

Fiber Raw Materials Markets: Pressure Builds on Traditional Sourcing Model

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Containerboard is the Biggest Consumer of Fiber in the P&B Industry

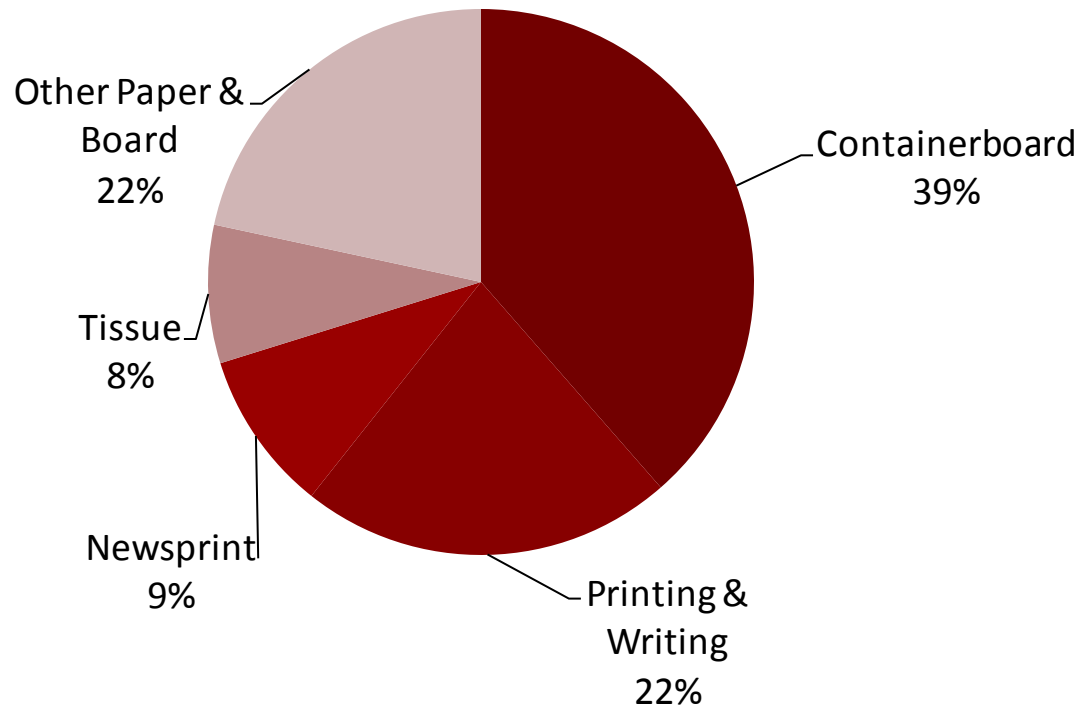
- World Consumption Estimated at 402 Million Tonnes in 2010
- With 164 Million Tonnes of Wood Pulp
 - Translating into 700 Million Cubic Meters of Wood
- And 218 Million Tonnes of Recovered Paper

- Dominance of Containerboard Mainly Due to Size of Sector
 - Also to Fiber Intensity of Product Area
 - That is, Little Usage of Coatings and Fillers



World Fiber Consumption by Major Paper and Board Grade - 2010 (Million Tonnes)

