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ADAPTATION ON A BUDGET: HOW VIETNAMESE INNOVATORS ARE TRYING  
TO DESIGN THEIR WAY OUT OF CLIMATE CHANGE

By

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Thesis

presented in partial fulfillment of the requirements  
for the degree of

Master of Arts  
In Environmental Science and Natural Resource Journalism

The University of Montana  
Missoula, MT

May 2016

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#### Abstract

In the rapidly developing Mekong Delta of Vietnam, young innovators are facing a challenge far greater than simply trying to catch up with the wealthier world. In a growing trend, the next generation of Vietnamese is acting under a common understanding: climate change is real, it's here and the time to respond is growing short.

For over a decade, Southern Vietnam has consistently been ranked by international organizations like the Intergovernmental Panel on Climate Change as one of the most vulnerable places in the world to the impacts of climate change. That vulnerability is heightened by the fact that the country is still developing economically and is deeply committed to following the industrial path of wealthy nations—the same path that led to climate change in the first place.

Unlike in the United States, the powers that govern Vietnam have acknowledged the problem and, at least in theory, expressed the political will to support efforts to adapt. Given the urgency of the situation, global entities like 350, Live & Learn and the Union of Concerned Scientists have started paying close attention to the response in Vietnam.

But even with outside financial support, local activists face an uphill battle in their quest to adapt to climate change. Recognizing the problem is perhaps the easiest step. Designing solutions is harder, but still doable. It's implementing them, and in time, where the odds become nearly insurmountable—and expensive.

Bùi Thi Bích Liên pores over the diagram spread before her. A glass of iced coffee sits, perspiring and untouched, as she hunches closer, her straight black hair trailing halfway down her back. Liên's fingers trace the outline of pipes and small valves. A droplet of water gains momentum as it slides down the side of the glass, joining the growing moat below. It's nearing 90 degrees outside and it's only 9:00 a.m.

Nine thousands miles away, a state of emergency is about to be declared on the East Coast of the United States, due to raging winter storms and freezing temperatures. But here, in the rapidly developing Mekong Delta of Vietnam, the problem is just the opposite. For the past three decades, the average nightly temperature in Can Tho City, the largest city in the delta, has increased by more than two degrees Fahrenheit. Days like today, when shirts are damp with sweat before noon, have become the norm, even during the rainy season when residents used to get some relief.

Liên is converting that heat into motivation.

Three years ago, the young university lecturer joined five of her colleagues and students to spearhead a design for a sustainable cooling and rainwater collection system to help low-income residents in Can Tho withstand the heat. Before Liên and her team came along, residents were relying on room fans, unable to afford air-conditioning units to stay cool.

The team, called CT 24, designed a system to collect and funnel rainwater through a sprinkler mounted atop hot tin roofs. When run on hot days, the water evaporates, imitating a swamp cooler and lowering indoor temperatures in as little as 10 minutes. Any excess water collected can be used for laundry, dishes and even drinking, if boiled.

“So the water enters at this point and is blocked.” Liên said, straightening up and brushing flyaway strands of hair from her face. The action is automatic, her eyes never leaving the papers spread before her. “At this point, the water is going down through these filters where we have activated carbon that will remove chemicals and things that are bad for health.”

CT 24's project is part of a movement spurred by Vietnamese innovators attempting to react to environmental shifts using clean technologies—without breaking the bank. Take Nguyen Thong Tha, a recent university graduate who has created what he calls “the floating toilet” in an effort to address water pollution in a time of drought. Or Tieu Thanh Vu, an agricultural engineer who's invented a hydroponic system that grows bean sprouts and fish simultaneously, while using less electricity, chemicals and water than traditional farming methods. Innovators like these are working across the delta with a common understanding: climate change is real, it's here and the time to respond is growing short.

For over a decade, Southern Vietnam has consistently been ranked by international organizations like the Intergovernmental Panel on Climate Change as one of the most vulnerable places in the world to the impacts of climate change. That vulnerability is heightened by the fact that the country is still developing economically and is deeply committed to following the industrial path of wealthy nations—the same path that led to climate change in the first place.

That's both a tremendous asset and a real danger according to Dan Spencer, an environmental studies professor at the University of Montana who has been bringing students to the Mekong Delta to study climate change since 2011. Vietnam, Spencer explained, may not have as many resources as the United States, but it does have the momentum and drive that many first-world nations lack.

