Three Cheers for Abe's High-Tech CLT Wooden Arrow: The Future of Japanese Construction 安倍氏のハイテク「木の矢」を称賛する?CLTと日本建築の未来

Andrew DeWit

The attached August 7 Bloomberg article, "Japanese Women Armed With Chainsaws Head to the Hills Under Abe's Plan", legitimately lauds this Abe initiative that promotes women and Japanese forestry, especially high-tech and environmentally friendly forestry. The article reports that 3000 women are entering the wood business in a variety of capacities, including as lumberjacks. Further expanding women's opportunities in non-traditional roles is a no-brainer in any context, but especially in Japan. Japanese women continue to make inroads in construction, higher education and other areas. But their below 70% rate of employment, between 25 and 54 years of age, is lowest among the world's wealthiest countries, and they tend to be concentrated in gendered occupations and held back from managerial positions. The sight of women wielding chain saws might further cut through deeply entrenched stereotypes in the Diet, Keidanren, small business and other men-dense (dense-men?) venues. It may also help keep younger women in the 896 cities, towns and villages that face "extinction" by 2040 due to the continuing flight of young women to Tokyo and the other large city-regions.

Strimmer in hand, opening up opportunity
(http://www.bloomberg.com/news/2014-08-06/women-harvesting-trees-meet-two-planks-of-abe-japan-plan.html)

The focus on the wood industry per se comes in the June 24, 2014 revision of the "New Growth Strategy," which adds several clear government commitments in forestry. These include the use of more domestically-sourced wood waste for use as biomass fuel as well as lumber for building materials. Perhaps paradoxically, these initiatives could be environmentally friendly. Roughly 66% of Japan is forested, and forest volume is expanding by 100 million cubic metres per year. This expansion is greatly in excess of Japan's consumption of 70 million cubic metres of wood per year. Moreover, Japan sources 72% of this wood consumption from overseas, often from areas where forests are shrinking such as Indonesia, meaning that Japan uses little of its domestic forests' growth. In consequence, Japan's forests on the whole are ageing – half of all trees are over 45 years - and declining in their capacity to sequester carbon. Japan's forests' carbon sequestration peaked at 25 million tons in 2005 and had declined to 21 million tons by 2012.

Table 1.6
Surface Area by Use

(1,000 square kilometers)

Year	Total	Forests	Farmland	Inland water	Roads 1)	Building land 2)	Others
1980	377.7	252.6	56.1	11.5	10.4	14.0	33.1
1990	377.7	252.4	53.3	13.1	11.4	16.0	31.5
2000	377.9	251.1	49.1	13.5	12.7	17.9	33.6
2010	377.9	250.7	46.7	13.3	13.6	19.0	34.7
(%)	100.0	66.3	12.4	3.5	3.6	5.0	9.2

1) Including farm roads and forest roads, etc. 2) Including industrial land and other land for buildings.
Source: Ministry of Land, Infrastructure, Transport and Tourism.

Japan's Surface Area By Use
(http://www.stat.go.jp/english/data/handbook/c0117.htm)

In short, there are multiple good reasons to put more Japanese women (and men) to work in the nation's forests and on forest-related technology. Perhaps the most promising technology

highlighted in the Bloomberg article is "cross-laminated timber," or CLT. This "engineered wood" technology involves gluing bits and pieces of wood together into large structural elements that has begun to displace the energy- and carbon-intensive concrete and steel in tall buildings. First patented, in France in 1985, the first multi-story CLT residential building went up in Styria, Austria in 1998.[1] At present, the world's tallest CLT building is the 10-story (32.17 metres) Forte Apartment complex, in Melbourne Australia, whose construction from CLT rather than steel and concrete saved time and money as well as 1,451 tons of carbon.[2] In addition, the Forte building's construction from wood has resulted in greater energy-efficiency and reduced water costs, roughly 25 percent less than a typical structure of its class, and is compliant with building codes. A third-party lifecycle (50 year) assessment of the Forte building also found that its greenhouse gas emissions would be 22 percent below a comparable concrete and steel structure, a reduction that "has never been achieved by an Australian residential building before."[3]

Destruction of Indonesian Forests
(http://www.jatan.org/eng/indn02_a.html)

