related to urban development:

- A large area in Nhon Binh ward, originally low-lying agricultural land and aquaculture ponds, has been raised by 1-2m in elevation to build new urban areas (Figure 4). This has led to reduction of flood retention capacity and obstruction of the flood flow.
- A number of newly built roads are blocking the floodway, such as Highway 19 and the extension of Dien Bien Phu Road.

These construction projects contribute to increasing flood depth and flood duration in Nhon Phu. Community members have had to repeatedly raise their house elevations to cope with flooding (photo below and Figure 5). Some families have had to raise their house foundation by nearly 2m to avoid flood waters.

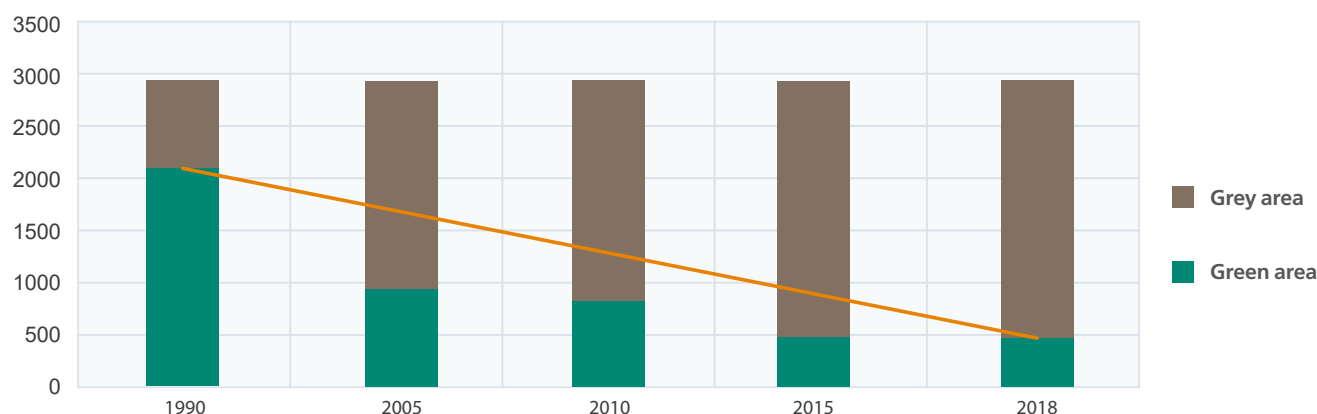
implementation of development plans. Currently, in Nhon Phu, several projects were approved over a decade ago, but construction still has not started. This is particularly true in Quarter 2, which has been designated for development of the Go Tu new urban area over 10 years ago, but there is still no information as to when construction will start. As a result, more than 300 households in this area, of which nearly 80% are temporary housing with only one floor, cannot build, repair or upgrade their houses, even when they have enough money to do so. As a result, they have been regularly, heavily affected by floods during these past 10 years.

Flood challenges in Can Tho, in the Mekong Delta, are somewhat different because of the tidal nature of flooding, but similar in terms of how development is exacerbating flooding. The total green area in Ninh Kieu



Figure 5 Images of houses in Nhon Phu after repeated raising of ground elevation

Photo: ISET-International

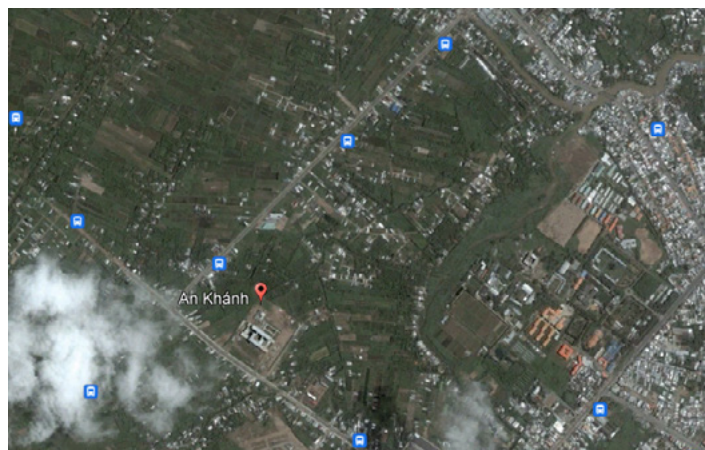
Figure 6 Reduction of green area in Ninh Kieu district, Can Tho City