“It has the possibility of being a test case—showing how well we can simultaneously be addressing development needs in poor countries, while beginning to shift to adapt to climate change,” he said.

Unlike in the United States, the powers that govern Vietnam have acknowledged the problem and, at least in theory, expressed the political will to support efforts to adapt. Given the urgency of the situation, global entities like 350, Live & Learn and the Union of Concerned Scientists have started paying close attention to the response in Vietnam. Consequently, entrepreneurs like Liên have won international recognition; CT24's model caught the attention of the Asian Cities Climate Change Resilience Network, formerly based in the United Kingdom, and the group secured foreign funding to get the project off the ground. That was in 2013.

But even with outside financial support, Liên and other local activists face an uphill battle in their quest to adapt to climate change. Recognizing the problem is perhaps the easiest step. Designing solutions is harder, but still doable. It's implementing them, and in time, where the odds become nearly insurmountable—and expensive.

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A two-hour bus ride south of Can Tho, in the small farming village of Trung Binh, local agriculture official Trần Hoàng Quan has watched the sea creep closer and closer to the government's open-air meeting house for the past five years. By his estimate, the sea gains 15 inches of ground every year.

While increasing temperatures plague much of South Vietnam, the heat is just one face of a multi-headed beast that is climate change. And heat is perhaps the most tamable. Much more pressing is the threat of sea level rise. In areas near Trung Binh, the sea has intruded more than 320 yards over the past decade, or about the length of three football fields, as reported by the DRAGON Institute (Delta Research and Global Observation Network), a Mekong-based climate change research group established in partnership with the United States Geological Society. On the surface, sea level rise might seem intuitive to understand. The globe heats, ice melts, oceans rise. It should be a threat equally spread across the globe; but it's not.

Imagine water collecting on a front lawn. It's easy to tell where the lowest parts of the yard are when a sprinkler has been left on for too long, or after a good rain. In either instance, water droplets are theoretically distributed evenly across the ground; but once a saturation point occurs, unabsorbed droplets come together to follow the path of least resistance. Puddles are born. While the scenario is every toddler's dream, the same principle, applied to sea level rise, yields a much grimmer outcome.

As temperatures rise and glacial ice melts, oceans gain more liquid water. But just as with uneven lawns, the rising sea seeks a path of least resistance—in other words, it's drawn to low-

lying land. So while it is a global phenomenon, coastal communities with low elevations are already locked in battle against a foe that much of the world has yet to comprehend.

The Mekong Delta is particularly vulnerable in this scenario, as most of the land is less than seven feet in elevation. The region is home to 22 percent of Vietnam's population, roughly 18 million people. As the third largest exporter of rice by volume, mild land loss in Vietnam could have serious ramifications for food security beyond its borders in places like the Philippines and Indonesia. Even a three-foot rise in sea level could spell disaster.

The Vietnamese government has no disillusion about the gravity of the situation; where it hesitates is in determining how best to prepare for, and if possible, to stave off the rising water. Standing atop his own community dike in Trung Bihn, Quan points to a network of blue tarps, sand bags, long sticks and earthen walls—the village's only defense against the sea. The wall of dirt stretches as far as the eye can see in either direction, standing about four feet tall and five feet wide.

“As you can see,” Quan said, pointing to the ground, “this is only sand. It's not stable. That's why we have to cover it with plastic sheets, so the sea can just touch the outside of the dike.”

Twice a year, the young official gathers up every able-bodied villager he can find to repair the dikes where the sea has broken through. “The sea usually rises up in November and December of the solar calendar, and we have to wait for the seawater to drop to start the job,” he said. “We have only five or six hours, because the sea rises up again very quickly. That's why we need everyone to work as quickly as they can.”

Two local government bodies and the International Union for Conservation of Nature (IUCN) supply limited funding to help maintain the dike. But even with the outside support, the village can't afford to invest in a more permanent defense.

“We don't have enough money to concrete the whole dike,” Quan said. “So for now we just reinforce it temporarily every year.”

All over Vietnam, local governments are grappling with the challenge of funding climate change defense. Since the ruling Communist Party recognized climate change as a national security threat over half a decade ago, they have been required to formulate their own action plans for coping with the threat and then to submit those plans to the national government for approval.

