

JAPAN: HOUSING SECTOR REQUIRES 40% FROM WOOD DEMAND

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Japan is an island nation in East Asia. Located in the Pacific Ocean, it lies to the East of the Sea of Japan, China, North Korea, South Korea and Russia, stretching from the Sea of Okhotsk in the North to the East China Sea and Taiwan in the South. Japan is an archipelago of thousands islands the characters that make up Japan's name (Ni-hon) mean "sun-origin", which is why Japan is sometimes referred to as the "Land of the Rising Sun".

GEOGRAPHY

Japan has a total of 6.852 islands extending along the Pacific coast of East Asia. Its surface is about 377,835 km². The four largest islands are Honshu, Hokkaido, Kyushu, and Shikoku, which together comprise about 95% of Japan's land area. The country, including all of the islands it controls, is spanning 3,000 km from North-East to South-West and only 300 km from West to East. Together they are often known as the Japanese Archipelago. The islands of Japan are located in a volcanic zone on the Pacific Ring of Fire (240 volcanos). Japan has 108 active volcanoes. Destructive earthquakes, often resulting in tsunami, occur several times each century. The 1923 Tokyo earthquake killed over 140,000 people. More recent major earthquakes are the Great Hanshin (1995) and the Tōhoku (2011) with a 9-magnitude and triggered a large tsunami. The last major one was on 24th May 2012, with a 6.1 magnitude struck off the coast of northeastern Japan. About 73 % of Japan is forested, mountainous, and unsuitable for agricultural, industrial, or residential use. As a result, the habitable zones, mainly located in coastal areas, have extremely high population densities (partially after www.wikipedia.org).

CLIMATE

The climate of Japan is predominantly temperate, but varies greatly from North to South. Japan's geographical features divide it into six principal climatic zones: Hokkaidō, Sea of Japan, Central Highland, Seto Inland Sea, Pacific Ocean, and Ryūkyū Islands. The northernmost zone, Hokkaido, has a humid continental climate with long, cold winters and very warm to cool summers. Precipitation is not heavy, but the islands usually develop deep snowbanks in the winter. The average winter temperature in Japan is 5.1°C and the average summer temperature is 25.2°C. The main rainy season begins in early May in Okinawa, and the rain front gradually moves North until reaching Hokkaidō in late July. In most of Honshū, the rainy season begins before the middle of June and lasts about six weeks. In late summer and early autumn, typhoons often bring heavy rain.

BIODIVERSITY

Japan has nine forest ecoregions which reflect the climate and geography of the islands. They range from subtropical moist broadleaf forests in the Ryūkyū and Bonin Islands, to temperate broadleaf and mixed forests in the mild climate regions of the main islands, to temperate coniferous forests in the cold, winter portions of the Northern islands. Japan has over 90,000 species of wildlife, including the brown bear, the Japanese macaque, the Japanese raccoon dog, and the Japanese giant salamander. A large network of national parks has been established to protect important areas of flora and fauna as well as 37 Ramsar wetland sites. Four sites have been inscribed on the UNESCO World Heritage List for their outstanding natural value.

DEMOGRAPHICS

Japan has the world's tenth-largest population, with over 127 million people. Honshū's Greater Tokyo Area, which includes the de facto capital city of Tokyo and several surrounding prefectures, is the largest metropolitan area in the world, with over 30 million residents. Japanese society is linguistically and culturally homogeneous, composed of 98.5% ethnic Japanese, with small populations of foreign workers. Zainichi Koreans, Zainichi Chinese, Filipinos, Brazilians and Peruvians, mostly of Japanese descent, are among the

*Since 1996, the author has been in Japan for many Pacific RIM conferences. During his visits at different universities, research units and associations he gave courses and seminars. All these experiences gave him an overview of the Japanese forestry, wood industry, higher education, economy society and traditions.

small minority groups in Japan. Japan has the longest overall life expectancy at birth of any country in the world: 83.5 years for persons born in the period 2010–2015. The Japanese population is rapidly aging as a result of a post–World War II baby boom followed by a decrease in birth rates. In 2009, about 22.7% of the population was over 65, by 2050 almost 40% of the population will be aged 65 and over, as in 2006. Japan's population is expected to drop (-25%) to 95 million by 2050 (different sources).

