Topic: Asian Markets with a Focus on Japanese Markets

Title: How the Japanese Lumber and Timber Market is Influenced by Japanese Natural Disasters

Graduating Essay

FRST 497

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Abstract

In the past few decades, numerous calamities have hit the coast of Japan and devastated cities around the nation. As communities rebuild their foundations, infrastructure needs to be re-established. Houses and schools need to be rebuilt. This creates an opportunity for housing starts and other development, and subsequently, a demand for construction-ready materials. This demand would open the door to an increase in timber and lumber imports from foreign markets, such as Canada, the United States and Russia.

In this essay, I focused on the years preceding and following the 1995 Kobe Earthquake and the 2011 Tohoku Earthquake, and looked for any possible trends in the timber and lumber markets within that timeframe. By comparing my findings for those years, and cross-referencing them with trends in non-event years, I did find a correlation between spikes in demand, import levels and disaster events. I believe that by studying past time periods, and the market flows and disaster events during those years, we are able to make educated predictions and better respond to shifts in demand.

Through the writing of this paper, I have achieved a deeper appreciation of how global timber and lumber markets function, and how they are affected by events happening at the global level. Furthermore, I now understand how much housing starts influence the timber and lumber market, and the fluctuations that occur from year to year.

Keywords: Asian Markets, Japan, Timber, Lumber, Natural Disasters, 1995 Kobe, 2011 Tsunami, Russia, Canada, United States

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Introduction

Japan is known by many as a mecca of culture and history; a spiritual place entrenched in the delicate place of equilibrium between the wonders of modern technology, and the traditional cultural values of the past. As one of the heavily-industrial countries in the world, and one that supports a population of 127,000,000 citizens, Japan has long been a strong participant in global trade (CIA, 2014). Appropriately, the growth of the economy and population over past decades had led to an increase in infrastructural development. However, the population has declined in recent years, and is undergoing a demographic shift towards an older majority (Aquino, 2013; Torres, 2013). The graph below illustrates the trends in the Japanese population from 1960 to 2013, and includes projected population levels for the future.

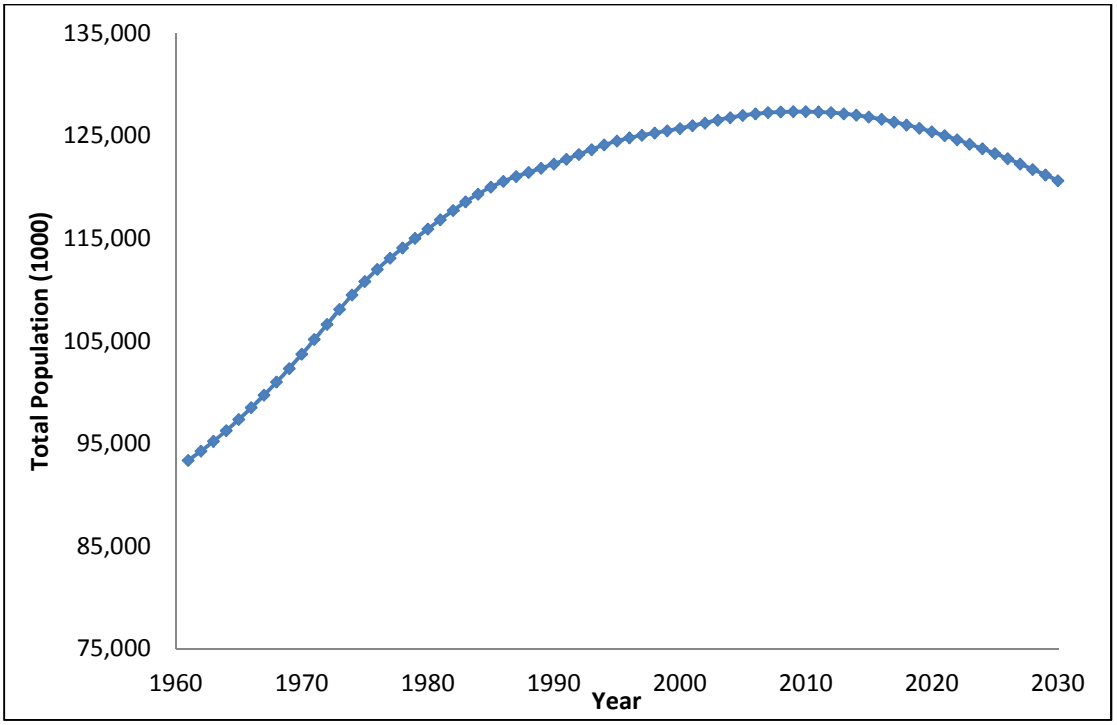

Figure 1 - The graph shows trends in the Japanese Population from 1960 - 2014, as well as projected population levels for the future (FAO, 2014).

As it stands, the state of the Japanese lumber and timber market is in flux. The current lack of domestic harvesting and its declining rate over the past years has led to an increase in lumber imports (Iwai, 2002). Of note, it seems that over the years, Japan has established itself as a major importer of Canadian lumber, more specifically, high grade lumber from British Columbia, and has developed itself into a market driven by a strong demand for lumber of the highest quality (COFI, 2014).

There are factors that have influenced the lumber and timber market in the past, and continue to impact the market today. The small area of land that Japan occupies is one of these factors. In the years of extensive economic and population growth, softwood lumber was imported heavily for construction purposes (Daniels, 2005). However, with the passing of time, and a diminished area available for development, as well as a dwindling population, infrastructural construction, such as housing starts, and the need for construction materials, began to decline, as is evidenced in Figure 2.

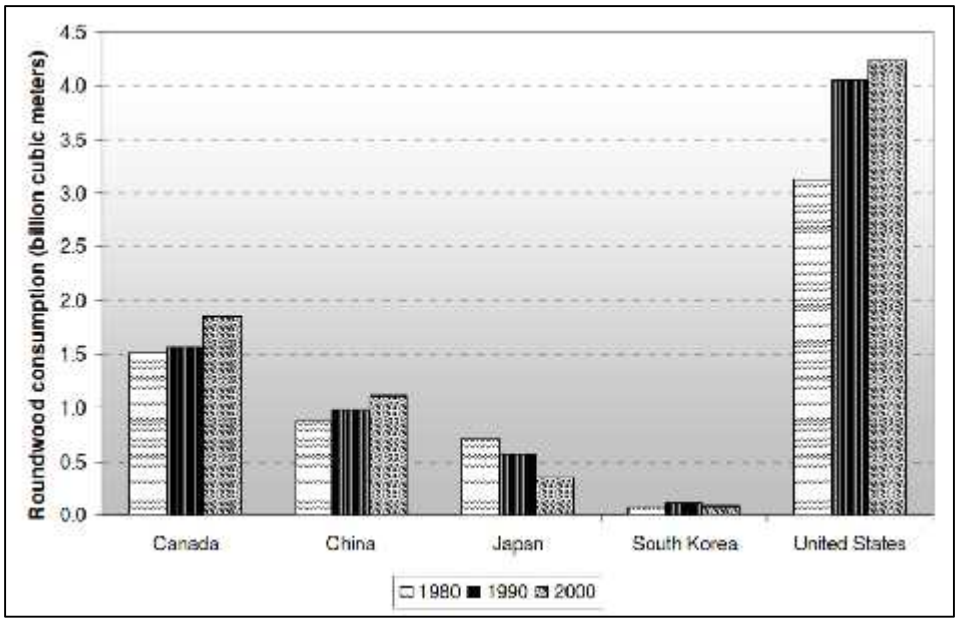

Figure 2 - Trends in Roundwood Imports from 1980 to 2000 (Daniels, 2005)