Can Tho City, where Lien's rainwater project first debuted, is home to one of three official climate change offices in the country. The presence of the office adds pressure on the city to set an example in being proactive in its adaptation and mitigation efforts. The People's Committee of Can Tho, similar to a governor's executive cabinet in the United States, recently released a new 15-year action plan for coping with climate change, “For a stronger and more resilient city of Can Tho.”

The 54-page plan, spanning 2015 through 2030, is candid about the threats posed to area residents: extreme storms, floods, invasive pests and diseases, droughts, sea level rise, heat. It's

even more candid about the associated costs. Based upon preliminary calculations, the city will need a minimum of 25,575 billion VND (roughly \$1.15 billion USD) by 2030 “to achieve the basic degree or capacity of responding” to climate change.

In wealthy nations like the United States, the effects of climate change can often be buffered or dealt with retroactively in a way that isn't an option for many developing nations. In the developed nation, infrastructure is in place to help farmers through drought or to help local districts fight mega wildfires. In Vietnam, that's not the case. Though its economy has made a tremendous comeback since the war, from being one of the poorest countries in the world in the 1980s to now rapidly gaining influence and power in Southeast Asia, its gross national income is still three times lower than the World Bank average for lower middle income countries around the world. It has a long way to go before it can easily bankroll its own infrastructure projects.

Local governments also have to navigate the country's centralized system. Ky Quang Vinh, the director of Can Tho's climate change office, is still waiting on the national government to approve his city's 15-year plan. Without approval, no aspect of the plan can move forward, but Vinh isn't easily deterred from action. After all, he is Vietnamese, and a member of a society known for its resilience.

“While we are waiting for this project,” he said, “we can do other things.”

Vinh has turned his attention to making sure people understand what the term “climate change” actually means and how it impacts their daily lives. For years, the phrase has been tossed around on television and radio stations all over the country, without much explanation. Farmers who live in rural areas without internet access or research libraries are completely dependent on national news anchors and local officials to educate them about the implications of climate change—and connections between the science and what farmers are experiencing on the ground are lacking. Some farmers still believe that tornados are a sign that the gods are unhappy, even though Can Tho's action plan recognizes the devastating storms as a symptom of climate change. Other frantically bounce from crop to crop, gambling that mangos will tolerate the heat better than rice or peppers.

Vinh believes that the quickest and most effective way to bridge the information gap is to work with teachers to educate school children. It's a cascading effect, he said. When children come to their parents with homework assignments focused on the environment or adapting to climate change, families absorb the information on a deeper level than if an official had come by with a leaflet.

“In the long term, the parents will understand the meaning of what they are doing,” Vinh said, “and so this is one way we want to communicate with the people.”

While Vinh's youth-based approach is yielding positive results, it's a slow process. In rural areas of the Mekong Delta, where 70 percent of the region's population is based, farmers are only slowly beginning to draw connections between lower crop yields and a series of plagues linked to climate change. But within the city, where internet access is widespread and information runs

deeper than that aired by the state-controlled media, some citizens are discovering for themselves just how bleak future predictions are, and how little is being done.

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It is for his love of fishing that Trong Do first began digging into climate change science. Do and his wife are casual farmers, not tied to the land for a living, but instead as a hobby. They lead a middle-class life, she as an insurance agent, he as a retired engineer turned fish-farmer. Now 51, Do remembers reading about climate change in the paper and feeling uncertain as to what the news actually meant for his family and catfish farm on the outskirts of the city. So he turned to the internet to conduct his own research.

“Right now, the sea water is about forty miles away from my farm,” he said. “If it reaches our place, we won’t be able to fill our fish pond anymore.”

The thought of losing his precious hobby casts shadows over the enthusiast’s face. Do is adamant that he wants to fish forever, so he’s is doing all he can to be proactive. He has been consuming as much information as he can find—mostly off the internet—about sea level rise, temperature increases and upstream dams. He’s also made a point of attending workshops with scientists from Can Tho University to learn about adaptation methods, from using shade to slow evaporation, to employing bacteria to keep fish feed and antibiotics out of local water sources. Instead of helping him feel more prepared, Do said all of his research has led to him feeling more scared than hopeful.

“I’m worried that the leaders of the government here are adapting too slowly to the changes that are happening,” he said. “We are just residents. The government needs to make a law, or some action, and then we can cooperate with them and support them. But we can’t manage it.”