402 million tonnes

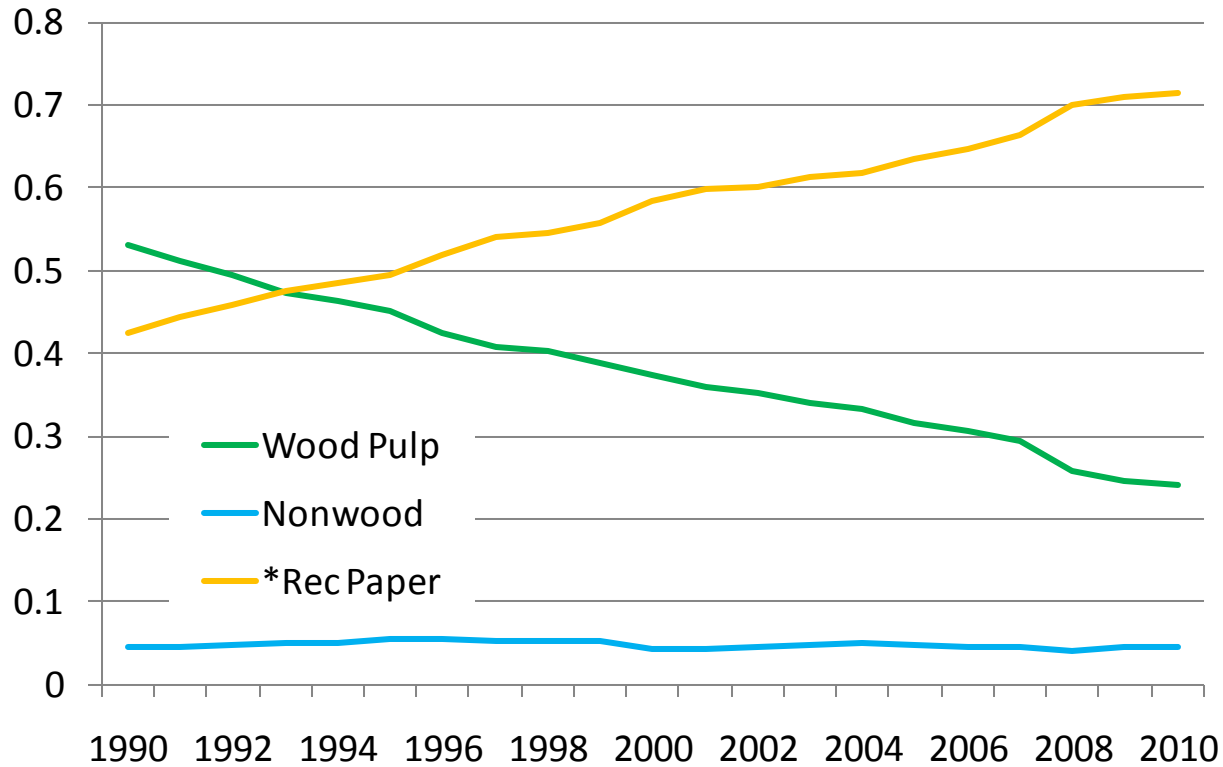


Containerboard Industry Started to Shift To Recovered Paper in the 1990s

- Low Prices as Recycling Rates Jumped in Developed World
- Environmental Concern on the Part of End Users
- Improved Papermaking Technology
- Shift Accelerated Over the Past Decade
 - Rapidly Rising Containerboard Demand in Fiber-Short Regions
 - Still Lower Cost Than Virgin Fiber in Most Regions
 - Aggressive Investment in New Technology in China



Furnish Shares of World Containerboard Production



*Net of fiber loss

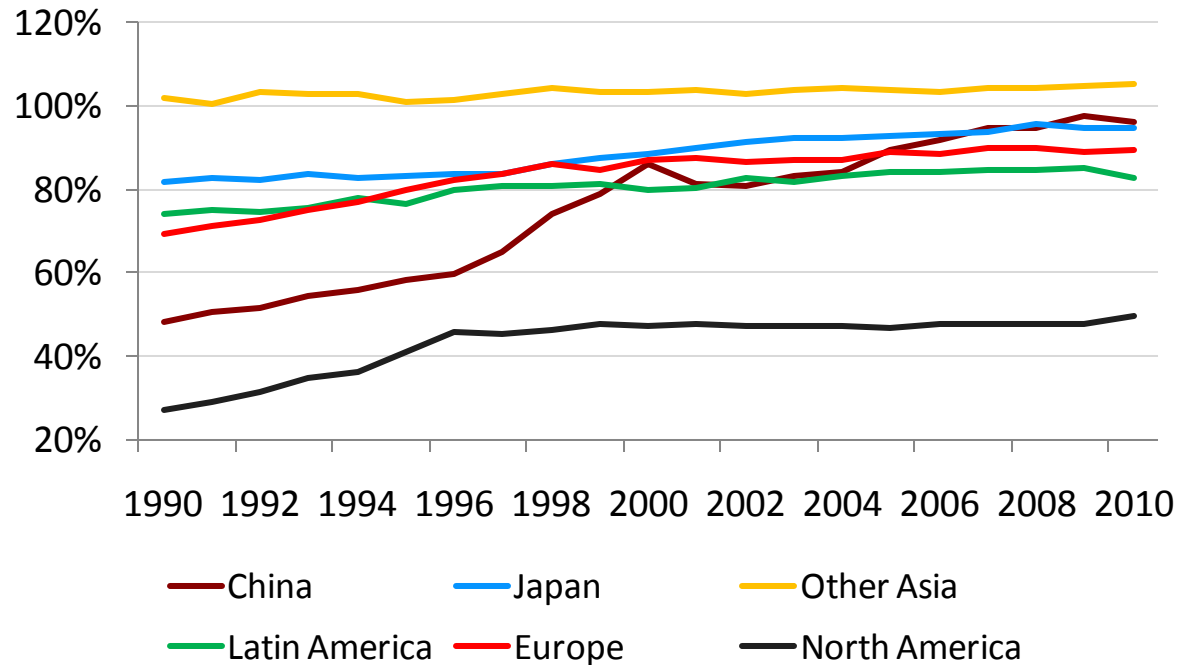


China Uses the Most Recovered Paper in its Containerboard

- Reflecting the Lack of Virgin Fiber and Strong Demand
- Other Developing Regions Are Also Heavy Users of Recovered Paper
 - Still Lower Cost Than Virgin Fiber in Most Regions
- Developed Regions Tend to Use More Virgin Fiber
 - With North America at the Top End of Spectrum