More generally, the use of CLT in high-rise building appears positioned for a boom. Stories on it have migrated from the specialist community into the mainstream press over the past two years. And of late, the interdisciplinary assemblage of 11,000 designers, planners, engineers and consultants who compose the multinational ARUP have been prominent in publicizing CLT. Their August 5, 2014 story on "A short history of tall wood buildings" includes several examples of recent CLT and other engineered wood tall buildings, in addition to several beautiful ancient structures.[4] The new edition of the ARUP A2 business magazine also describes the engineered-wood boom's benefits. They point out that accelerating urbanization and concerns about sustainability make 10-20 storey wood buildings very attractive for increasing numbers of architects, engineers and developers.[5]

Forte building Melbourne
(http://www.thefifthestate.com.au/archives/51883/)

The Bloomberg article which follows details the growth strategy's focus on accelerating the deregulation necessary to get CLT into the building mix. The bureaucrats in the Ministry of National Lands, Transport and Infrastructure and the Forestry Agency are working to a schedule that would permit the diffusion of CLT by 2016, after studying its strength and other properties in test projects. But as the ARUP and others describe, there is already ample evidence that CLT is at least as fire- and earthquake resistant as steel and concrete. Indeed, in 2007 an Italian-made CLT building shipped to Japan for severe earthquake tests "survived without significant damage or residual displacements and then was shipped back to be used as a student residence in Italy."[6]

One of the world's oldest wood buildings, Horyu-ji in Nara, Japan
(http://ja.wikipedia.org/wiki/奈良県**#mediaviewer/**ファイル**:Horyu-ji08s3200.jpg)**

The resilience of CLT is one reason it is being used in the rebuild of Christchurch, New Zealand, which was severely damaged by earthquakes in 2010 and 2011.[7] Japan itself is a site of rapidly expanding interest in CLT, as can be seen from the fact that the Japan CLT Association had only a few members when it was set up on January 19 of 2012, but has 158 members as of July 2014.[8] The Nikkei newspaper of June 24 reports that, from this fall, the Abe regime is ready to subsidize half the cost of CLT buildings in order to stimulate regional economies as well as get more CLT structures in place to whet the appetites and imaginations of builders.[9] As the June 2014 edition of the Norin Kinyu, Monthly Review of Agriculture, Forestry and Fishery Finance, argues in a page 1 piece on "Tall Wood Buildings," it is time to diffuse this robust, sustainable building technology throughout Japan and especially in the structures for the 2020 Olympics.[10]

Japanese Women Armed With Chainsaws Head to the Hills Under Abe's Plan (http://www.bloomberg.com/news/2014-08-06/women-harvesting-trees-meet-two-planks-of-abe-japan-plan.html)

Aya Takada and Katsuya Kuwako

Junko Otsuka quit her job in Tokyo and headed for the woods, swapping a computer for a bush cutter and her air-conditioned office for the side of a mountain. She was part of a new wave of women taking forestry jobs, the result of economic, social and environmental policies sprouting in Prime Minister Shinzo Abe's **Japan** (http://topics.bloomberg.com/japan/).

Otsuka, a 30-year-old graduate from **University of Tokyo** (http://topics.bloomberg.com/university-of-tokyo/), said she's fine with the 20 percent pay cut to be the first female logger at Tokyo Chainsaws, a lumber company. The Sugi and Hinoki trees she harvests -- cedars and cypresses in Japan -- are used to build local homes under the government's program to encourage the use of domestic wood.

Otsuka is one of about 3,000 women joining Abe's campaign to revive forestry and logging as part of his growth strategy for the country. Along with farming, it's seen by the government as a key to creating jobs and sustaining population in rural areas as manufacturers such as **Sony Corp. (6758)** (http://www.bloomberg.com/quote/6758:JP) and **Nissan Motor Co. (7201)** (http://www.bloomberg.com/quote/7201:JP) shift their factories to **emerging markets** (http://topics.bloomberg.com/emerging-markets/).

"When I studied forestry at university, I learned that trees on Japanese mountains, ripe for harvest decades after planting, were left untouched as nobody wanted to do the job," Otsuka said in an interview during a break from her work on a 95 degree-Fahrenheit (35 Celsius) day on the side of Mount Mitake, about 40 miles from the center of Tokyo. "I am in the place where I should be."