ECONOMY

Some of the structural features for Japan's economic growth developed in the Edo period (1600's), such as the network of transport routes, by road and water, and the futures contracts, banking and insurance of the Osaka rice brokers. As of 2012, Japan is the 3rd largest national economy in the world, after the United States and China, in terms of nominal GDP (45,920 USD), and the fourth largest national economy in the world, after the United States, China and India, in terms of purchasing power parity. As of January 2011, Japan's public debt was more than 200% of its annual gross domestic product, the largest of any nation in the world. The service sector accounts for 75% of the gross domestic product. Japan has a large industrial capacity, and is home to some of the largest and most technologically advanced producers of motor vehicles, electronics, machine tools, steel and nonferrous metals, ships, chemical substances, textiles, and processed foods. Japan is home to 326 companies from the Forbes Global 2000 or 16.3% (as of 2006). Agricultural businesses in Japan cultivate 13% of Japan's land, and Japan accounts for nearly 15% of the global fish catch, second only to China. As of 2010, Japan's labor force consisted of some 66 million workers. Japan has a low unemployment rate of around 4%. Almost one in six Japanese, or 20 million people, lived in poverty in 2007. Housing in Japan is characterized by limited land supply in urban areas. Japan is the second-largest producer of automobiles in the world. Japan's main export markets are China (19%), the United States (16%), South Korea (8%), Taiwan (6%) and Hong Kong (6%) as of 2009. Its main exports are transportation equipment, motor vehicles, electronics, electrical machinery and chemicals. Japan's main import markets as of 2009 are China (22.2%), the US (11%), Australia (6.3%), Saudi Arabia (5.3%), United Arab Emirates (4.1 %), South Korea (4%) and Indonesia (4%). Japan's main imports are machinery and equipment, fossil fuels, foodstuffs (in particular beef), chemicals, textiles and raw materials for its industries (especially wood products). Although Japan has officially renounced its right to declare war, it maintains a modern military with the sixth largest military budget, used for self-defense and peacekeeping roles (partially after www.wikipedia.org).

FOREST PROFILE

Hills and mountains cover 70% of the land. Forests cover 24 million ha or 67% of the land. Among temperate countries, only Finland surpasses Japan in terms of ratio of forest cover. But because of its large population, the forest area per capita is a mere 0.2 ha or about one-third of the global average (www.worldforestry.org). According to Japan's forestry agency (1995) there were 53% natural forests left in the country. Here the term "natural forests" includes a secondary forest grow naturally. Traditional people have preserved their forests, understanding the ability of the forests to prevent natural disaster such as landslides or floods and, in particular, they have carefully stewarded an area called "satoyama", which is located between a village and the wilderness. It mainly consists of secondary forests, farmland, farm ponds, and meadows that are habitat for wild animals and plants, while and at the same time supplying crops. In general, the species distribution in terms of areas is as follows: about 50% predominantly coniferous, more 42% predominantly broadleaved, 7.4% mixed forest stands, and about 0.6% predominantly bamboos. Japan's climate is very different from north to south, and gives rise to various kinds of forests. Japan's forests are classified into five types:

- *Sub-tropical zone forest* covers Ogasawara and the southwestern islands, where the average temperature is 21°C. Sub-tropical trees and mangrove grow here.
- *Warm temperate zone forest* located in Kyushu and Shikoku, and in the southern part of Honshu, where the average temperature is from 13°C to 21°C.
- *Cool temperate zone forest* in the central and northern parts of Honshu and the Oshima Peninsula of Hokkaido.
- *Mixed forest of coniferous and deciduous broad-leaved trees*, where the average temperature is almost the same as in the Cool temperature zone forest. It is located in the lowlands north of the Oshima Peninsula.

Reforestation and forest maintenance have been part of the Japanese culture for over 400 years, and in some areas for as long as 600 years. Living under conditions of steep topography, high rainfall and frequent earthquakes, the people of Japan have long developed a keen appreciation of the direct role of forests in mitigating natural disaster. Japan has preserved its land while utilizing the forests effectively for centuries. The history of organized initiatives to conserve forests dates back to the beginning of the Edo Era (1600's) with the designation of specific forest areas for water conservation and sand stabilization. Official