Recovered Paper Share of Containerboard Furnish by Region

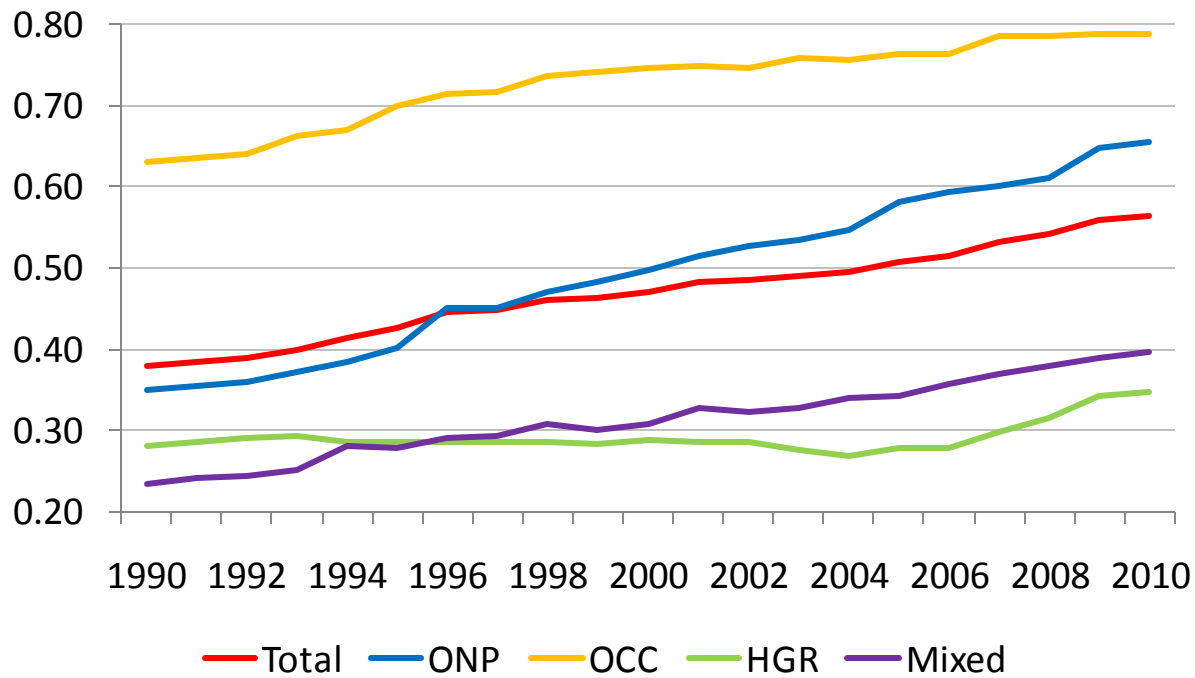


Rapid Growth in Containerboard Usage of Recovered Paper

- Has Been a Major Factor Boosting Recovery Rates
- Especially in the Case of Old Corrugated Containers (OCC)
- World Recovery Rate for All Grades Reached 56% in 2010
 - With OCC Hitting a Very High 79%
- Mixed and High Grade Recovery Rates Remain Relatively Low
 - At 40% and 35%, Respectively, in 2010