Postwar Harvest

More than two-thirds of Japan's roughly 146,000 square miles of land is wooded, much of it reforested after widespread harvesting for rebuilding following World War II. About 40 percent of the country's forests are man-made and ready for logging and replanting, according to Shinkichi Mizutani, executive director of More Trees, a Tokyo-based conservation group. The need for sustainable management dovetails with the government's push to revitalize communities outside urban centers.

Abe came into office with his three-arrow strategy to end 15 years of deflation that stunted the economy. Nineteen months along, the first two points -- monetary and fiscal stimulus -- have succeeded in stoking inflation. The government now plans corporate-tax cuts, trade

liberalization, reduced barriers for agricultural land consolidation and special zones of lighter regulation to spur investment and raise salaries.

Less than 70 percent of Japanese women between 25 years and 54 years old have jobs, the lowest rate among the world's richest countries, according to estimates by Japan's Cabinet Office. The nation's workforce may swell by more than seven million people and gross domestic product could jump by as much as 13 percent if participation by women equaled that of men, Goldman Sachs Group Inc. said in a report May 6.

Rich Resource

"In advanced economies rich with timber resources, such as **Germany** (http://topics.bloomberg.com/germany/), forestry is an important industry to sustain growth and employment for rural communities," said Hisashi Kajiyama, a senior research fellow at Fujitsu Research Institute in **Tokyo** (http://topics.bloomberg.com/tokyo/). "Japan was an exception because its resources were exhausted in the era of postwar rebuilding. The situation is beginning to change as trees replanted after excessive logging are becoming available for commercial use."

The prime minister set a goal of maintaining Japan's population above 100 million for the next 50 years by revitalizing regional economies and enhancing women's roles. In May he received a warning from the Japan Policy Council that almost half of Japanese communities risk extinction as younger workers migrate to urban areas in search for jobs.

World's Wood

The value of Japan's wood products has fallen 80 percent from its 1980 peak of 967 billion yen ($9.5 billion) after tariff cuts and the yen's appreciation boosted imports and depressed domestic prices, according to the Ministry of Agriculture, Forestry and Fisheries. The nation agreed to eliminate import quotas in 1964 and cut tariffs to as low as 3.9 percent from 20 percent, spurring an influx of cheap products. Purchases from overseas jumped 27 percent to 1.22 trillion yen last year. Lumber futures traded in **Chicago** (http://topics.bloomberg.com/chicago/) fell 6.2 percent this year.

Abe plans to double Japan's wood output to 39 million cubic meters by 2020 and raise the share of reliance on domestic sources to 50 percent, from 28 percent now. The government is considering boosting subsidy payments to forest workers and companies to meet the goal. The policy could increase sales for companies such as **Sumitomo Forestry Co. (1911)** (http://www.bloomberg.com/quote/1911:JP) and **Mitsui & Co. (8031)** (http://www.bloomberg.com/quote/8031:JP), the biggest private owners of Japanese forests after **Oji Holdings Corp. (3861)** (http://www.bloomberg.com/quote/3861:JP) and Nippon Paper Group Inc. Higher production would curb imports from countries including the U.S., **Canada** (http://topics.bloomberg.com/canada/) and **Russia** (http://topics.bloomberg.com/russia/).

Buildings, Power

To increase consumption of Japanese wood products, the government plans to revise regulations by 2016 so that cross-laminated timber, or CLT, can be used for buildings and condominiums, displacing steel and concrete. The revision would follow a 2010 law that encourages local governments to use domestic wood when they build public facilities and incentives offered last year to buyers of Japanese timber.

The housing sector is of "major importance" to Japan's demand as 25 percent to 30 percent of new wooden houses are built to replace residences constructed before 1981, when the

government tightened anti-earthquake standards, according to Hakan Ekstrom, president of Wood Resources International LLC, a forest industry consultant based in Bothell, **Washington** (http://topics.bloomberg.com/washington/). About 150,000 units a year will be replaced in the future, up from as many as 120,000 annually the past five years, he said.

The government also promotes the use of unsold logs and wood scrap as alternative fuel at **power plants** (http://topics.bloomberg.com/power-plants/), improving earnings for the timber industry. Japan's forestry agency estimates the volume of lumber waste available for power generation at 22 million cubic meters a year, enough to produce electricity for 2.4 million households.