Figure 2 shows a clear indication of the trends in round wood imports in Canada, China, Japan, South Korea, and the United States. Japan, along with South Korea, has seen a gradual decrease in consumption, while consumption in Canada, China, and the United States has increased significantly. This decrease could be due to national development limitations, or a lack of infrastructural needs.

Another factor that influences the timber and lumber market of Japan is the shifting ideology behind building construction. As a global community, we have gone through building trends in which we have favoured concrete and steel, as well as hybrid materials at different points in time. In Japan, concrete and steel have been the de-facto material for the better part of the last three or four decades. However, recently, a shift back towards traditional materials, such as wood, has been seen. In 2010, the "Promotion of Wood Usage in Public Buildings" Act was announced by Japan in an effort to promote wood as a construction material (COFI, 2014). In accordance with the Act, wood would be used in the construction of most public buildings. In cases where the use of wood was deemed impractical or unsuitable, finished wood products would be used within that building. The Act would have the beneficial effect of raising the number of wooden structures used as public buildings out of the total number of public buildings, which now stands at 7.5%. As a comparison, the percentage of total number of wooden structures out of all existing buildings is 36% (COFI, 2014).

As a result of the particularly specific geographic region that Japan is located in, natural disasters such as earthquakes and tsunamis are common occurrences and have had an effect on the Japanese Lumber and Timber Market. Due to its geographical position in the Pacific Ring of Fire, and the specific tectonic plate configuration that lies beneath, Japan experiences a great number of earthquakes, tsunamis and typhoons (Israel, 2011). As a result of having the North

American, Pacific, Eurasian and Philippine plates converging beneath, Japan suffers from approximately 1,500 earthquakes a year, which is to be expected as roughly 80-90% of all earthquakes that occur within a year happen along the Pacific Ring of Fire. In particular, the 1995 Kobe event and the Tsunami event of 2011 were two of the most damaging disturbances to occur in Japan. Both events had major economic consequences, with the 1995 Kobe Earthquake costing over $100 billion, and the 2011 Tsunami event costing over $235 billion (Chen, 2011; Kim, 2011; Sample, 2011; Zhang, 2011). In addition to the colossal infrastructural damage, there was massive loss of human life and numerous communities were displaced.

This technical paper addresses the issues surrounding the Japanese Timber and Lumber market. Furthermore, it investigates the relationship between the market and natural disasters, and how the market reacts to those natural disaster events. Due to the precarious balance of tectonic plates under Japan, this study could be beneficial in determining potential trends in the Japanese Timber and Lumber market for the future. By understanding how the trade system will react to certain events, better predictions about the market would be possible, potentially helping exporters adjust accordingly to changes in demand.

From an organisational standpoint, this paper is structured to provide background information on Japan, followed by a historic overview of wood supply for Japan focusing on Russia, Canada, and the United States as source countries. Natural disaster events in Japan, as well as the damages and consequences of those events, as they relate to the Japanese Lumber and Timber market, will then be addressed.

In this report, the word timber refers to logs that have not yet been processed, (ie. retains bark) and lumber refers logs processed to produce construction-ready boards and planks.

Background

Historically, as a country, Japan has been involved with numerous industries such as the manufacturing of vehicles, and the innovation and production of modern, cutting edge technologies and medicine. With respect to the economic growth and subsequent population expansion, lumber has been used over the years as a major building material (Statistics Bureau, 2013). In fact, wood is still an integral part of building construction, regardless of the increased use of concrete and steel in the last few decades. Temples and monasteries across the country have always been constructed using wood as well, most of which have stood up against the test of time, weathering the elements and natural disasters.

During the Meiji Period, Japan underwent a radical shift in ideologies and government. In the years between 1868 and 1912, the country strived for modernization and established itself as a major participant in the global trade economy (Asia for Educators, Columbia University, 2009). As a result, the feudalist society and dynamic class system that had been in place for many decades fell in favour of an equal society. The change in government led to the subsequent freedom to choose between professions. Buoyed by a strong economy and a complete culture shift, Japan was able to invest in numerous industries and technologies, and become a supreme world power.

Following the Second World War, Japan was occupied by members of the Allied Powers for a period of nine years, from 1945 to 1952 (Japan Guide, 2002). As a result, the country plummeted from its former position as a global power. It would be years later that the Japanese economy would rise again and regain status. The growth of the economy would prove to raise living standards and create changes in the make-up of society.

The occupation of the country did end in 1952 with the signing of the peace treaty (Japan Guide, 2002). This created a situation in which Japan would have been very concerned with reinvigorating the Japanese economy. The resulting boom in economic and population growth would have increased housing starts within Japan, and ultimately an increase in imported lumber from foreign lands.

Historic Overview of Wood Supply for Japan

In this study, I have chosen to look at the imports coming into Japan from three specific countries: Russia, Canada, and the United States.

Over the past half-century, these three countries have supplied a large majority of the lumber moving into Japan (Iwai, 2002). Between 1960 and 1980, the Japanese government began to allow wood importation, and slowly moved towards eliminating existing import taxes. This was due to the fact that domestic demand rose with the economic growth and the domestic supply of wood was found to be inadequate. The year 1969 would mark the first time that imported wood accounted for 50% of the total wood volume consumed in the country, a trend which would continue to be seen over the years as Japan moved forward. With changes to the legislation behind timber and lumber imports, numerous improvements were made to ports and other points of resource entry. Furthermore, sawmills were built in close proximity to those points in order to maximize resource processing efficiency.

Initially, the bulk of the lumber and timber imports were from sources in the South East Asian Region (Iwai, 2002). This would be the case until the 1980s, when Canada and the United States would take over as the top exporters into Japan, Canada more so than the United States. Under this configuration, North America was generally the supplier of lumber that would be used for construction purposes, while South East Asian provided wood that had already been processed into plywood. Russia has also been a major contributor to the flow of timber and lumber into Japan.