Do isn’t alone in his thinking. Some regional scientists have identified government inaction as one of the biggest hurdles to adaptation. Just a few years ago, the World Bank conducted a study on rice cultivation in light of increased flooding and saltwater intrusion. According to one local researcher, the study results were politely accepted by the Vietnamese government, then filed away without any action. The researcher, also a professor at Can Tho University and only a few years older than Do, sees the entire process as an exercise in patience. He believes that given more time, the government will come around and begin incorporating the scientists’ suggestions. Like Do, he too is waiting.

Do and his generation grew up during the birth of Vietnam’s communist regime, where the government made the first move and the people followed. But unlike the researcher, the ever growing danger of his farm being overtaken by the sea, coupled with the stagnant nature of bureaucracy, has begun to change Do’s actions, if not yet his train of thought. While Do’s transition from follower to instigator is only just beginning, young professionals in the Mekong Delta like Liên, Tha and Vu are moving at a quicker pace toward independent innovation.

Tha, the inventor of the “floating toilet,” embodies a youth fresh out of college. The 24-year-old is stylishly dressed, with black pants, a button-down shirt and tousled hair. A zippered black riding jacket rests beside his motorcycle helmet. He sips a sweet drink out of a tall, artsy glass in



an open-air café not far from the university. It's a popular place where students come to hang out.

Being fashionable is part of Tha's identity. When his post-baccalaureate work takes him out of the city to a neighboring hamlet, he sheds his slick riding gear and dons a worn denim jacket and a full-brimmed mesh hat that one might expect to see atop a fly fisherman in Montana, not in the fields of Vietnam. Just as confidently as he dresses, Tha refuses to let his passion for his work be stifled by climate change. In fact, like Liên, the looming environmental threats have acted as a motivator rather than a deterrent.

"I am worried about climate change," he said, "but that's the reason why I want to stay right here."

Working closely with student-led clubs at the university, like the Delta Youth Alliance, Tha has created a cheap composting toilet that keeps waste out of local water supplies. What began as a passion project quickly caught on, and the young inventor was featured on national television for his work. His design has since become a paragon for environmental clubs at Can Tho University.

"After doing so many projects, and seeing them work effectively," he said, "I want to do more."

For Tha, adapting to climate change is within reach for Vietnam. People in the delta aren't scared to change, he said, they just need help knowing how to change. If people are given a good design, one that actually works, they'll adopt it, regardless of the rationale behind it. Unlike Do, Tha believes good design must come first, then community and government support will follow.

Vu, the agricultural engineer, shares Tha's passion for quality design and clean technology. More casually dressed, in faded jeans, a crisp polo and flip-flops, the 37-year-old is also somewhat of a national celebrity. In 2014, Vu received a government award for his sustainably designed hydroponic system, which allows farmers to grow bean sprouts alongside fish, using very little water or electricity, and no chemicals or pesticides. The system, housed in a shiny, metal cabinet, is designed to encourage symbiosis; fish waste is funneled upward to fertilize the sprouts and nutrients from the plants trickle down to feed the fish. His design and subsequent award also earned Vu a spot on national television.

Since the broadcast, Vu has received calls from farmers all across Vietnam interested in purchasing one of his units. Vu downplays his newfound celebrity, shrugging off praise as a colleague gestures to a framed photograph hanging in the living room, displaying Vu, stone-faced, accepting the award on the national stage. Vu said he's honored to be recognized, but recognition doesn't equal funding.

More so than Tha or Liên, Vu markets his product as a businessman, focusing on his clients' intentions before agreeing to strike a deal. Unlike the floating toilet or rainwater system, Vu's hydroponic unit only works as a clean technology if the people purchasing it agree to use it as such, which means growing their products without chemicals. The inventor is adamant—the system is more than just a tool, it's a way of life, and he won't sell it to just anyone.

“It is simple,” he said, “in business, profit is a must, but we still must have a heart. Firstly, it’s for the sake of the environment; and secondly, it’s for the health of the people.”

In order to reach the farmers willing to use his technology cleanly, Vu chooses to sell his units at a low profit margin, making just enough to survive and to continue building his machines. Running a hand through his short-cropped hair, Vu explains that it’s a stressful process, but he keeps working because he believes farmers must begin using sustainable technologies now if they are to survive in the future. His mission is his number one priority.

In the café that morning, Liên shows equal passion for her work. After nearly an hour, her focus on the sustainable cooling system diagram only breaks when a patron enters the white-tiled room. She glances at the watered-down coffee shoved halfway across the table. Then, suddenly inspired, she reaches into her pocket for her phone and pulls up a video featured on the website of the Asian Cities Climate Change Resilience Network. It’s her model brought to life.

