European Spruce & Asian Woodchip Market Overview

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Overview

• Norway spruce (*Picea abies*) has emerged as a suitable substitution for US softwood
  ▪ The extensive bark beetle infestation in Europe (Germany, Czech Republic, Poland, etc.) has forced salvage harvesting and driven down prices

• One Belt, One Road initiative heavily subsidized
  ▪ Spruce logs and lumber are mainly moving in containers but some lumber on rail as well

• The Asian pulp and paper market is undergoing a structural shift
  ▪ Japanese mergers and capacity closures while the number of Chinese producers increases

• Traditional hardwood chip suppliers are turning away from the export market while new ones are emerging
  ▪ Australia, Chile and South Africa
European bark beetle

- The Czech Republic has been hardest hit
  - Approximately 18 million cubic meters of timber have been infected
- Austria, Germany (Bavaria), Poland and Slovakia have also been affected
  - Combined total of 16.5 million cubic meters
- Salvage harvesting operations are underway in affected countries
  - Dead trees can remain on stump for up to three years
  - Drought and record heat exacerbating disease
- Sawmill capacity increases are unlikely
  - Major markets are soft
European log exports to World, January 2016 – July 2019
Cubic meters

Czech Republic
Germany
Poland
Major supplier log exports to China, August 2017 – July 2019

Cubic meters
Russian exports of logs and lumber to China, 2016–2019YTD
Cubic meters
Softwood logs unit price to China, November 2017- July 2019
US dollars, FOB
Softwood lumber unit price to China, January 2017 - July 2019
US dollars, FOB
One Belt, One Road network

- Rail is heavily subsidized by the Chinese government
- Favorable container rates on backhaul to China
- Customs inspections, rail gauge variations, politically unstable areas
Asian imports of woodchips and wood pulp, 2008-2018
Million BDMT and million tonnes
Total hardwood woodchip imports in the Asia-Pacific markets, 2008-2019E
Million BDMT
Woodchip imports in the Asia-Pacific region, 1H2017–1H2019
Thousand BDMT

<table>
<thead>
<tr>
<th>Hardwood</th>
<th>1H17</th>
<th>1H18</th>
<th>1H19</th>
<th>1H19/1H18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>5,373</td>
<td>5,597</td>
<td>5,449</td>
<td>-2.6%</td>
</tr>
<tr>
<td>China</td>
<td>5,709</td>
<td>6,299</td>
<td>6,421</td>
<td>1.9%</td>
</tr>
<tr>
<td>South Korea</td>
<td>224</td>
<td>258</td>
<td>254</td>
<td>-1.7%</td>
</tr>
<tr>
<td>Taiwan¹</td>
<td>185</td>
<td>210</td>
<td>189</td>
<td>-10.1%</td>
</tr>
<tr>
<td>India¹</td>
<td>—</td>
<td>76</td>
<td>48</td>
<td>-36.5%</td>
</tr>
<tr>
<td>Indonesia¹</td>
<td>—</td>
<td>2</td>
<td>540</td>
<td>nm</td>
</tr>
<tr>
<td><strong>Total hardwood</strong></td>
<td><strong>11,490</strong></td>
<td><strong>12,442</strong></td>
<td><strong>12,901</strong></td>
<td><strong>3.7%</strong></td>
</tr>
</tbody>
</table>

nm = not meaningful.
1. Through May only.
Sources of hardwood chips for the Asia-Pacific markets, 2019 YTD

Vietnam: 41.6%
Australia: 22.9%
Chile: 13.2%
South Africa: 7.6%
Thailand: 7.7%
Malaysia: 1.8%
Indonesia: 1.1%
New Zealand: 0.7%
Ecuador: 0.5%
South Africa: 7.6%
Brazil: 3.0%
Malaysia: 1.8%
Indonesia: 1.1%
New Zealand: 0.7%
Ecuador: 0.5%

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China: Average value of hardwood chip imports, 2009-2019 YTD
US dollars per BDMT, nominal prices CIF
Asia-Pacific hardwood chip imports from Southeast Asian suppliers and traditional suppliers, 2005-2019E

Thousand BDMT
Australia: New hardwood plantation establishment, 1995-2018
Thousand hectares
Chile: *Eucalyptus globulus* log supply and demand forecast, 2017-2022

Million cubic meters

Source: Instituto Forestal.

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**Demand**

**Supply**
Indonesian imports and exports of pulpwood fiber, 2012-2019E

Thousand BDMT

- Chip exports
- Pulplog imports
- Chip imports

Outlook for woodchip supply and demand in the Asia-Pacific market, 2018, 2023 and 2028

<table>
<thead>
<tr>
<th>Year</th>
<th>Demand</th>
<th>Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>23.5</td>
<td>25.0</td>
</tr>
<tr>
<td>2023</td>
<td>24.0</td>
<td>26.0</td>
</tr>
<tr>
<td>2028</td>
<td>24.5</td>
<td>27.5</td>
</tr>
</tbody>
</table>
Vietnamese hardwood chip exports, 2004-2019E
Thousand BD MT

- Other
- China
- Taiwan
- South Korea
- Japan

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Vietnamese share of the Asian hardwood chip market, 2000-2019E
Area of Vietnamese eucalyptus and acacia plantations in 2005, 2010 and 2018
Thousand hectares
Global imports of wooden furniture from Vietnam, 2006-2019E

Million US dollars
The way ahead

- Asian pulp and paper capacity consolidation will not outweigh expansion
- Vietnam should be able to increase
  - 11.3 million BDMT in 2019F
- Vietnamese government interference
  - Biggest potential hurdle
- Non-traditional suppliers
  - Thailand and Malaysia
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