The way markets work is that foreign demand is filled, as long as all domestic options are explored. For example, if Russia were to be lacking in woody resources at a national level due to

a disaster event or a housing initiative, Russian lumber and timber companies would be looking to fill those domestic needs first, and then looking towards addressing foreign markets second. A further example would be the Canadian Lumber market. As it stands presently, Canada produces more lumber than the domestic demand, and as a result, exports heavily to countries such as the United States, China, and Japan (NRC, 2013). Interestingly, due to the cost of using the domestic wood supply, Japan imports heavily despite having domestic sources for wood.

Furthermore, decreasing exports from one country would spark an increase in exports from other competitor countries in the same market that are looking to fill the void and hoping to capitalize on an opportunity.

In recent years, Russia, Canada, and the United States have taken over the bulk of lumber and timber that Japan imports. Looking at Figure 3, clear trends of this can be seen for all of the countries (Japan Lumber Importers' Association, 2009).

Year	2004	2005	2006	2007	%	2008	%	2009 Jan~Sep
SOUTHSEA	**1,612**	**1,366**	**1,372**	**1,021**	**-26**	**728**	**-29**	271
N. America	3,731	3,384	3,240	3,020	-7	2,638	-13	1,838
RUSSIA	**5,922**	**4,694**	**4,942**	**3,986**	**-19**	**1,888**	**-53**	531
New Zealand	1,081	913	848	808	-5	869	+8	399
LOGS	**12,428**	**10,391**	**10,423**	**8,861**	**-15**	**6,148**	**-31**	**3,055**
SOUTHSEA	**586**	**543**	**516**	**450**	**-13**	**※ 643**	**+43**	412
N. America	3,979	3,308	3,441	2,724	-21	2,929	+8	1,622
Russia	861	965	987	954	-3	668	-30	531
New Zealand	170	127	172	119	-31	138	+16	59
Chile	348	310	305	343	+13	321	-1	95
Europe	2,968	2,894	3,045	2,654	-13	2,009	-24	1,610
SAWN TIMBER	**8,912**	**8,147**	**8,465**	**7,244**	**-14**	**6,707**	**-7**	**4,329**

Figure 3 - Trends in Imported Timber and Lumber into Japan from 2004 to 2009 (Japan Lumber Importers' Association, 2009). Please note that the values shown above are in 1000 cubic metre units. The table above uses terminology that is different from the one used in this report. For the purposes of my report, the "Logs" label should be understood as timber, and the "Sawn Timber" label should be understood as lumber.

As seen in the table show above, timber and lumber imports into Japan have been in a steady decrease in the five years in-between 2004 and 2009. Overall, the amount of timber flowing into Japan has fallen drastically from 12,428,000 m^3 in 2004 to 3,055 m^3 in 2009. Upon further scrutiny, it seems that Japan saw a decrease in timber from both Russia and North America. While the amount of timber going into Japan decreased rather evenly over the five years, save for a minute upswing from 2005 to 2006, the amount of lumber imported into Japan was relatively stable from 2004 to 2006, despite some fluctuation. It was in the time period between 2006 and 2007 that the lumber imports began to decline at sustained rate. While Canada and the United States saw a gradual decrease in volume exported into Japan from 2004 onwards, the

volume coming out of Russia and into Japan would stay relatively stable, even seeing a rise from 2004 to 2006. However, in the year 2007, Japan would see the beginning of a massive drop in volume imported from Russia.

While it is important to note that the 2009 data column in Figure 3 only accounts for values from January to September, the ongoing trend of decline in total volume imported is to be expected. In fact, later publications from various sources in more recent years do suggest and show a decline in imported lumber and timber.

Russia

It is interesting to note that until the year 2007, Russia had been exporting large volumes of timber into Japan. As shown in the graph below, the volume of imported non-sawn timber was quite substantial.

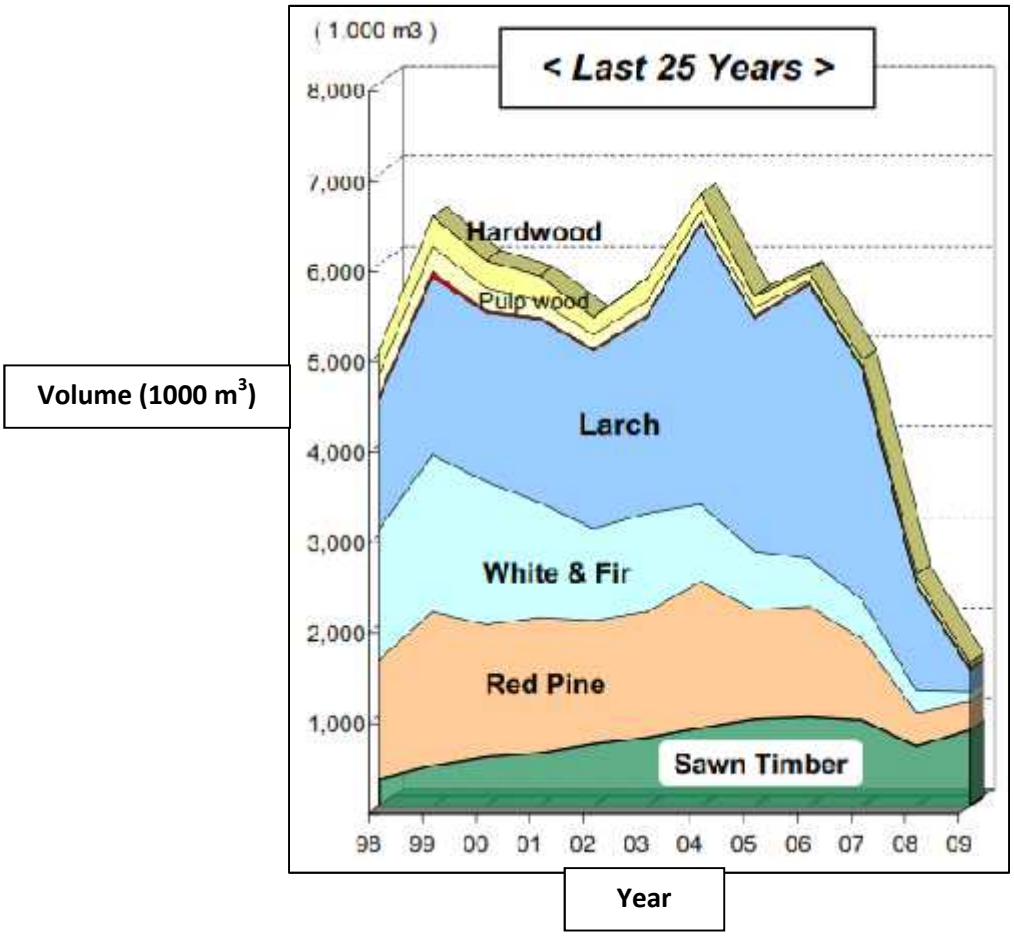

Figure 4 - Trends in Russian Timber Exports into Japan from 1998 to 2009 (Japan Lumber Importers' Association, 2009).