orders were issued placing restrictions on felling and exploitation in order to prevent forest degradation. The struggle to conserve forests was sustained through the centuries and eventually gave birth to the Forest Law enacted in 1897 establishing a nation-wide forest protection system. Multi-storey forest management places emphasis on a low-impact harvest system which helps ensure that mountainsides are not denuded. Rational management of natural forests, combined with diverse systems, provide environmental benefits. Forests are selectively harvested and result in the development of mixed stands of trees having different heights and more than one species, consistent with the "Intensive Management System for Multi-storey Forests". About 41% of Japan's forest area, more than 10 million ha, consists of plantations. Major plantation species are cedar, cypress and pine in most parts of Japan; to note specifically Sugi - Japanese Cedar (*Cryptomeria japonica*) and Hinoki - Japanese Cypress (*Chamaecyparis obtusa*) which were planted during the 1950's under the assumption of intensive management for high-quality timber. Felling is restricted in fragile areas for both plantation and natural forests which play a crucial role for protection of Public benefits and services. Approximately 64% of plantations are less than 40 years old and therefore need sustained tending. The total growing stock in Japan's forests has been calculated at 3,500 million m³, and a good half of it consists of softwood species in man-made forest plantations. About 42% of forests are in public ownership, and 58% of forests are private. 49% of the private forest (14.5 million ha) is natural and 46% is planted. 31% is national forest (7.8 million ha) and 61% of it is natural (31% plantation). Only 11% are public forest (2.8 million ha) and 51% natural (44% plantation). Japan has more than 2.5 million ha of land in formally protected areas. Included in this total is a network of specific forest reserves (after Japanese Forestry Agency).

WOOD PRODUCTS AND TRADE

Supply/demand of the wood industry

Japan is a major consumer of wood and paper products. It has extensive domestic forest product processing industries, which utilize a large quantity of imported raw materials. Even though two thirds of its land is covered by forests, Japan is one of the world largest wood importers. Foreign imported timber is cheaper than Japan's domestically grown logs, even after considering freight costs for importing it. Japan is one of the world's largest importers of forest products and by far the largest importer of tropical logs and wood products (sawnwood and panels) after China. Japan's forest industries are generally characterized by large, modern, technologically advanced mills. Nonetheless, only a few number of smaller, older sawmills still operate. Harvesting in Japan's own forests is well below sustainable levels of growth and production due to the very high costs and complicated rules for forest management. The wood demand was approximately 70 million m³ in 2010, which has been decreasing in recent years mainly due to recession of economy. Among the total wood products demand, the largest is plywood, 46% and the next is lumber for sawn timber, 36%. Unfortunately importing wood has not only supported deforestation in other countries, it has also caused a decline in Japan's local processing industry. Tree farming was encouraged as a national policy in the middle of the 20th century. Now many tree farms have been abandoned and are particularly vulnerable to landslides during heavy rains. The demand for industrial wood decreased within 20 years dramatically. In 1990 the amount of wood for industrial use (including pulp and paper) was 111 million m³ and dropped to 82 million m³ in 2007. The supply with domestic wood (for industrial purposes) was close to 30 million m³ in 1990 and dropped to the half in 2003 (16 million m³) and increased consecutively the next years and reached 19 million m³ in the last years (after Japanese Forestry Agency, Hidayat, 2007).

Energy use of woody biomass

Among the variety of woody biomasses, most of the "mill residue wood" and "construction refuse wood" is almost fully utilized. However, more than 20 million m³ of "unused thinned wood," a by-product of wood production, is estimated to be left in the forests every year. Use of this "unused thinned wood" is indispensable for the promotion of energy production using woody biomass. In August 2011, the "Act on Purchase of Renewable Energy Sourced Electricity by Electric Utilities" was adopted in the Diet. In accordance with the legislation, the "Feed-in Tariff Scheme for Renewable Energy" was introduced in July 2012. The scheme will support power generation from biomass. The major increase in wood demand registered in the last two decades is for fuel wood, which doubled from 0.5 to more than 1 million m³. Also the use of pellets for heating starts to increase in Japan and also the importation of them (after Japanese Forestry Agency).

Wood processing industry

A rapid decrease of this industry was reported since 1990s which changed dramatically the no. and national infrastructure. The no. of sawmills reduced from 16,881 in 1990 to 7,905 in 2007 and it continued. The volume of logs processing into sawwood decreased from 30 million m³ in 1990 to less the 10 million m³ today. According to Pöyry (2009) the imports of softwood logs decreased from 12 million m³ in 1999 (45%