World Recovery Rates for Major Recovered Paper Grades

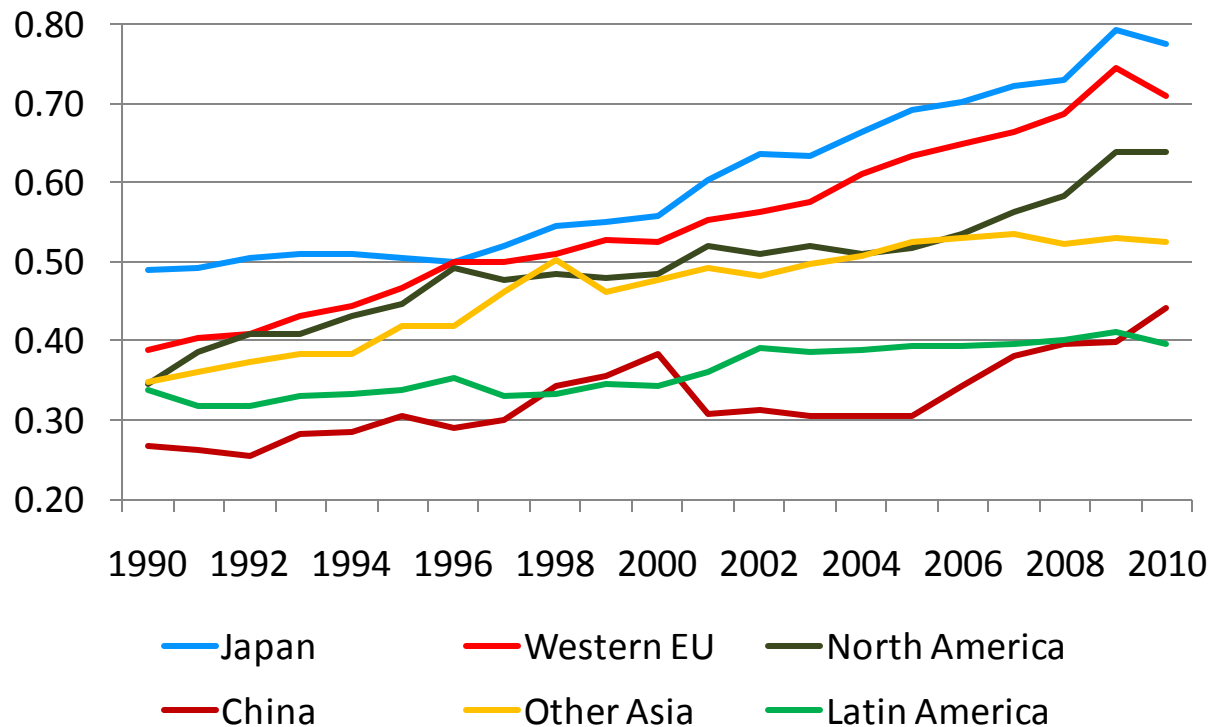


Recovery Rates in the Developed World Have Reached a Very High Level

- As Chinese Papermakers Scour the World for Fiber
- And Governments Encourage Waste Reduction
- Japan Leads the World with an 80% Recovery Rate
 - With Oceania and Western Europe Not Far Behind
- Recovery Rates Remain Much Lower in the Developing World