As shown in the graph above, the volume of lumber and timber that Russia exported to Japan was quite substantial, even reaching a ten year peak of nearly 7, 000, 000 m^3 in the period between 2004 and 2005. Similarly to what is shown in Figure 3, the decline in volume shown in

Figure 4 picks up speed between the years of 2006 and 2007. This was directly correlated to the Russian Softwood Log Export Tax (International Forest Industries, 2011). On April 1st, 2008, the Russian Softwood Log Export Tax was implemented by the Russian government, and as the name suggests, created a 25% tariff on all softwood exports. Additionally, this tax would also have a minimum of €15/m^3 imposed as a cover.

As a result of this tax, many major countries that had been strong markets for Russian timber, including Japan, began to move away from Russian sources. This is best evidenced through the fact that Russia now exports 70% of its timber to China, as opposed to the 46% value in 2006 (Japan Lumber Importers' Association, 2009; International Forest Industries, 2011). Of note, while the percentage of timber exported to China has increased, the actual volume has been on the decline. The change in percentage is a reflection of the fact that Russia has lost target export countries. The tax was originally conceived with the hopes of creating better timber access at lower costs for domestic sawmills, as well as further developing the Russian Timber Industry (Owen, 2013). Not only did this tax fail to achieve the desired effect, but logs became expensive to acquire, and the overall supply saw a decrease.

It is interesting to note the effects that were seen in the Chinese timber market, which had maintained ties to the Russian Timber market throughout the years following the tax implementation. Due to the decrease in log exports from Russia, China began to seek out new sources, and eventually, the United States emerged as a candidate, something that would also have caused changes to Japanese Timber and Lumber market trends as well (Owen, 2013).

North America

In recent years, North America has seen its share of highly damaging events that are major factors in determining the amount of lumber and timber that is exported to Japan. The British Columbia Pine Beetle Infestation, and Hurricane Katrina and Hurricane Sandy, of 2005 and 2012 respectively, are such events.

Hurricane Katrina and Hurricane Sandy displaced numerous communities and caused damages that totaled in the billions, $125 billion and $65.7 billion USD respectively (NOAA, 2014). With the damages done at the infrastructural level, it is expected that housing becomes a concern for the government. Hurricane Sandy caused the destruction of approximately 650, 000 houses, clearly creating a domestic need for lumber and timber (Blake, Kimberlain, Berg, Cangialosi, & Beven II, 2013).

A look at log export patterns of the past from the United States hints at the fact that North American needs for lumber and timber will affect the volume exported to Japan from North American sources.

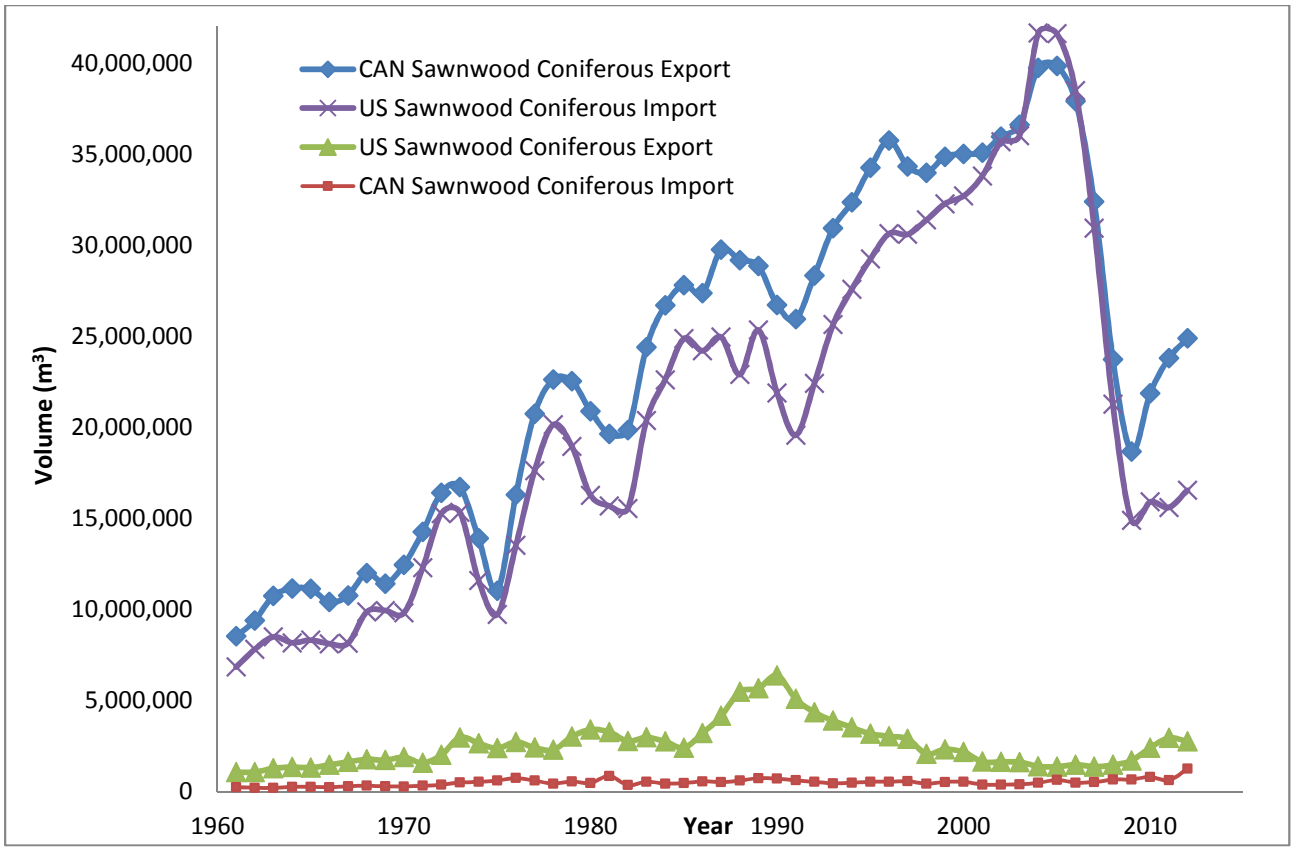

Figure 5 - Trends in Sawnwood Imports and Exports from 1961 to 2013 (FAO, 2014).

Figure 5 shows a close relationship between Canada and the United States with respect to lumber imports and exports from North America. As one of the main importers of Canadian Lumber, the United States import markets seem to match and adjust to fluctuations in Canadian export levels. This close correlation undoubtedly has an effect on the volume available for Japan to import.

