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Traditional Shelters, CYCLONE HOUSES, and the *Temptations* of Modern Construction

Shelter, like food, is a fundamental human need, and just as cuisines differ from culture to culture, so do modes of habitation. As economies become increasingly globalized, however, this diversity in housing styles is becoming more and more homogenized. Today, most people in Port-Vila or Luganville live in buildings that are made in much the same way as those found in Sydney, Paris or New York. But across most of Vanuatu, the great majority of people still live in small villages rather than cities, and it is in these areas that we see the wisdom of traditional approaches to building houses.

There are two basic differences that distinguish house construction in most of the world's modern towns and cities from those used in the traditional villages of Vanuatu and throughout the South Pacific. First, modern homes are generally designed as a single building, with separate rooms for sleeping, cooking, eating, bathing, and relaxing. With the advent of centralized climate-control systems, such as air conditioning and heating, people now spend much of their lives within the four walls of a building. By contrast, in Vanuatu's villages,

most people construct separate units for the various activities of their lives. One house is used for sleeping, but another one is built at some distance to serve as the kitchen, which helps to keep the sleeping quarters cool and free from vermin. Bathing and toilet facilities are then located in more secluded parts of the village, to ensure privacy. Each of these units tend to be small, even cramped by modern standards, largely because people spend the greater part of their days outdoors, whether working in their gardens, performing kastom (customary) activities in public areas such as nakamals, or relaxing under the shade of a coconut tree.

A second major distinction deals with the methods and materials used. Modern houses are envisioned as permanent structures, built to last for many decades. As such, they rely on manufactured materials that require cash to purchase. In tropical areas, concrete blocks, wooden timbers, and corrugated metal sheets are the most common construction supplies, and except for their cost, they are relatively easy to obtain and assemble, and are very durable. At the same time, they absorb and retain heat as they bake under the tropical sun, making them uncomfortable spaces for living. By contrast, traditional housing is viewed as more ephemeral, lasting only for five or ten years, or may even be built for a single season or event, such as the visit of family members. Their construction relies entirely on plant materials that are locally available, most of which can be collected at no cost from family-owned forests. These natural products are subject to more rapid decay, and therefore must be routinely replaced or rebuilt. At the same time, they combine the many advantages of natural materials, including both refuge from torrential rain and a cooling shade from the sun.

Despite the benefits of traditional approaches, modern methods and materials are making inroads across many of Vanuatu's rural villages. The durability and ease of construction are tempting advantages, and even the status of living in a concrete house can sometimes outweigh the benefits of using natural materials. These trends were illustrated vividly on the island of Tanna a few years ago, during the crisis triggered by Cyclone Pam, Vanuatu's worst severe weather event in recorded history, which

struck the county's southern islands on March 13, 2015.

The Plants mo Pipol project, a collaboration initiated in 2013 between the Vanuatu Department of Forestry, the Tafea Kaljoral Senta, and the New York Botanical Garden, has been documenting the native and introduced plants in southern Vanuatu, along with their indigenous names and traditional uses. During our work on Tanna in June 2014, we came across a particular style of house in the village of Yenhup, which our local hosts, Samuel Harwaen, David Kapwia, and Alexis Tupun, called a cyclone house (or "saeklon haos" in Bislama), and this particular structure was the only cyclone house we had documented until that time. Our hosts had informed us that several other cyclone houses could be found across Tanna, but that such buildings were no longer important because modern concrete houses with metal roofs were stronger and safer refuges during times of severe storms. The disastrous Cyclone Pam, which struck less than one year later, would soon teach us some valuable lessons in the role that traditional construction can play in the survival, independence, and resiliency of the people of Vanuatu.

Given the strength of the storm, the death toll from Pam was relatively low (between twelve and sixteen people). But as the late Chief Jacob Kapere pointed out, all of these deaths were associated with modern housing materials, and no loss of life occurred to anyone who sheltered in a traditional house. This fact did not pass unnoticed by the villagers of Tanna. In fact, during our first visit after the cyclone, we saw dozens of new cyclone houses being built across all areas of the island, providing us with an opportunity to document the methods and plant materials used. There are many shared elements among the methods of constructing cyclone houses in Tanna, as well as nearby Aneityum. The basic form is an A-frame building, whose triangular shape provides amazing structural strength and stability. Moreover, the rafters of the roof extend not merely to the ground, but are buried into the soil up to one meter deep. In coastal areas, the ubiquitous beach hibiscus (Hibiscus tileaceus), known as "burao" in Bislama (and newou in the Nafe language of South Tanna or intophau in the Aneityum language), is used because the wood of this tree is resistant to rot and naturally arched. Burao trees are not found in the interior of the islands, so local people from inland villages use a different plant, known as "kerosin wud" in Bislama (Fagraea berteroana). In the Naukau language of North Tanna, this plant is called nafuas, and similarly nafua in the Nafe language, and napou in Aneityum. Kerosin wud is an epiphytic tree that grows on the branches of other large forest trees, and while it is unrelated to burao, its main trunks have a similar arched shape and rot-resistant properties.

