THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

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Campus Trees to Reduce Embodied Carbon in New Construction

The much-loved mature Acacia tree grove across from Shaw Auditorium made way for the construction of the new Martin Ka Shing Lee Innovation Building in late 2022. These trees are not native to Hong Kong, but the year-round greenery and wide, inviting leaf canopy had created a beautiful natural oasis for the campus.

Typically, felled trees from construction sites are ground into wood chips or mulch and used as landscape amendments. While this makes use of the material, it represents a low-value-added solution. For this new Innovation Building, HKUST was determined to find a better and longer-term solution. The project management team learned that the lumber from Acacia trees has a mix of deep brownish and reddish hues and is dense enough for woodworking. The challenge is that Acacia trees do not grow straight; they meander and curve in ways that make them less attractive for harvesting. This is why the majority of Acacia trees in Hong Kong go straight to the chippers. The team also recognized that harvesting trees was not in the Innovation Building's capital budget, and harvesting and preserving the wood from these trees would be expensive, especially since one of the last remaining sawmills in Hong Kong had just gone out of business.

However, the project team persisted in investigating how to gain the most value from the Acacia grove. They recognized that utilizing the wood from the mature trees would trap carbon dioxide, effectively

removing it from the atmosphere and reducing our embodied greenhouse gas emissions from the construction site by around 75 tons. Further, since carbon is stored in the waste wood and raw materials are harvested and manufactured locally in a less energy-intensive way, making furniture and other products would result in a lower life cycle environmental impact. Finally, in a city that is designed for typhoons and extreme weather, the local community is accustomed to buildings that are concrete and steel-intensive. Utilizing locally harvested wood in our buildings represented an opportunity to reconnect our campus community to the natural world in a meaningful way.

Outcomes

After making the case to senior leadership, the project team was able to secure additional funding to carefully remove these trees in ways that preserved the value of the wood so they could be dried, milled into planks, and brought back to campus in the form of new tabletops, furniture, panelling, and other value-added resources for the interiors of new construction. Even the small branches and sawdust from the trees were used for compost on campus so that we could retain the full cycle of value from these resources. Of the 97 trees on the original site, 34% were retained on site, and 64% of the remaining trees with broader diameters were collected to produce usable lumber.

Campus users can appreciate the beauty and heritage of these beautiful trees in their new forms on campus at the newly renovated Student Center, as furniture at the HKUST offices, as acknowledgment plaques around campus, and other installations. When the Innovation Building is completed in 2025, visitors will be able to see lots of interior amenities and furniture from the trees while learning about the value of the trees and their contribution to regulating carbon emissions.

Key Takeaways for Other Institutions

A key lesson from this project is how systems thinking approaches can help guide project and design teams. While a development team might take a narrow view—seeing trees within a site boundary as an impediment—the design method can include conversations about seeing the entirety of the process from different angles. How many items that seem like waste are actually valuable? How can building materials come from the site itself? How can we utilize the design process to emphasize a circular economy view of where materials come from?

For future tree felling on our campus, HKUST has embraced the lessons learned from this project and developed a new Tree Felling and Planting Policy to maximize the value of trees at the end of their lifespan. Before trees are felled, they should be examined for health and amenity value. Some may be useful for products (for example, the Aquilaria is a local tree that produces a fragrant oil that is used for incense and perfumes, and the Cinnamomum Camphora produces an oil that is an excellent mosquito repellent). Those trees with valuable hardwood shall be cut and sorted for maximum reuse. Wood logs that are kept shall be more than 200 mm in diameter, and not less than 1.5 meters long, preferably over 2 m. Where available, existing saplings of native species and exotic species with value shall be transplanted to a suitable site in HKUST.

Contact

Marcus Leung-Shea Senior Manager, Sustainability / Net-Zero
marcus.leungshea@ust.hk