Disaster events such as Hurricane Katrina and Hurricane Sandy create an immediate need for housing through their destruction. Millions are without homes in a matter of minutes with the magnitude of damage to communities, and without timely intervention and restoration of power, food, and shelter, a descent into chaos would quickly follow (NWSWFO, 2005).

However, Figure 5 seems to show no discernable response to the disaster events of 2005 and 2012. U.S. sawnwood import levels do not rise during those time frames and instead follow the trends of previous years.

The decline in North American lumber and timber exports seen in Figures 6 and 7 may be attributable to the Mountain Pine Beetle infestation event that occurred in British Columbia, Canada. Peaking in 2005, the Mountain Pine Beetle infestation has ranged over approximately 1, 801 million hectares and affected a total of 710 million cubic metres of timber that would have been otherwise merchantable and available as potential resources to be imported by Japan (Ministry of Forests, Lands and Natural Resource Operations, 2012). An additional factor would be the exports to Japan from European countries. In 2012, Japan became one of the largest markets for Finland, which exports 55% of total shipments to non-European markets, undoubtedly taking shares of the market away from North American sources (Ekstrom, 2014).

Looking at Figure 6 and 7, it is interesting to note that, while the overall exports from Canada and the United States have dropped over the years, the composition of the exported volumes has remained relatively similar to the levels shown in the years before 2008 and 2009.

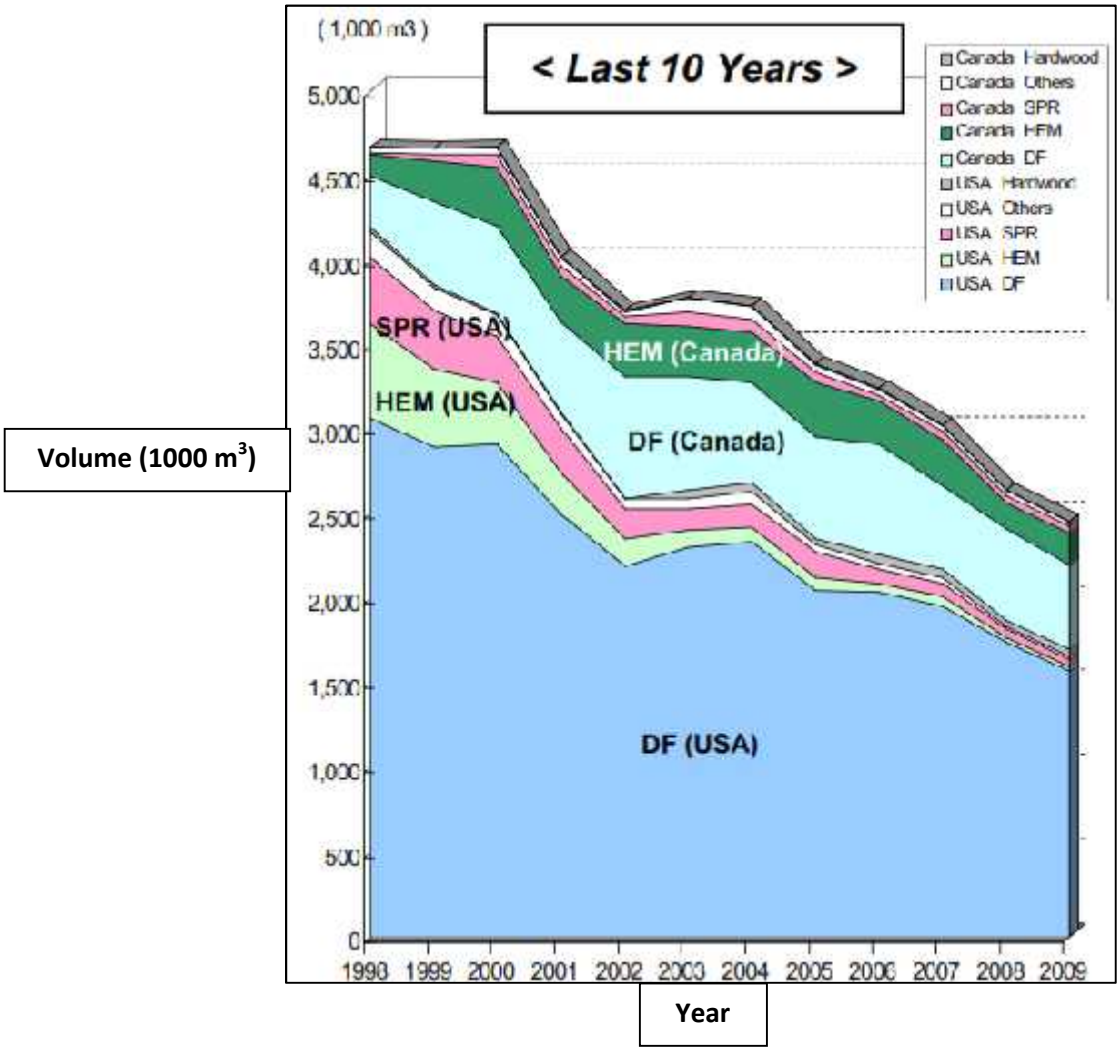

Figure 6 - North American Timber Export Trends into Japan from the year 1998 to 2009

(Japan Lumber Importers' Association, 2009)