Russia, 30% USA) to less than 4 million m³ in 2010 (50% USA, 30% Canada). According to the report of the Japan Lumber Importers' Association the demand for processing logs (sawnwood and veneer) in 2014 is forecasted to be 4.4 million m³, which falls below the forecasted shipments of 4.6 million m³ (74% North America) for 2013 (after Japan Lumber Journal, Vol.55/2, 2014). The imports of sawn softwood from Europe (especially Alps region and Scandinavia and also Oceania) assure highly quality timber for construction (spruce, pine) and the Japanese investments in South East Asia allow imports of cheap timber (plantation pine). Pöyry (2010) signalized that the exportation of soft sawnwood from Europe to Japan decreased also from 3 million m³ in 2005 to less than 2 million in 2009. An increase of this amount due to the reconstruction activities and increase of wood housing is foreseen. According to the report of the Japan Lumber Importers' Association the demand for sawnwood in 2014 is forecasted to be 6.9 million m³, which falls below the forecasted shipments of 7.8 million m³ (48% Europe, 36% North America) for 2013 (after Japan Lumber Journal, Vol.55/2, 2014). The significant development of this industry is the wood lamination business which increased the capacities by three times within 15 years to 1.65 million m³ based partially on imported panels.

Plywood Supply

Generally the no. of plywood companies decreased from over 500 in 1990 to less than a half in the last years. Special veneer production supposed to stay constant. Commodity plywood is strongly imported. Compiled by the Japan Plywood Manufacturers' Association from the Trade Statistics of the Ministry of Finance, the amount of imported plywood in November 2013 was 301,835 m³ (7.1% increase compared to the same month in the previous year) shifting from a decrease in the previous month to an increase. The largest import country is Malaysia 43.0%, followed by Indonesia 28.5% and China which fell below the results of the same month in the previous year for the 3rd consecutive month to 21.9%. According to Plywood Statistics compiled by the Ministry of Agriculture, Forestry and Fisheries, the amount of production (domestic supply) of regular plywood in November increased to 244,095 m³ (4.3% increase compared to the same month in the previous year), and with the effects of the good condition in housing demand, the amount of shipments also increased to 259,579 m³ (6.2% increase). Because the amount of shipments exceeded the amount of production, the stocks decreased to 165,669 m³ (28.1% decrease). The amount of stocks of softwood plywood was 121,808 m³ (32.1% decrease) decreasing to a level of about two-thirds of the same month in the previous year. According to Pöyry (2009) the Japanese annual production of plywood was 2.3 million m³ and the consumption about 5.1 million m³. Paulitsch (2013) informed about the decrease in the production and consumption of plywood in Japan from over 3 million m³ respectively over 8 million m³ in 2006. At that time 1.5 million m³ were imported from Malaysia and about 1 million m³ from China and Indonesia each (after Japan Lumber Journal, Vol.55/1, 2014).

Particle - and Fiberboard

Japan is operating together with South Korea many production lines for wood based panels in South-East Asia and Oceania, outside of their country. Much more than one and a half decades ago Japan was the main engine for these developments in South-East Asia and Oceania. It looks to be for Japanese much economically to produce the (half-finished) panels in regions with available forest plantations at high wood availability and low wood prices, labour costs and environmental requests. The installed capacity for particleboard in 2010 was 2.5 million m³ in about 20 lines of 14 companies. In many of these production lines the capacity is small and technological not more according to the state of the art (WbPI, 2012). These production capacities are not fully used and are partially closed. According to Pöyry (2009) the Japanese annual production of particleboard was about 1 million m³ and the consumption about 1.2 million m³. Japan supported and used between the first nations the technology of wood recycling for the panel production.

The no. of the MDF lines operating in Japan is low compared to the neighborhood and market request reaching a capacity of 635,000m³ in four older lines not operating and full load. According to Pöyry (2009) the Japanese annual production of MDF was about 330,000m³ and the consumption about 650,000m³. Some Japanese industrial groups specialized in housing are operating many production lines for different types of panels inside and outside of the country.

Japan has no OSB production facility inside the country but is importing especially from North-America about 200,000m³. According to Pöyry (2009) this value was much higher before 2007.

Wood products exports

Wood demand in developing countries is increasing including in China. In 2011, China accounted for the largest share in the value of wood products exported from Japan. The Government is promoting the export of wood products to China and Korea, through the exhibition of domestic housing materials in these countries. The Japan Wood Products Export Promotion Council is also participating in the revision of China's

“Wooden Structure Design Standard”, to ensure that Japan’s domestic wood species are included in the Standard.