Images of blue water tanks and browned metal roofs with sprinklers fade in and out, as a series of residents testify to the functionality of the system. The sun-withered face of a woman talks into the camera about how hot her house becomes during the summer; she then explains that the collection system is giving her family access to cool, clean water she otherwise couldn’t afford.

Liên smiles at the screen. A waiter brings a fresh glass of ice water and places it on the table beside the long-neglected coffee. Condensation is already forming on the new glass. Liên is no longer hunched over her diagram. Her fingers are still, lightly resting on the black and white outlines of pipes and filters. She stares out the window at the passing motorbikes as Lady Gaga’s 2009 hit, “Paparazzi,” plays in the background.

Right after the test models were completed and the footage for the video filmed, Liên’s foreign funding ran out. CT24’s design was a success, installation was relatively easy, but it still cost money to build, and to reach the rural residents who need it most. Liên reached out to local organizations and government offices, but most are dealing with their own budget shortfalls. For the past three years, Liên’s project—this bundle of clean technology with the potential to cool her city—has sat, confined in report-form, on a shelf.

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Dependency on foreign funding has become a corner stone for many change makers in Vietnam—even within the government—as the country strives to strengthen its economy. Environmental ethicist Dan Spencer believes wealthy nations must heed Vietnam’s appeals for assistance.

“I really do believe that there is a notion of ecological debt, climate debt,” he said. “First-world nations have a moral obligation to assist in the transition. It’s really necessary, particularly because we have benefitted so much from the greenhouse gases and fossil fuels that generate climate change—we continue to.”

The United States in particular has a deeper obligation to help, Spencer believes, given our past political and military involvement in Vietnam.

“It makes Vietnam very different from somewhere like Bangladesh, which has equal need, but we don’t have the same history,” he said. “I would say the same thing about Central America, versus places like Paraguay—we have a history there that I think obligates us to pay attention.”

The connection Spencer draws between Vietnam’s war-torn history and its current environmental predicament is spot on for Duong Van Ni, director of Can Tho University’s Department of Environment and Natural Resources Management. Ni believes that the war severed the connection between people and the land and prompted a cycle of migration that has led to overexploitation of natural resources.

“During the war, young people grew up in the city. They lost their culture. They lost their experience of how to farm,” Ni said. “So that’s why, after the war ended, after the government gave them a piece of land, they don’t know how to survive on that land—how to make food come out of that land.”

“For those people who are living like this,” said the crisply dressed scholar, his hair neatly parted, “they have to survive. They have two choices for their survival—the first, they migrate to the city. And the others, they migrate to exploit the environmental resources.”

Ni, who has been internationally recognized for his research on climate change adaptation, explains that many people who move to the city looking for work have a hard time adapting to urban life. They return to the countryside after only a couple of years and resort to harvesting timber, fishing and other exploitive endeavors in order to support their families. It’s a cycle the government hopes to break by pushing its agenda for economic development.

But as Vietnam continues to focus on industry, Ni cautions it must do all it can to break the patterns that led to climate change in the first place. Many countries respond reactively to environmental issues instead of proactively, he says, for example passing laws to protect local forests only after the trees are all but gone. Ni points to Vietnam’s powerful neighbor, China, as a lesson to be learned.

“During the last ten years or twenty years, they earn[ed] a lot of money,” Ni said. “But now they have to spend that money [on the] environment. So that’s why, when you develop, you have to balance, you have to select how to balance between development and conservation.”

Until people are able to meet their basic needs, he said, the environment will take a back seat and balance will be difficult to achieve. People can’t care about protecting the forests when they don’t have enough to eat.

But for many young professionals in the delta, the environment and daily life can no longer be seen as separate problems. They must be jointly addressed if Vietnam is to survive intact into the next century. For Liên, one economic setback can’t be an excuse to walk away from her work, or to forget about the daunting heat. It’s just another hurdle she must figure out how to overcome.

Liên, like so many in Vietnam, is resilient. Until she figures out a way to get her cooling system back up and running, she’s turned her attention to another problem—air pollution in Can Tho

City. This time she's casting a wider net, bringing the problem before lecture halls full of her students, hoping one of them might have a solution. Even the smartest innovator won't be able to face climate change single-handedly, and Liên doesn't intend to. Rather than backing down, she is trying to help others catch up.