

# Bamboo Living Developments Steps Toward Sustainability

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## Abstract

Bamboo Living has entered its 23rd year of pioneering work in building code approved Bamboo Construction. Bamboo Living has designed and manufactured nearly 400 homes for sites in Hawaii and other parts of the world. Bamboo Living's buildings are engineered by licensed structural engineers and have withstood multiple Category 5 hurricanes with 278kph (173mph) winds addressing the need for resiliency in a time of changing climate.

Bamboo Living was founded in 1995 with the goal of protecting forests by reducing the number of trees cut for construction. Bamboo Living developed a method for prefabrication that allows for construction in remote areas while meeting the requirements of the most stringent building codes. In 2009 at the World Bamboo Congress the author presented a plan for using bamboo to combat climate change through carbon sequestration and avoided deforestation.

In 2018 Bamboo Living will complete its first multi-family condominium project. Construction will soon begin on Bamboo Living's first multi-story commercial complex. In 2016 Bamboo Living was featured in a front-page article in the LA Times Travel Section. In 2017 Bamboo Living was featured on HGTV in a show called Tiny Paradise. In 2018 Bamboo Living will again be featured on cable TV. Bamboo Living is now expanding into the development of entire communities built with structural bamboo. Each Bamboo Living project is a step further toward sustainability by saving trees while sequestering carbon.

## Discussion

Bamboo Living was founded in 1995. Since that time, Bamboo Living has become a leader in providing artisan-quality bamboo homes and innovative durable building products made from bamboo, possibly the most rapidly renewable resource on the planet.

The company inspires social change and environmental stewardship by delivering exquisitely designed internationally code compliant residential and commercial buildings that are constructed from long-lasting, natural, and safe materials. Their bamboo is pressure treated with mineral salts to provide protection from insects and fire. The first Bamboo Living home is now 23 years old and in excellent shape.

Bamboo Living has developed and implemented a precedent-setting plan for resource conservation—saving trees and promoting reforestation by proliferating the use and growth of bamboo. They have created meaningful employment across the socio-economic spectrum in their supply chain from growers to craftspeople to builders and contractors.

Bamboo Living's goal is the protection of forests by reducing the number of trees cut for construction. In the early 1990s the author designed and built a home for himself on Maui. The home was powered by solar photovoltaic electric and used substantial recycled materials. However, upon delivery of the construction framing materials the author was very concerned about the amount of lumber required for the construction and began looking for an alternative.

The author and his friend and builder, Jeffree Trudeau, had seen the work of Simon Velez and Linda Garland. The author met with Ms. Garland at her bamboo estate in Bali and became inspired by the

potential of bamboo as a replacement for wood in construction. Mr. Trudeau then assisted with the World Bamboo Congress held at Ms. Garland's estate the next year. As a result, the author, an architect, with his friend and builder set out to begin building with bamboo instead of wood and developed Bamboo Living. The trees now saved from being cut over the past 23 years of building with bamboo now amount to a sizable forest.

The first bamboo home the author and Mr. Trudeau built was for Kutira Decosterd on Maui. They prefabricated the structural elements on site with the idea of developing a method of prefabrication for future projects. That first project was published in the Italian magazine *Brava Casa*.

Initial building permits were difficult to obtain since there was no building code standard for the use of structural bamboo in the United States. The permits required a lengthy process sometimes taking over a year. As a result, Bamboo Living began pursuing the development of a building code standard for bamboo. After seven years of effort, Bamboo Living developed the first ever International Code Council (ICC) Evaluation Services Report which was first issued by ICC in December of 2004. This pioneering effort was helped by participation of the author and the Vice President of ICC on the INBAR building code committee headed up by Professor Jules Janssen of Eindhoven University in the Netherlands.

Over many years, Bamboo Living developed its method for prefabrication that now allows for construction in remote areas while meeting the requirements of the most stringent building codes. The Bamboo Living construction system has allowed construction of projects with minimal impact on the project site and minimal construction waste.