Recovery Rates in Major World Regions

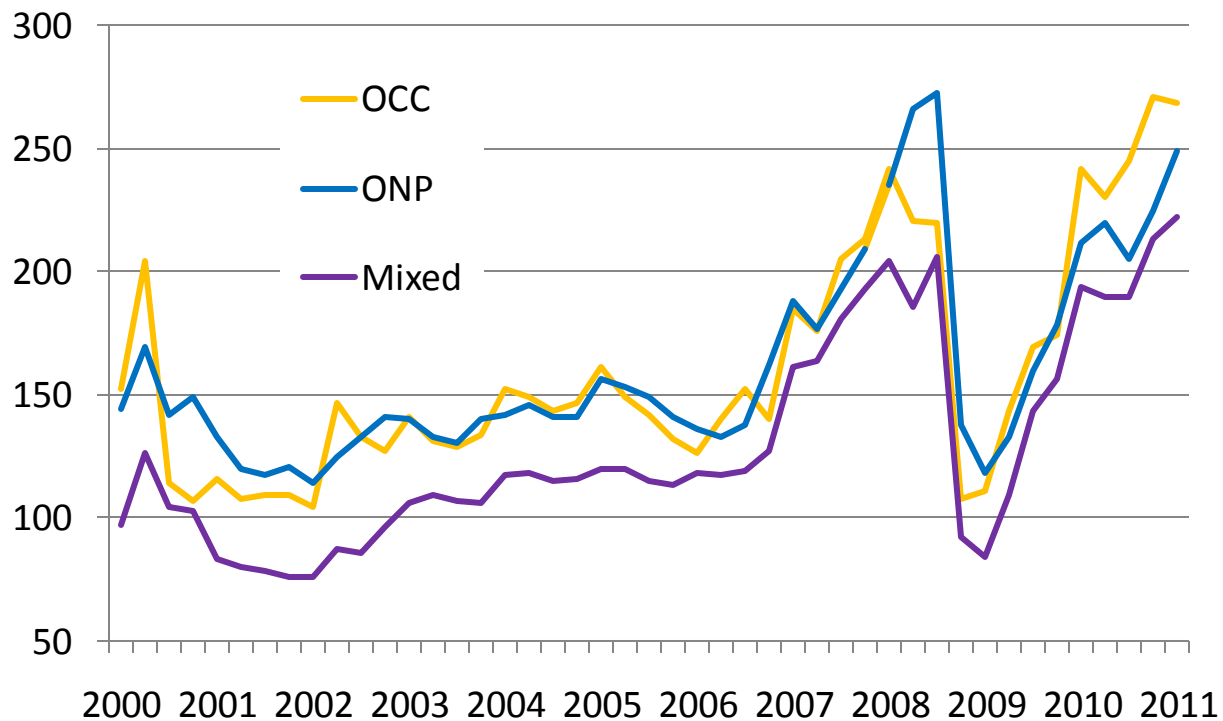


Recovered Paper Prices Have Risen Steadily Over the Last 10 Years

- Reflecting the Increasing Tightness in the Markets
- And Rising Costs Associated with Digging Deeper into the Waste Stream
- Major Factors Boosting Costs Include:
 - Processing Lower Quality Material, Especially from Single-Stream Systems
 - Reaching Further Geographically for Supplies



Prices for Major Bulk Grades Delivered to China (US\$/Tonne)

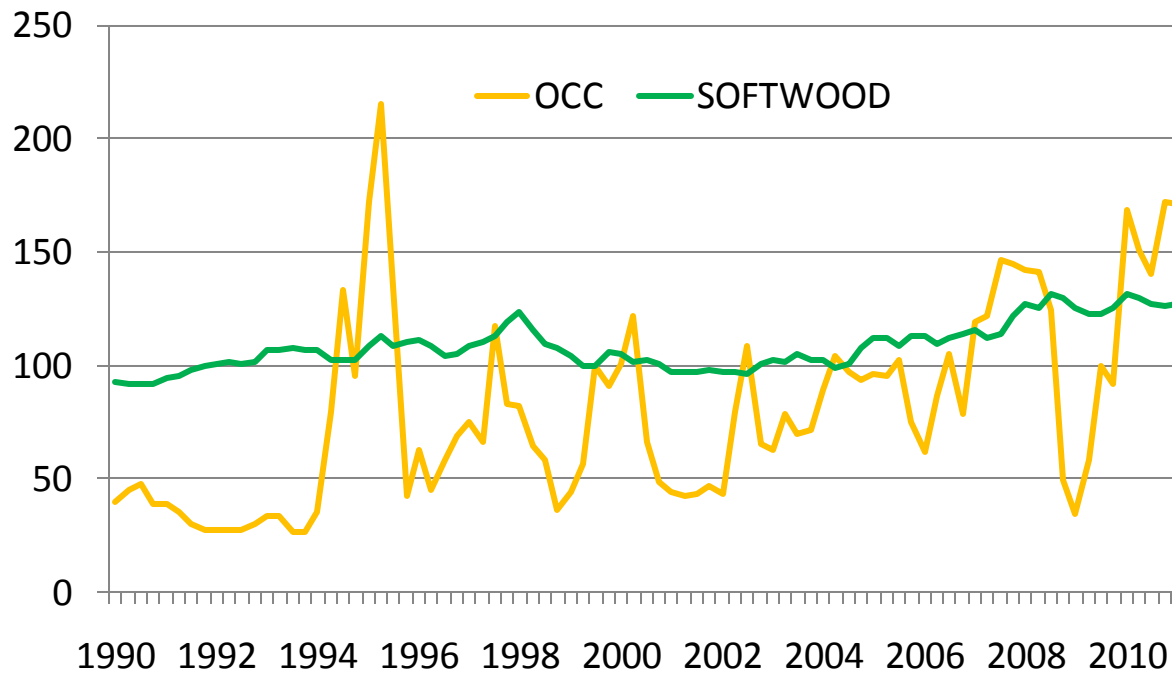


Recovered Paper Prices Have Surpassed Virgin Prices in Some Regions

- With the US South Being the Prime Example
- Partially as a Result of the Depressed Wood Products Business
- Other Regions Will See the Same Phenomenon
 - Since Recovered Paper Prices Are Set by the Chinese
 - While Virgin Fiber Prices Are Set on a Regional Basis



US OCC Price and Equivalent Price of Softwood Fiber for a US Southern Kraftliner Mill (US\$/Tonne)



Economics Continue to Favor Recovered Paper in China

- OCC Prices Still Lower Than Virgin Fiber, Especially Imports
 - Energy Costs are Relatively Low, With On-site Coal Plants
 - Latest Technology on New Paper Machines
 - Much Lower Capital Costs Since Kraft Pulp Mill Not Required
- Chinese Papermakers Are Scrambling to Find New Sources of Recovered Paper
- But All of the New Containerboard Projects Still Based on This Fiber