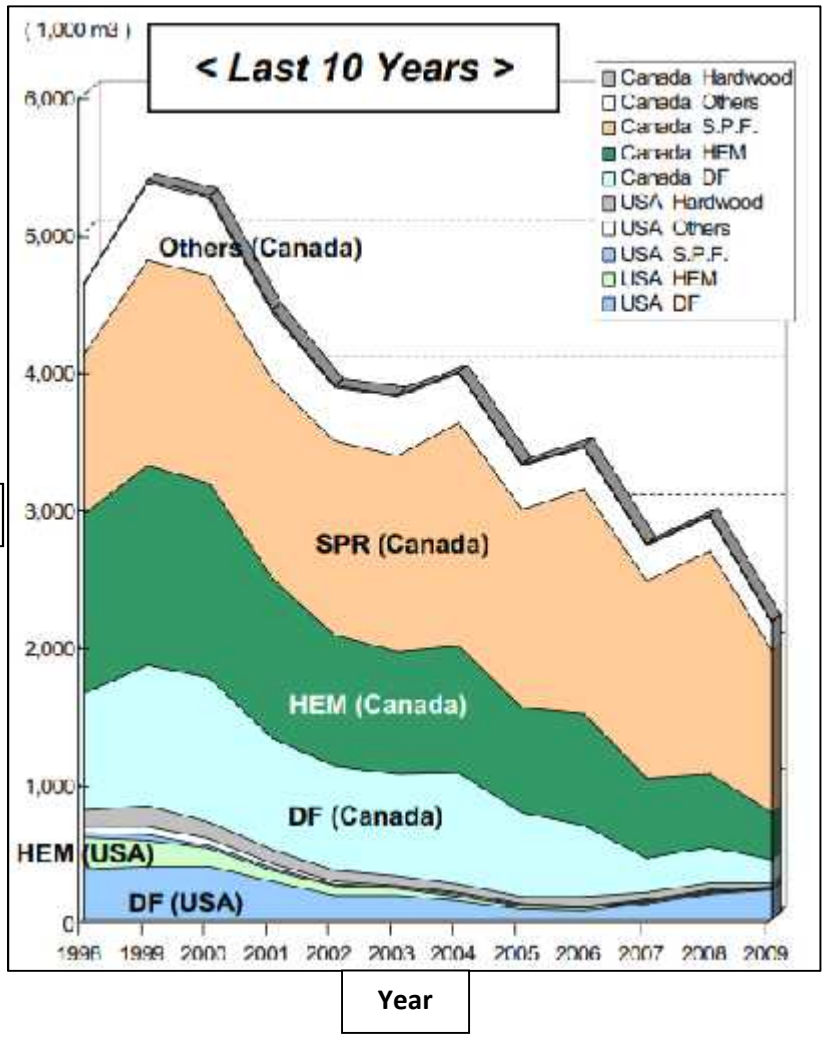

Figure 7 - North American Lumber Export Trends into Japan from the year 1998 to 2009

(Japan Lumber Importers' Association, 2009)

Natural Disasters in Japan

The 1995 Kobe Earthquake event was a devastating blow to the country. Measuring 7.2 on the Richter scale, it struck over twenty cities and towns, killed thousands and injuring millions more over the span of less than a minute (Chen, 2011). Housing would clearly be in demand after a disaster event in which infrastructural damage amounting to over $100 billion. A look at Figure 8 seems to validate this claim.

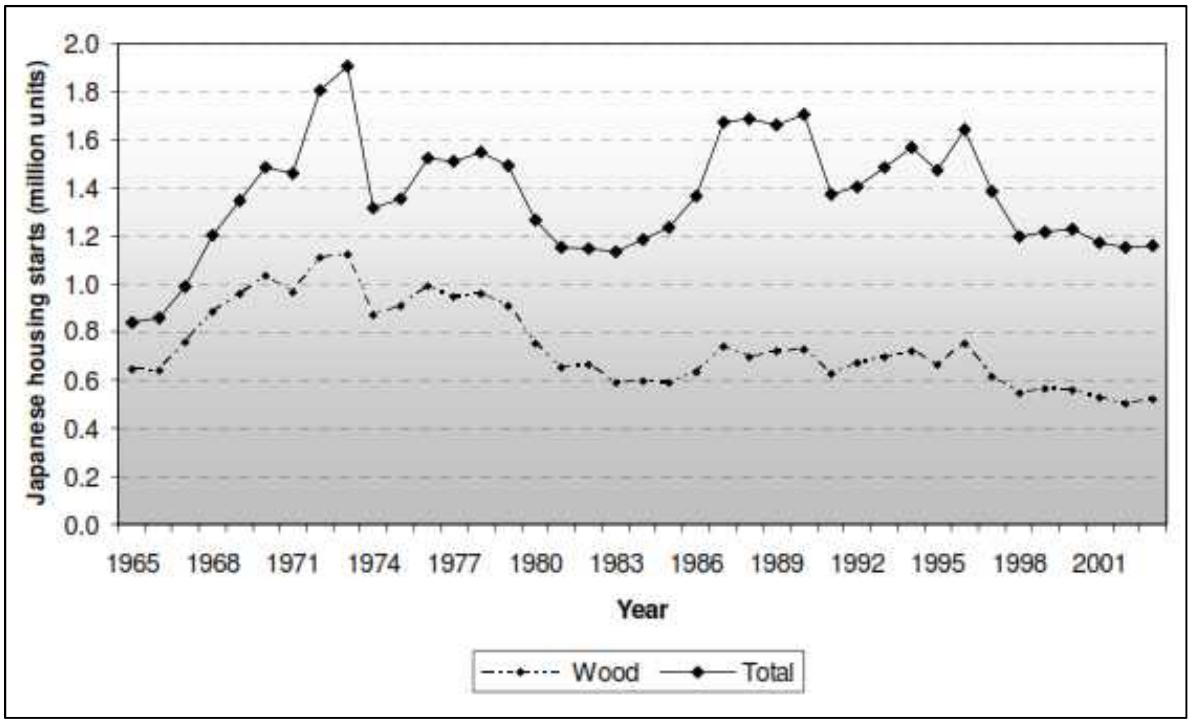

Figure 8 - Japanese Housing Starts from the year 1965 to 2004 (Daniels, 2005)

There is a rise in Japanese Housing Starts in the year of 1995, which does indeed coincide with any ongoing restoration and rehousing efforts that would have manifested in the years after the earthquake event. It is interesting to note that the spike in housing only seems to last approximately two years after the event, before sliding again. There is another possibility for the increase shown in the timeframe between 1995 and 1997. The increase in Japanese taxes in 1997

would have created a housing boom for those looking to avoid the 2% tax increase (Yoshikawa, 2012; Fujioka & Shimodoi, 2010). The graph below illustrates housing trends in Japan as it relates to wooden and non-wooden housing, as well as the housing spike, and subsequent fall, in 1997.