To date Bamboo Living has designed and manufactured nearly 400 homes for sites in Hawaii and other parts of the world. Clients repeatedly express how uplifting to their spirits living in their bamboo homes has become.

Bamboo Living's buildings are engineered by licensed structural engineers and have withstood multiple Category 5 hurricanes with 278kph (173mph) winds addressing the need for resiliency in a time of changing climate.

In 2009 at the World Bamboo Congress the author presented a plan for using bamboo to combat climate change through carbon capture and avoided deforestation. Dr. Walter Liese wrote a paper that outlined the issues and problems of using bamboo for carbon sequestration and climate change mitigation. With Dr. Liese guidance, the author developed a strategy that addressed each of the issues that Dr. Liese raised. The author submitted the strategy in a paper and presented that strategy in a power point at the 2009 WBC in Bangkok. Since that time, the International Network for Bamboo and Rattan (INBAR) has researched and developed a strategy for using bamboo for climate change mitigation (Lou, YP, 2010) that fleshes out the plan first presented by the author.

Paul Hawken's recent bestselling book, *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming* (Hawken, 2017.) demonstrates that with a broad concerted effort, global warming can not only be mitigated but be reversed. Bamboo can and should play a role in that global effort.

Beginning with its first single structure in 1995, Bamboo Living has highlighted the role for bamboo in efforts toward sustainability to an ever-widening audience.

Hawaii has been the home of Bamboo Living from the beginning. Bamboo homes fit seamlessly into Hawaii's culture of living in harmony and connection with nature. This love of the land is a common thread that ties Hawaii residents together, resulting in a beautiful culture of sustainability and stewardship. It has been an inspiring place to design and build these homes.

This connection to nature leads many homeowners to design their dwellings for off-the-grid living.

For other homeowners, this is a necessity rather than a choice. Solar power, water catchment, and individual septic systems are all common, especially on the Big Island of Hawaii where many lots are completely disconnected from public utilities. This reliance on the land, gaining power from the sun and water from the rain, creates an increased awareness of earth's limited resources – and a greater desire to protect them.

Hawaii also presents many nature-related challenges: hurricanes, earthquakes, and even insects pose a serious threat to homes and buildings. As mentioned earlier, Bamboo Living structures have been field-tested in hurricanes with 173 mph winds. In Hawaii, the homes withstand tropical storms and frequent earthquakes. The homes hold up extremely well due to the inherent strength of structural bamboo. Bamboo has been shown in tests as well as in practice to be a superior building material. In the US, building materials are only tested up until initial failure. In India at IIT in Delhi, researchers tested bamboo after initial failure by continuing to add loading. Unlike concrete and steel, which fail catastrophically, the bamboo continued to perform. This provides another layer of safety not found with concrete and steel construction. Lastly, building with bamboo is a logical fit in tropical and sub-tropical areas because of the threat of insects, especially termites. When treated properly, bamboo becomes an inhospitable environment for termites. Bamboo Living structural poles are thoroughly treated and third-party inspected with time-tested natural non-toxic borates in a large pressure treatment tank at our factory in Vietnam.

Bamboo Living homes are designed to exist in partnership with the nature that surrounds them. The features of these homes, such as passive cooling and ventilation, natural light, structural integrity to protect against hurricanes and earthquakes, and resistance to insects, attract sustainability-minded folks who are interested in saving forests, reversing climate change, living in harmony with nature, and having a safe sanctuary for their loved ones.

After 23 years of building single family dwellings and small resorts, Bamboo Living is expanding its building technology into the commercial design sector. In 2018, Bamboo Living completed building its first multi-story multi-family project and will begin constructing its first multi-story commercial complex later in the year. Both projects are exciting because they are an opportunity for a larger audience of people to enjoy the beautifully detailed architectural quality of Bamboo Living structures. The wide visibility of these structures will inspire other sustainable bamboo design initiatives at a local and national scale.