Latest listing of Chinese Containerboard Expansions

Company	Location	CAP	Date	Grade
Lee &Man	Guangdong	500	2011Q1	Recycled Liner
Hunan Shuanghua Paper	Hunan	100	2011Q1	Recycled Medium
Foshan Gold Rich Paper	Guangdong	100	2011Q1	Recycled Medium
Fujian Liansheng Paper	Fujian	300	2011Q1	Recycled Medium
Hebei Baoding Orient Paper	Hebei	360	2011Q1	Recycled Medium
Shouguang Meilun Paper	Shandong	600	2011Q1	White-top Liner
Nine Dragons Paper	Tianjin	400	2011Q2	Recycled Liner
Nine Dragons Paper	Tianjin	400	2011Q2	Recycled Liner
Longyuan Paper Taikang Mill	Henan	200	2011Q2	Recycled Medium
Zhejiang Yongtai Paper	Zhejiang	200	2011Q2	Recycled Liner
Zhejiang Jian Paper Packet	Zhejiang	650	2011Q2	Recycled Liner



Latest listing of Chinese Containerboard Expansions

Company	Location	CAP	Date	Grade
Zhejiang Jian Paper Packet	Zhejiang	250	2011Q2	Recycled Medium
Lee & Man	Chongqing	400	2011Q4	Recycled CNT
Fujian Lishu Pulp & Paper	Fujian	200	2012Q1	Recycled Medium
Fujian Liansheng Paper	Fujian	450	2012Q1	Recycled Liner
Fujian Liansheng paper	Fujian	350	2012Q2	Recycled Medium
Nine Dragons	Fujian	350	2012Q2	Recycled Liner
Nine Dragons	Fujian	300	2012Q2	Recycled Liner
Yuen Foong Yu	Jiangsu	450	2012Q2	Recycled CNT
Hebei Changtai Paper	Hebei	500	2012Q4	Recycled Medium
Lee & Man	Hubei	900	2012	Recycled CNT
Nine Dragons Paper	Liaoning	600	2013Q3	Recycled CNT

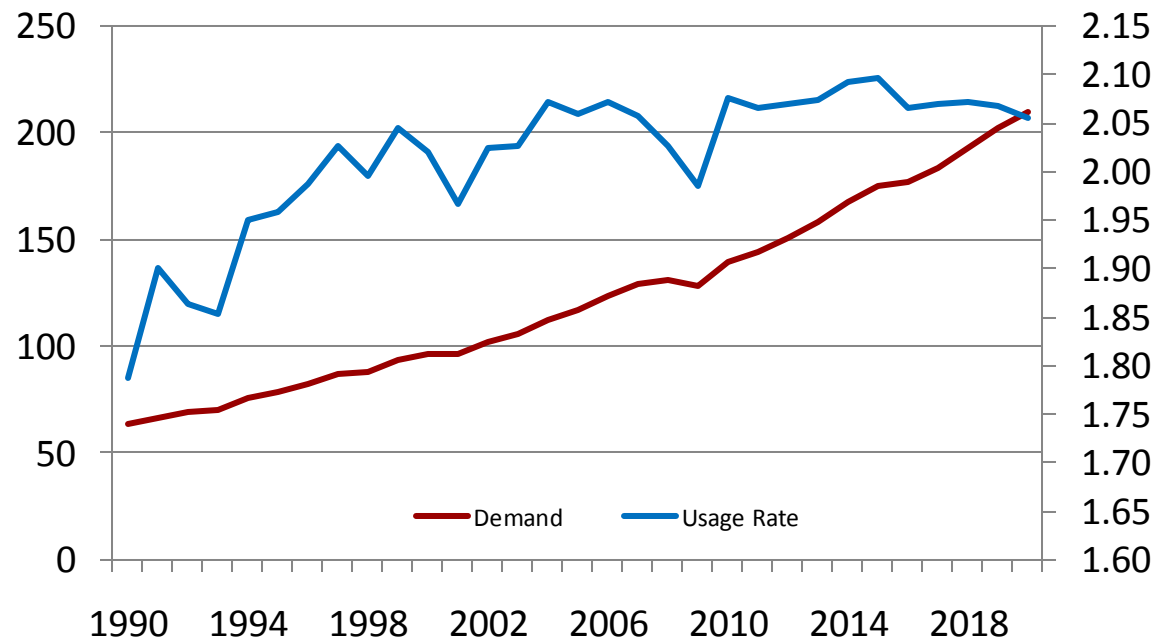


World Containerboard Demand Will Continue to Closely Track the Economy

- Although Industrial Production Should Slow Relative to GDP
- As Developing Regions of the World Shift Toward More Services
- Lighter Weights of Containerboard Will Slow Tonnage Growth
 - Driven by Higher Fiber Prices
 - Improving Paper Machine Technology
 - Environmental Concerns