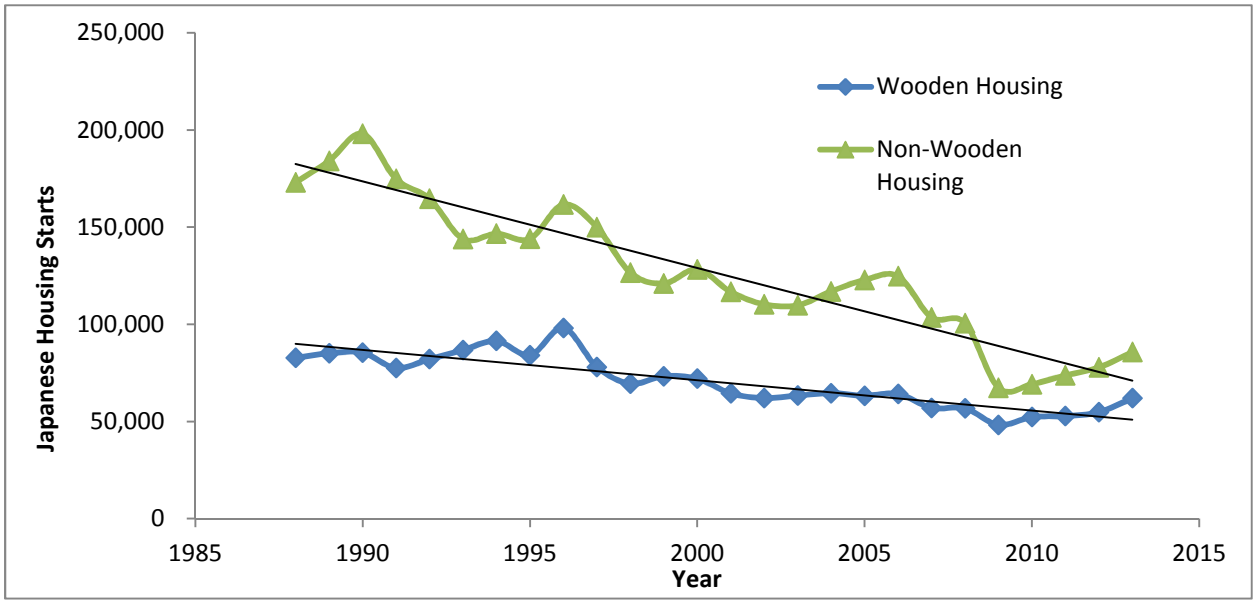

Figure 9 - Wooden and Non-Wooden Housing Trends from 1985 to 2015. This graph uses data from (Statistics Bureau, 2013)

Similar to the 1995 Kobe Earthquake, the 2011 Tsunami event was also a disaster event that rocked the entire nation down to its core. Triggered by an earthquake that measured 9.0 on the Richter scale, the tsunami attained heights of 30 feet, killing over ten thousand and injuring countless more in communities along the coast (Oskin, 2013). Looking back at Figure 9 once more, there is a lesser number of housing starts overall in the years before the 2011 Tsunami event; however, both wooden and non-wooden housing start trends rise and seem to have been increasing at a sustained rate in the years following.

The graph below shows a pattern of log exports from British Columbia.

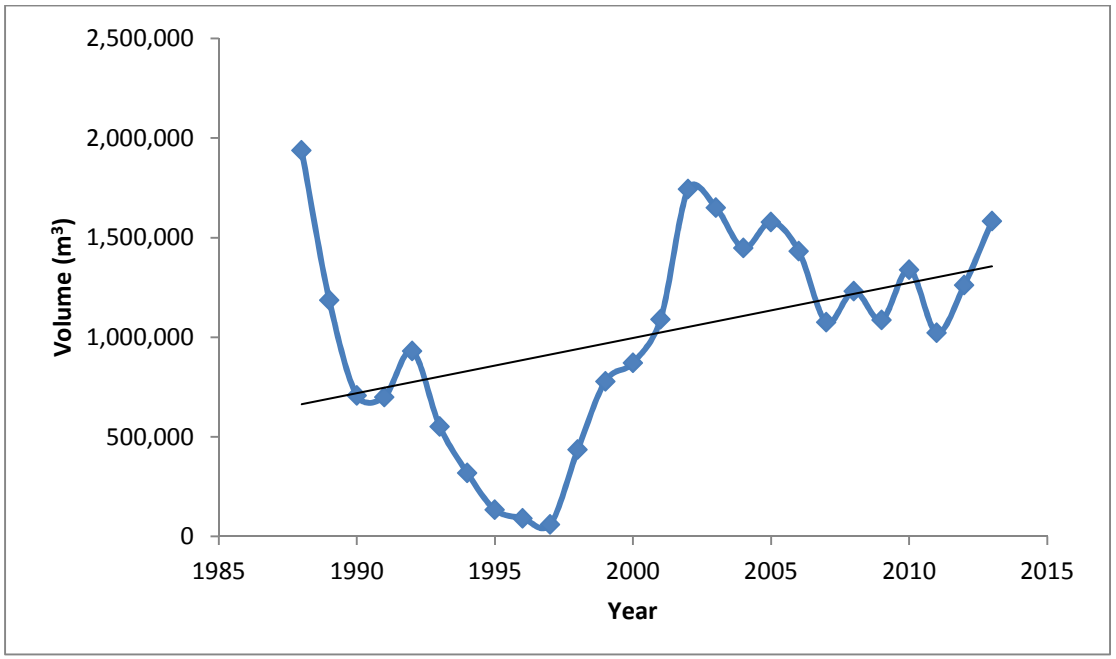

Figure 10 - Total Volume of Log Exports from British Columbia from 1985 to 2015 (Cohen, 2013)

The fluctuation shown in Figure 10 between the years of 2005 and 2011 could be attributed to the Mountain Pine Beetle infestation. However, it is the period of sustained growth from 2011 onwards that carries potential for the future. The upward trend could be due to the increase in wooden housing starts in Japan that seems to be increasing at a continuous rate, as well as be a sign of the BC Lumber and Timber industry revitalizing itself after a period of economic downturn.

The Aftermath

Looking at the various housing start trends, it seems that there are increases in the years following disaster events. However, this may only last a year or two before the number starts to fall again. As a whole, the number of Japanese Housing starts has been in a state of decline since 1990. There have been brief periods in-between then and now that have seen the number trend upwards, however it seems to have never lasted more than two years. Perhaps it is a commentary on the space that is available for housing starts, or a commentary on the efficiency of the Japanese to re-develop disaster zones in short periods of time. Or perhaps more pessimistically, it is a stark reminder of the ongoing population decline and demographic shift in Japan (Buttonwood, 2014).

Figure 9 does show an upward trend in the number of Japanese wooden housing starts, potentially hinting at a future of green housing. This shift may be a product of the 2011 "Promotion of Wood Usage in Public Buildings" Act, announced by Japan in an effort to promote wood as a construction material (COFI, 2014). While the act was mainly to promote wood in the construction of public buildings, it may have also influenced and led to the increase in wooden housing. The difference between wooden and non-wooden housing that had previously existed before 2009 is now miniscule in comparison. Furthermore, even with the increase in the number of housing starts, Japan has kept the number of wooden and non-wooden housing starts relatively similar and increasing at comparable rates.

Green Building Programs such as the CASBEE-Sumai program in Japan may also be an influencing factor in this trend of decreasing imports (Eastin, Sasatani, Ganguly, Cao, & Seol, 2011). In his report, Ivan Eastin states that while wood is largely agreed to be the most

environmentally friendly structural building material, there is unfortunately a low level of interest in adopting Green Building programs such as the CASBEE-Sumai due to a perceived lack of demand for green buildings among consumers. However, Eastin does conclude that there is heavy interest in value-added wooden building materials.

There is also the dilemma of choosing between domestically sourced lumber and imported lumber. Programs such as the CASBEE-Sumai Green Building program, and other governmental agencies, provide subtle incentives for contractors to use lumber from domestic sawmills (Eastin, Sasatani, Ganguly, Cao, & Seol, 2011). This also creates an interesting stand-off between domestic and foreign sources for Japanese Timber and Lumber imports.