Housing sector

Very positively report about the prefabricated housing built starts for sale shows an significant increase from approx. 169,000 houses in 2009 to about 260,000 in 2013. From about 975,000 housing starts in 2013 about 540,000 homes were made from a wooden structure (Japan Lumber Journal, Vol.55/1, 2014). Approximately 40% of Japan’s wood demand is used for building construction. In particular, the trend of new housing starts of wooden houses significantly influences wood demand as a whole. Recently, major housing companies have begun to use domestic wood more aggressively in their business activities. The Forestry Agency is promoting local housing projects through the cooperation among forest owners, log producers, lumber producers, and local home builders who are willing to use local wood products. In October 2010, new legislation to promote wood use in public building was enacted. According to the legislation, the Government is promoting wooden structures and wooden interior decorations in public buildings as long as possible. Further, the governmental ministries and local governments are developing their own policies to increase the use of wood in public buildings. In May 2011, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) developed the “Planning and Designing Standard of Wooden Constructions” as a technical standard on the construction and repair of wooden buildings by the Government. This also allows the easy use of CLT, mainly designed and produced in Europe, and the issuing of JAS draft (September 2013) (Japan Lumber Journal, Vol.54/20, 2013).

Furniture imports

Japan’s imports of office, kitchen and bedroom furniture (HS 9403.30) calculated for one month (November 2012) totalled 24.8 million USD. From this value about 7.3% is the share of the office, 34.2% of kitchen and 58.5% of bedroom furniture. This different structure of furniture compared to Europe is to understand according the very limited leaving space and different tradition for eating and sitting. Of imports of furniture in 2012 Chinese manufacturers provided 56.9% of bedroom, Vietnamese about 37.5% from kitchen followed by Indonesia, Philippines and Malaysia (Japan Lumber Journal, Vol.54/1, 2013)

Pulp and paper

The pulp and paper became a very strategic industry of Japan, ranked number 13 between the largest manufacturing industries with a total of 68 billion USD absorbing about 35,000 employees. Currently Japan is placed on the 3rd rank and produces about 31 million t of paper. The pulp industry was 2006 about 10.6 million tons in 21 production lines. At the same time Japan imported about 2.5 million t, especially from Canada (34.7%), USA (24.8%), Brazil (13.6%) and New Zealand (9.7%). The paper and paperboard industry counted about 420 units in the same year. Japan exported about 3.7 million t of recovered paper (83.8% China). Japan consumption of paper and cardboard was 2006 about 250 kg/person, worldwide on 3rd place after US (300kg/p) and Sweden (265kg/p) together with Germany and Austria (Hidayat 2007).

JAPANESE HIGHER EDUCATION IN WOOD SCIENCE

Japan exist has many centers of higher education in wood science, mostly included in to agricultural and forestry faculties. Due to the relocation of wood processing businsses outside the country, maintaining only the final processing of parts inside Japan and the increase of imports for forest products, the number of students in this field decreased too. This development imposed nowadays the merging of institutes dealing with wood in new departments which are not more containing “wood” in their name. The study programs also in this field were influenced by the American system of bachelor (undergraduate), master (graduates) and PhD. The university study is not free of charges.

Kyoto University, Faculty of Agriculture, Department of Forest and Biomaterials Science

[\(http://www.kais.kyoto-u.ac.jp/e/modules/tinycontent0/\)](http://www.kais.kyoto-u.ac.jp/e/modules/tinycontent0/)

Kyoto University, Faculty of Agriculture, Department of Forest and Biomaterials Science includes the following study directions: Biomaterials Design, Wood Processing, Fibrous Biomaterials, Tree Cell Biology, Chemistry of Composite Materials and The Chemistry of Biomaterials. The Laboratory for Wood Processing is concerned with this main subjects: Fundamental problems in wood machining (wood cutting, wood drying, surface roughness etc.), Improvements of woodworking machines and cutting tools and automatization of machining process (FEM, pattern recognition etc.), Scanning of wood and wood based materials (coustic emission, Xray-CT, millimeter-wave etc.). This department together with the Japan Wood Research Society are publishing the prestigious Journal of Wood Science in Springer, Tokyo.

Hokkaido University, Faculty of Agriculture, Environment and Forest Resources Science
(<http://www.agr.hokudai.ac.jp/>)

At the Forest Science Department of Hokkaido University, Faculty of Agriculture, the focus is in forest and use of its products based on both of natural science and social science by fieldworks availing vast research forest, in addition to lectures and experiments inside the university. One of the fields of this department is the Laboratory of Timber Construction. Its current research activities are Mechanical Timber Joints, Static and Dynamic Resistance of Timber Construction, Effective Sustainable Use of Regional Wood Resources.

Kyusyu University, School of Agriculture, Forest Bioscience
(<http://www.agr.kyushu-u.ac.jp/>)

Following departments are included at School of Agriculture of Kyusyu University; Wood Science, Forest Chemistry & Biochemistry, Biomaterial Science, Bioresources Chemistry, Biomacromolecular Materials and Wood Material Technology.