World Containerboard Demand and Usage Rate Relative to GDP (Million Tonnes and Tonnes/Million 2005\$)

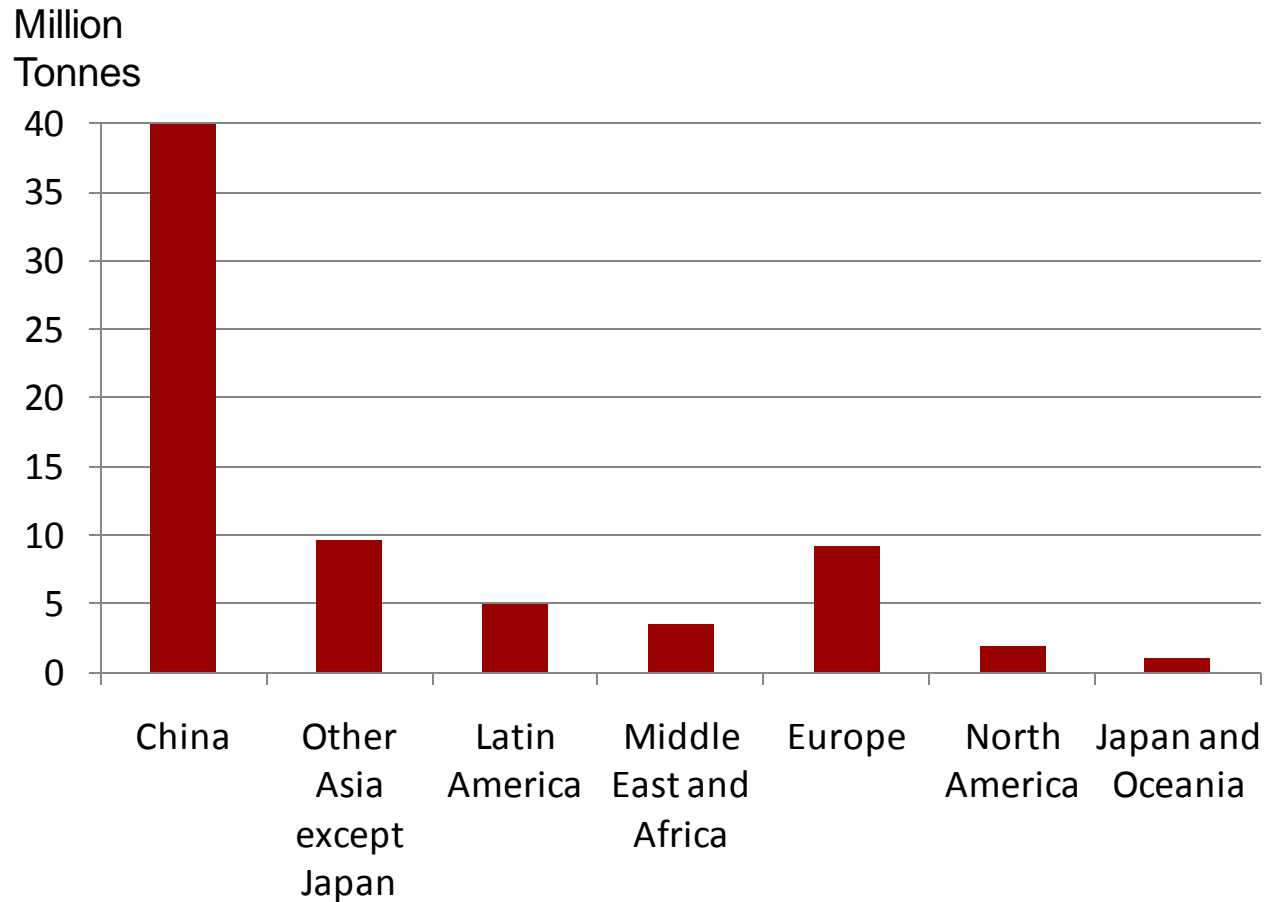


Vast Majority of Containerboard Demand Growth Will be in Developing Regions

- Strong Economic Growth
- Higher Share of Industrial Production in General Economies
- However, Growth Will Slow Relative to Historical Performance
 - Shift Toward More Service-Based Economies
 - Higher Prices for Containerboard and Corrugated Boxes
 - Increasing Environmental Concerns with Respect to Packaging