Source: *Strengthening Can Tho City's Resilience to Flooding with Green Infrastructure Solutions*, Dinh Diep Anh Tuan, Vo Quoc Tuan, Nguyen Hieu Trung, Tran Van Giai Phong, Vu Canh Toan, 2018, ISET-International

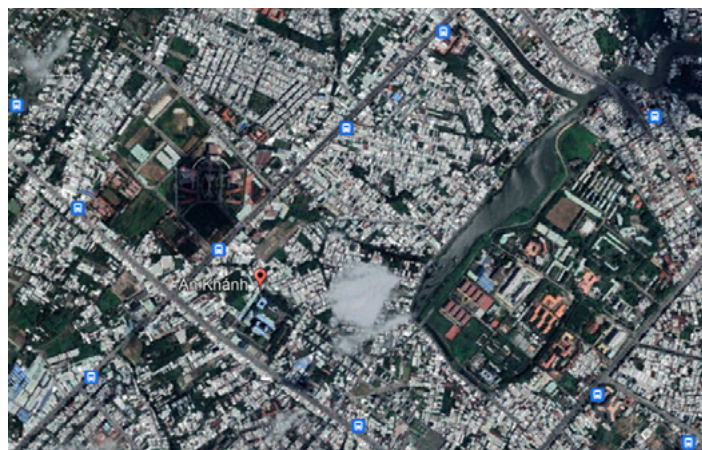
district of Can Tho has decreased significantly during the nearly 30 years from 1990 to 2018 (Figure 6). The green areas were replaced by housing projects, office buildings, economic and social infrastructure, and concrete surfaces. An Khanh ward – the site of the FRMC project – is a typical case of that conversion process. An Khanh ward has one of the highest urbanization rates in Can Tho City. Comparing satellite images between 2003 and 2022, we can clearly see that most of the agricultural land, trees, ponds, and small canals here have been leveled and developed (Figure 7). This has significantly undermined the natural water infiltration, retention, and drainage capacity, increasing the risk of flooding in the ward. Flood risks here has also increased due to encroachment of and waste disposal into local canals, blocking the flow and polluting the water, causing adverse impacts on the community when floods occur (side photo).



Waste disposal, stream narrowing and pollution of canals in An Khanh – June 2022.
Photo: ISET-International

Figure 7 Urban development in An Khanh ward in 2003 (left) and 2022 (right)

Source: Google Earth



Conclusion and Recommendations

Flood risks in urban areas are driven not just by weather and climate; urbanization and improper infrastructure development are significant and growing contributors to flood risk. This isn't just true in Vietnam; according to a study in the US, urbanization has led to a 21-time increase in flood risk in Houston City. Nonetheless, the role of urbanization in flooding is often not comprehensively analyzed and considered when flood risk reduction measures are identified and implemented. As a result, even as existing risk is mitigated, new risk is being built in, and with it is being built inevitable heavy damages to our cities and communities. To solve this problem, the authorities of provinces and cities need to immediately implement orderly but transformative solutions. Following are some recommendations:

- Require impact assessments be part of development plans and projects, and particularly of urban development and urban infrastructure plans and projects. Assessments should look at how projects will affect city-wide (or province-wide, for larger projects like dams and roads) flood. Require that any identified increases in flood risk be mitigated. Require ongoing monitoring and corrective measures for unanticipated or incorrectly mitigated impacts.
- For the existing built landscape, conduct a comprehensive review and assessment of flooding and implement radical measures to minimize flood impacts in places where prior or recent development has negatively impacted long-standing communities. When necessary, as in the cases of An Dong, Nhon Phu and An Khanh, city authorities need to revise and update the master plans, and identify and implement

drastic solutions to restore and replace lost green spaces and water surfaces and to restore and expand drainage routes that have been filled and/or narrowed.

- Implement needed measures to address suspended plan implementation in areas frequently affected by flooding such as Nhon Phu. Review and evaluate approved urban development projects to cancel unfeasible or no longer appropriate projects and speed up the implementation of other projects. As long as households remain unable to either move or upgrade, provide adequate support and compensation to those affected to enhance their resilience to flooding and minimize damages when flooding occurs.
- Strengthen the technical capacity of relevant departments and agencies at the local level on approaches, methods, and tools to build flood resilience, with a particular focus on integrated and systemic urban development planning that takes into account existing and future flood risks.
- Provide mechanisms and policies to protect and restore natural ecosystems, green areas, and water surfaces (within and surrounding cities); these play an important role in reducing flooding. Develop incentive mechanisms to encourage the application of green infrastructure solutions in flood risk reduction.