University of Tokyo, Institute of Agriculture, Environmental and Resource Science Course
(<http://www.a.u-tokyo.ac.jp/english/index.html>)

At University of Tokyo, Department of Biomaterial Sciences, is the Laboratory of Wood based Materials & Timber Engineering. A major in Wood Science and Timber Engineering is provided.

Tokyo University of Agriculture and Technology, Faculty Agriculture, Division of Natural Resources and Ecomaterials

(<http://www.tuat.ac.jp/en/department/agriculture/20130228092850/index.html>)

Within the Division of Institute of Agriculture undergraduate students of Department of Environmental and Natural Resource Sciences, master course students of Department of Natural Resources and Ecomaterials and doctoral course students of The United Graduate School of Agriculture are taught. The United Graduate School is an independent three-year Doctoral Course consist of a consortium of the agricultural faculties of three national universities of Ibaraki University, Utsunomiya University and TUAT. The division now consists of 6 professors, 5 associate professors and 3 assistant professors of which 10 teach and research wood science and technology. The average numbers of students per year for undergraduate, master's course and doctoral course are 65, 30 and 5, respectively.

Nagoya University, Agricultural Science, Dept. of Biosphere Resources Science
(<http://www.agr.nagoya-u.ac.jp/index-e.html>)

Dept. of Biosphere Resources Science from Nagoya University includes the Laboratory of Biomaterial Engineering, Laboratory of Biomass Resource Utilization, Laboratory of Forest Chemistry, Laboratory of Timber Engineering and Laboratory of System Engineering for Biology.

Shizuoka University, Faculty of Agriculture, Department for Wood Science
(http://www.agr.shizuoka.ac.jp/index_e.html)

Shizuoka Shizuoka University has about 10,000 students in nine faculties. The Faculty of Agriculture accept yearly about 150 new students. 40 of them like to specialize in Environment and Forest Resources Science. The Department for Wood Science has four laboratories: Wood Physics, Wood Composites, Wood Chemistry and Wood Adhesion.

Professional Association

Forestry and Forest Products Research Institute, Japan, (http://www.ffpri.affrc.go.jp/e_version/index-e.html)

Japanese Forest Society, (<http://www.forestry.jp/>)

Japan Wood Research Society, (<http://www.jwrs.org/>)

Japan Technical Association of the Pulp and Paper Industry, (<http://www.japantappi.org/>)

Japan Wood Preserving Association, (<http://www.soc.nii.ac.jp/jwpa/>)

Wood Technological Association of Japan, (<http://www.jwta.or.jp/>)

Society of Fiber Science and Technology, (<http://www.fiber.or.jp/index.html>)

Society of Materials Science, Japan, (<http://www.jsms.jp/>)

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- <http://www.capa.ne.jp/a-bank/sirakami/>
- <http://www.greenpeace.or.jp/>
- <http://www.gsi.go.jp/>
- <http://www.infoaomori.ne.jp/~nagainpo/>
- <http://www.infobears.ne.jp/rinkuma/index.html>
- <http://www.japantappi.org/e/>
- <http://www.jlj.gr.jp/>
- <http://www.jomon.ne.jp/~misago/index02.html>
- <http://www.kyoboku.com/essay/jyoumon.html>
- <http://www.maff.go.jp/>
- <http://www.nava21.ne.jp/~yamabun/yakutop.html>
- <http://www.pref.aomori.jp/sirakami/>
- <http://www.realwave-corp.com/index2.htm>
- <http://www.rinya.maff.go.jp/>
- http://www.rinya.maff.go.jp/j/kikaku/hakusyo/19hakush/pdf/19_e.pdf
- http://www.rinya.maff.go.jp/j/kikaku/hakusyo/20hakusho/pdf/20_e.pdf
- <http://www.sizenken.biodic.go.jp/isan/y041.htm>
- <http://www.stat.go.jp>
- <http://www.toonippo.co.jp/kikaku/shirakami/index.html>
- <http://www.wbponline.com/>
- <http://www.wsk.or.jp/index.html>



Fujisan (Fujiyama) the highest of Japan, view from conference center Shizuoka.



Wood utilization in the East Gate of Sunpu Castel Shizuoka (1616).



Dept. of Wood Science, Faculty of Agriculture, University Shizuoka.



Opening speach at the Pacific RIM BioComp 2012 Conference, Shizuoka.



Between tradition and modern time, Train Station of Shizuoka.