The Multi-story condominium project features (4) two-story bamboo buildings seamlessly designed together, creating ocean views for each unit while maintaining privacy between the 8 units. The building has a wrap around porch with bamboo rafters extending above. The second-floor units have lofts that allow the user to engage with the dramatically open and tall bamboo interior, a split bamboo ceiling framed by bamboo trusses and purlins. The entire outside is wrapped in bamboo siding to aesthetically reinforce the spirit of the building. The golden color of the bamboo material is complimented by copper colored roofing and trim work, and the tan desert colors found throughout Kona's sunbaked landscape. It's thrilling to see bamboo architecture fit so well within an urban Hawaii context and provide inspiration through its beauty and sustainable symbolism.

The Multi-Story commercial complex features the largest truss we have designed yet for a Bamboo Living Structure at 40 feet. This complex will feature (1) 2-story building and (4) smaller service buildings. Architecturally this project provides the opportunity to feature multiple buildings, establishing a continuous design style and a strong connection between the landscape and the buildings. This design results in beautiful communal courtyard spaces framed by the bamboo structures. Bamboo Living anticipates this project to reach a large audience of people on the Island of Maui due to its urban town location and its clear destination-like qualities. Many windows and skylights on the main building create a dynamic façade and reflect the design language of the surrounding town while also connecting the interior of the building to a diverse range of mountain and ocean views. The author's design seeks to engage a connection to nature both from inside and outside the building. The sustainable value of bamboo asks us all to examine the world around us and to

preserve and appreciate the pre-existing conditions in nature. Bamboo Living foresees this Multi-Story commercial complex as another crucial step on the path to continually increase the awareness of the world to the many benefits of bamboo construction technology.

Since the first article in *Brava Casa*, Bamboo Living projects have appeared in numerous magazines and other media. Bamboo Living continues in its effort to get the word out about the sustainability and beauty of bamboo construction.

In 2016, a Bamboo Living project made the front-page of the LA Times travel section. The project was part of a sanctuary for endangered palms and as with many Bamboo Living projects was powered by photovoltaics.

In 2017, HGTV aired an episode of their show *Tiny Paradise* featuring one of Bamboo Living's projects. The show reached 1.6million viewers. The house was nearly the smallest size home for which you can obtain a building permit under the International Residential Code. In 2017, HGTV also filmed one of the Bamboo Living cottages at Kalani retreat in Hawaii.

In 2018, United Airlines featured a Bamboo Living project in its February flight magazine *Hemispheres*. Also in 2018, DIY Network is filming a Bamboo Living showcase home.

Bamboo Living continues to promote the use of bamboo for construction both in the United States and other parts of the world.

## Conclusions

Bamboo Living has spent the last 23 years pioneering and promoting the use of bamboo in the United States and other parts of the world. Bamboo Living developed the first ever ICC-ESR for structural bamboo and is currently expanding into multi-story, multi-family and commercial projects.

Bamboo is a building material with a future. Unlike most construction materials, when grown with restorative agricultural techniques the more bamboo we use for construction the better for the environment. This is due to the carbon capture, the avoided deforestation, and minimizing the land needed to grow construction material.

The element of beauty that bamboo adds uplifts the spirit as well. Bamboo offers a symbol of hope for a sustainable future.

## References

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Lou YP, YX Li, K Buckingham, G Henley, GM Zhou. 2010. Bamboo and climate change mitigation. INBAR Technical Report No. 32. International Network for Bamboo and Rattan, Beijing, China. 20 pp.

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Multi-unit Condominium finished in 2018