Conclusion

Ultimately, the Japanese Lumber and Timber market does seem to be a cutthroat competition for those that look to export lumber and timber into Japan. Dips in volume from a particular source seem to be taken over rather quickly by a competitor. The Japanese Lumber and Timber market also seem to correlate with natural disasters. Any stimuli from natural disasters produce a visible and quantifiable reaction in the landscape of the Japanese Lumber and Timber market, and all other associated lumber and timber markets. However, natural disasters are but one of many factors that must be taken into account when looking at potential changes to the Japanese Lumber and Timber market.

It is possible for predictions to be made predictions about how lumber and timber markets would be affected by possible future events, based on the trends noticed in the time frames studied. Certainly, all probable factors would need to be carefully accounted for in any predictive study. However, using past history to determine the future is something that should be undertaken. Timber and lumber markets do seem to undergo similar patterns throughout the years, and it would be advantageous for companies that are involved with importing and exporting timber and lumber to be able to gauge future markets. Perhaps from a more humanitarian point of view, we would also be able to better fill the need for resources needed in housing start initiatives in disaster zones if we understood how demand fluctuates in global markets.

Works Referenced and Consulted

Aquino, F. (2013, June 7). *Japan's birthrate drops to 1.03 million, number of deaths keep increasing*. Retrieved March 25, 2014, from Japan Daily Press: http://japandailypress.com/japans-birthrate-drops-to-1-03-million-number-of-deaths-keep-increasing-0730181/

Asia for Educators, Columbia University. (2009). *The Meiji Restoration and Modernization*. Retrieved December 28, 2013, from Asia for Educators: http://afe.easia.columbia.edu/special/japan_1750_meiji.htm

Blake, E. S., Kimberlain, T. B., Berg, R. J., Cangialosi, J. P., & Beven II, J. L. (2013). *Tropical Cyclone Report - Hurricane Sandy (AL182012).* National Hurricane Center.

Chen, Y.-F. (2011, April 7). *Kobe Earthquake(1995)*. Retrieved December 22, 2013, from SAGE Knowledge: http://knowledge.sagepub.com/view/disasterrelief/n150.xml

CIA. (2014, March 11). *The World Factbook: Japan*. Retrieved January 30, 2014, from Central Intelligence Agency: https://www.cia.gov/library/publications/the-world-factbook/geos/ja.html

COFI. (2014). *Asian Market*. Retrieved January 28, 2014, from Council of Forest Industries: http://www.cofi.org/markets/asia/

Cohen, D. (2013, October 22). BC Log Exports. (L. Lin, Interviewer)

Daniels, J. (2005). *The rise and fall of the Pacific Northwest log export market.* Portland: United States Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Eastin, I., Sasatani, D., Ganguly, I., Cao, J., & Seol, M. (2011). *The Impact of Green Building Programs on the Japanese and Chinese Residential Construction Industries and the Market for Imported Wooden Building Materials.* Cintrafor.

Ekstrom, H. (2014). *Global Timber and Wood Products Market Update.* Wood Resources International LLC.

International Forest Industries. (2011, March 17). *Update on Russian Log Export Tax*. Retrieved December 31, 2013, from International Forest Industries: http://www.internationalforestindustries.com/2011/03/17/update-on-russian-log-export-tax/

Israel, B. (2011, March 14). *Japan's Explosive Geology Explained*. Retrieved December 20, 2013, from LiveScience: http://www.livescience.com/30226-japan-tectonics-explosive-geology-ring-of-fire-110314.html

Iwai, Y. (2002). *Forestry and the Forest Industry in Japan.* Vancouver: UBC Press.

Japan Guide. (2002, June 9). *Japanese history: Postwar (since 1945)*. Retrieved December 28, 2013, from JapanGuide: http://www.japan-guide.com/e/e2124.html

Japan Lumber Importers' Association. (2009). *Timber Imports and Market Situation in Japan.* Yokohama: JLIA.

Kim, V. (2011, March 21). *Japan damage could reach $235 billion, World Bank estimates*. Retrieved December 23, 2013, from Los Angeles Times: http://www.latimes.com/business/la-fgw-japan-quake-world-bank-20110322,0,3799976.story#axzz2wYMKKiyq

Macrotrends. (2014). *Housing Starts Historial Chart*. Retrieved March 26, 2014, from Macrotrends: http://www.macrotrends.net/1314/housing-starts-historical-chart

Ministry of Forests, Lands and Natural Resource Operations. (2012, May). *Facts About B.C.'s Mountain Pine Beetle*. Retrieved March 3, 2014, from Ministry of Forests, Lands and Natural Resource Operations: http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/Updated-Beetle-Facts_May2012.pdf

NOAA. (2014). *Billion-Dollar WEather/Climate Disasters*. Retrieved March 3, 2014, from National Climatic Data Center: http://www.ncdc.noaa.gov/billions/events

NRC. (2013, December 5). *Forest Products*. Retrieved March 27, 2014, from Natural Resources Canada: http://www.nrcan.gc.ca/forests/industry/13317

NRC. (2013, Janurary 17). *Japanese demand for lumber: reconstruction and government stimulus*. Retrieved December 25, 2013, from Natural Resources Canada: https://cfs.nrcan.gc.ca/selective-cuttings/10

NWSWFO. (2005, August 26). *Hurricane Katrina*. Retrieved January 30, 2014, from National Weather Service Weather Forecast Office: http://www.srh.noaa.gov/mfl/?n=katrina

Oskin, B. (2013, August 22). *Japan Earthquake & Tsunami of 2011: Facts and Information*. Retrieved February 20, 2014, from livescience: http://www.livescience.com/39110-japan-2011-earthquake-tsunami-facts.html

Owen, P. (2013). *The Impact of Russian Log Export on Asian Markets.* Boring, Oregon: Vanport Internation, Inc.

Sample, I. (2011, March 11). *Japan earthquake and tsunami: what happened and why*. Retrieved December 26, 2013, from The Guardian: http://www.theguardian.com/world/2011/mar/11/japan-earthquake-tsunami-questions-answers

Statistics Bureau. (2013). *Building Starts - Yearly - 2013.* Retrieved February 18, 2014, from e-Stat - Portal Site of Official Statistics of Japan: http://www.e-stat.go.jp/SG1/estat/ListE.do?lid=000001117094

Torres, I. (2013, April 17). *Japan's population continues to decline and age at record levels*. Retrieved March 25, 2014, from Japan Daily Press: http://japandailypress.com/japans-population-continues-to-decline-and-age-at-record-levels-1727133/

Zhang, B. (2011, March 30). *Top 5 Most Expensive Natural Disasters in History*. Retrieved December 25, 2013, from AccuWeather: http://www.accuweather.com/en/weather-news/top-5-most-expensive-natural-d/47459?partner=