In the northern islands of Vanuatu, the durable leaves of the "natangura" palm (Metroxylon warbugii) are the most important material for roof thatching, but this tree is not native to the southern islands, where people traditionally used a grass called wild cane ("waelken" in Bis-

lama, Miscanthus sinensis), also known as ning in the Nafe language on Tanna, and nieg or nigyec in Aneityum. In Tanna, waelken is often used in combination with native palm leaves (especially those from coconut trees), which are tied to stretchers made from the saplings or small branches of several tree species, including Geniostoma rupestre (known as kookasakyl in the Nahual language of West Tanna), Myristica fatua (known as "nandai" in Bislama and natan in the Nafe language), and Tarenna efatensis (or nahgen in Aneityumese). Leaves of Alpinia oceanica, a ginger relative called "wael ginga" in Bislama (or naleh in the Nahual language, and narer in Neuai) are sometimes placed at the top of the roof to help seal the ridgeline against the rain.

There are two other important elements in the construction of cyclone houses. First, the end walls are not constructed from flattened bamboo, as in most traditional houses in Vanuatu. Instead, the same waelken (Miscanthus sinensis) used on the roof is employed again, but in a different manner. In making the walls, the loose leaves of this grass are removed, and the stems or culms of the plant are twisted around each other to form a braid, and then the individual braids are attached to one another to form the wall, creating a structure that is both strong and highly flexible, enabling it to withstand hurricane-force winds without breaking. By contrast, solid concrete-block walls act as sails that can come crashing down on their inhabitants. The final critical design element of a cyclone house is the use of lashings to hold all the parts of the house together. Modern construction relies heavily on nails and screws, but these fasteners are no match for the wind speeds generated by a cyclone. In Vanuatu, people traditionally used vines or lianas instead, and have a wide selection of species from which to choose (including Flagellaria indica, Cayratia trifolia, Melodinus neoebudicus, Geitonoplesium cymosum, Smilax vitiensis, Jasminum didymum, and Durandea pentagyna). These wild "ropes" are first harvested from the forest, then brought to the area of the village where the cyclone house is being built. Depending on the species, the outer layer or "skin" of the vine may be removed. The stems are then heated over a fire, which softens them, making them pliable and easier to bend. While they are still hot, the vines are used to lash the various elements of the house together. As they cool in place, they tighten. This approach provides incredibly strong connections between the components of the structure, but retains sufficient flexibility to prevent the house from breaking apart in the face of strong winds. This method is far superior to the use of nails and screws, which can be easily pulled out by cyclonic forces, allowing metal sheets to tear away from roofs, and walls from their foundations.

The renaissance in cyclone-house construction has provided several important lessons. First, local people value their forests and other natural resources when they know that their lives and livelihoods depend on them. When traditional lifestyles are displaced by modern approaches, people risk a growing alienation from their natural environment, a phenomenon that has sadly become pervasive in many parts of the world, including North America, Europe, and Australia. Alternatively, when people value their natural resources, they are much more likely to conserve them. Another important lesson dealt with the frightening potential for the loss of traditional knowledge. As we interviewed local people about cyclone houses, we learned that only the oldest members of the communities — the generation of the grandparents — remembered how to build these important structures. In most areas, the knowledge of which plant species to use and how to use them had not been passed on to their adult children and grandchildren. Within another decade, the majority of these elders would have passed on, and the knowledge associated with cyclone-house construction, developed over so many centuries, could have been forever lost. After the storm, with the renewed understanding of the importance and wisdom of traditional houses, we saw evidence of the transfer of this knowledge to younger generations across all parts of Tanna and Aneityum. Thus, despite the great suffering left in Cyclone Pam's wake, there were some unforeseen "silver linings", and the preservation of traditional knowledge is high on that list.