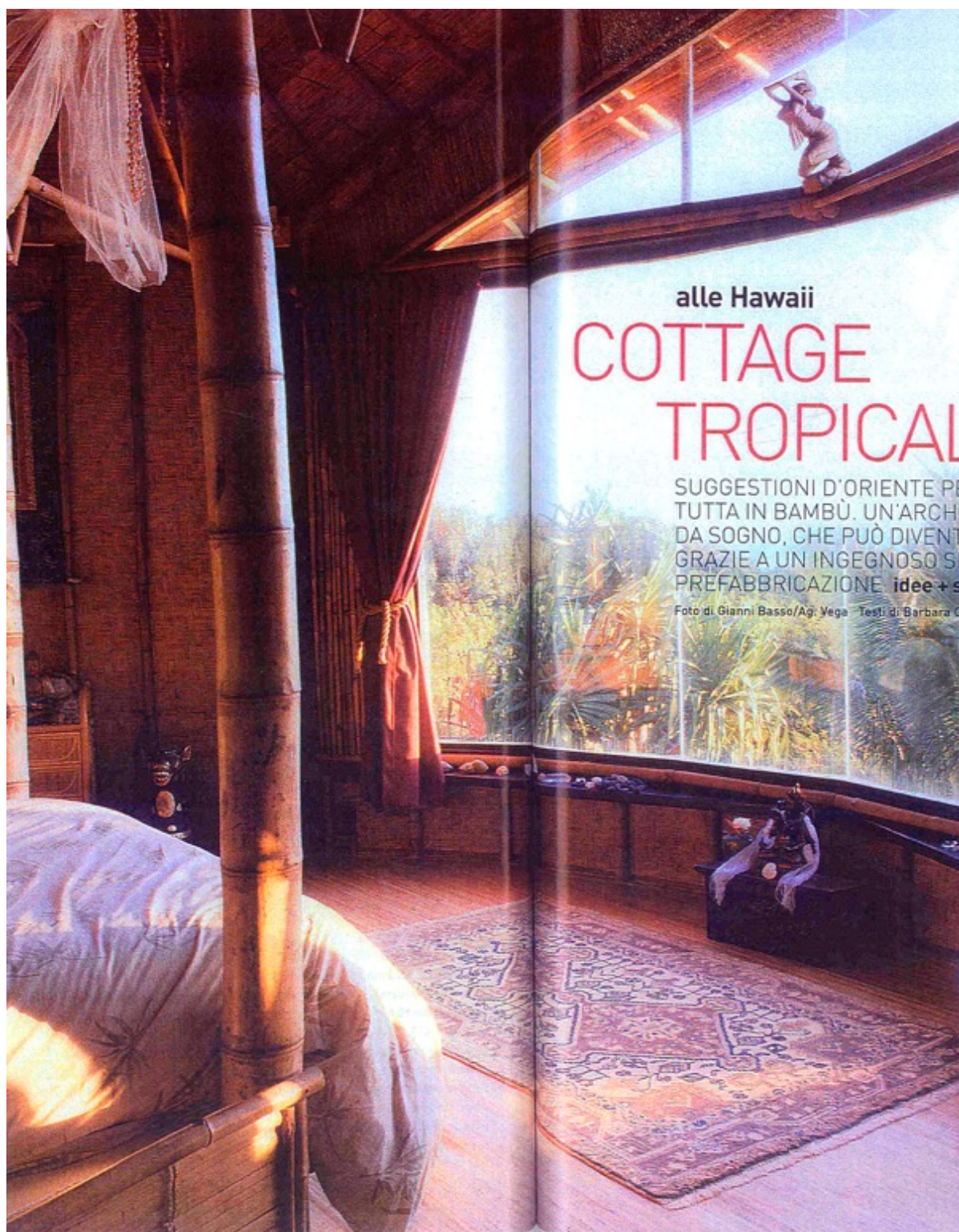












alle Hawaii

# COTTAGE TROPICAL

SUGGERIMENTI D'ORIENTE PER  
TUTTA IN BAMBÙ. UN'ARCHITETTURA  
DA SOGNO, CHE PUÒ DIVENTARE  
GRAZIE A UN INGEGNERO SINGHAPURA  
PREFABBRICAZIONE **idee + s**

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# Hawaii: Where to really get away from it all on the Big Island



Guests can enjoy a saltwater pool at Kipuka, a series of cottages without the usual resort offerings such as shops and restaurants. (Kipuka)

By **Jay Jones**



Cottages at Kipuka contain comfortable amenities such as hotel-grade beds, walk-in showers and fridges, but no ovens. The adventurous can try their hand at cooking in a solar oven. (Kipuka)