Excessive Logging

The country's increased use of its own lumber could help curb excessive logging overseas, as 5 million hectares of forests disappear globally annually, according to the agriculture ministry. In Japan, forests are expanding by 100 million cubic meters a year, more than the nation's consumption of 70 million.

Japan, the world's fourth-largest buyer of timber products, needs new laws and stricter oversight to stamp out imports of illegally logged wood, the Environmental Investigation Agency, a **lobbyist group** (http://eia-global.org/about-eia/), said on June 11. Siberian pine competes directly with home-grown wood, according to the EIA. Without illegal timber imports, demand for domestic wood would rise by about 13 percent, according to a study by Japan's **Hosei University** (http://topics.bloomberg.com/hosei-university/).

"If Japan increases production and consumption of domestic wood products, it would be helpful to curb excessive logging overseas," according to Mizutani from More Trees. "Logging should be done in a sustainable manner. Otherwise, it is harmful to our environment."

Carbon Consumption

A revival of forestry may also help Japan cut greenhouse gas emissions in the world's third-biggest economy. More than 50 percent of Japanese forests are made of trees older than 45 years. Aging weakens their capacity to consume carbon dioxide, the gas blamed for global warming, said Hiroshi Ishii, assistant director at the forestry agency's policy planning division.

Carbon absorbed by Japanese forests decreased to 21 million tons annually in 2012 from the peak of 25 million tons in 2005 as trees aged, according to Ishii. Replanting with younger trees will increase consumption, he said.

Ryosuke Aoki, the 37-year-old president and founder of Tokyo Chainsaws, said 80 percent of the company's revenue comes from conservation work subsidized by national and local funds. His dream is an independent and profitable business.

"We are going to buy nine hectares of land in a mountain near our office, and seek funds from individuals to replant trees there," he said in an interview. "Three decades later, we will return to our investors products made from their trees."

Heal People

Before Otsuka joined Tokyo Chainsaws last year, she was commuting on a crowded train and sitting in front of a computer late into the night organizing trade shows.

"We can produce from forests not only wood products but also a comfortable environment that can heal exhausted people from big cities," she said. "If my experience attracts people to forests and forestry, it will be great."

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[1] On the history and application of CLT, see Wolfgang Weirer, "History and Development of CLT using the Example of KLH" (http://www.woodworks.org/wp-content/uploads/CLT-Weirer.pdf).

[2] A brief (5:55 minute) and very well done interview with the project head can be found here (http://www.youtube.com/watch?v=pHpthNBiYqE).

[3] On this, see "Forte leads the way for cross laminated timber construction," (http://www.fmmagazine.com.au/news/green-zone/forte-leads-the-way-for-cross-laminated-timber-construction/#.U-eRqVZBAVp) Green Zone, August 15, 2013.

[4] See Robert Gerard, "A short history of tall buildings," (http://www.arupconnect.com/2014/08/05/a-short-history-of-tall-wood-buildings/) ARUP CONNECT, August 5, 2014.

[5] See "Why wood is good," ARUP A2 Magazine Issue 15, pp 9-11, which is free for download here (http://publications.arup.com/Publications/A/A2_magazine/A2_magazine_issue_15.aspx).

[6] See Pierre Quenneville and Hugh Morris, "Japan Kobe Earthquake Shake Table Simulation," (http://www.timberdesign.org.nz/files/Quennevile%5FMorris%5FKobe%5FShake%5FTable1%2Epdf) NZ Timber Design Journal, Issue 4 Volume 15, 2007.

[7] See Dave Parker, "Structural timber: Technical Growth pays off," (http://www.nce.co.uk/features/structures/structural-timber-technical-growth-pays-off/8665229.article) New Civil Engineer, July 4, 2014.

[8] The Association's list of members (in Japanese) is here (http://clta.jp/wp-content/uploads/2014/07/0d464ece91b9ef65b950aca0373d1be6.pdf).

[9] See (in Japanese) "New Growth Strategy: Government to Accelerate Diffusion of Domestic Cedar Construction,"

(http://natulogy.com/news/5823/) Nikkei Shimbun, June 24, 2014.

[10] See the article (in Japanese) by Okayama Nobuo here (http://www.nochuri.co.jp/kanko/pdf/nrk1406.pdf).

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