Growth in Containerboard Demand by Major Region (2010-2020)

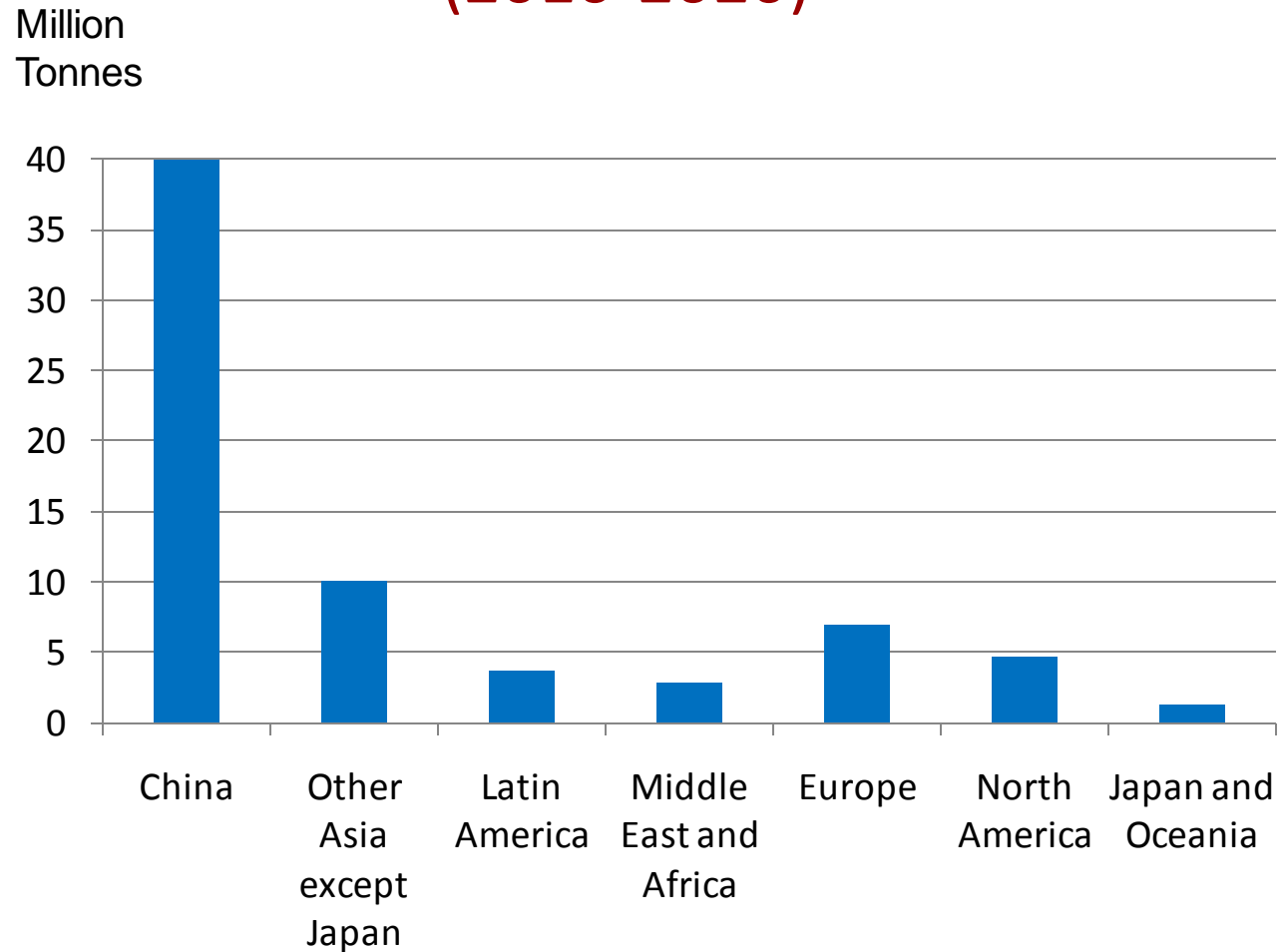


Containerboard Production Will Continue to Follow Demand Regionally

- Ability to Produce Quality Products from Recovered Paper
- Boxmakers Looking for Short Lead Times for Board
- High Transport Costs for Containerboard Between Regions
- China Will Continue to Post the Largest Increases in Output
 - Followed by Other Developing Countries
 - Although Exports Will Rise from North America



Growth in Containerboard Production by Region (2010-2020)

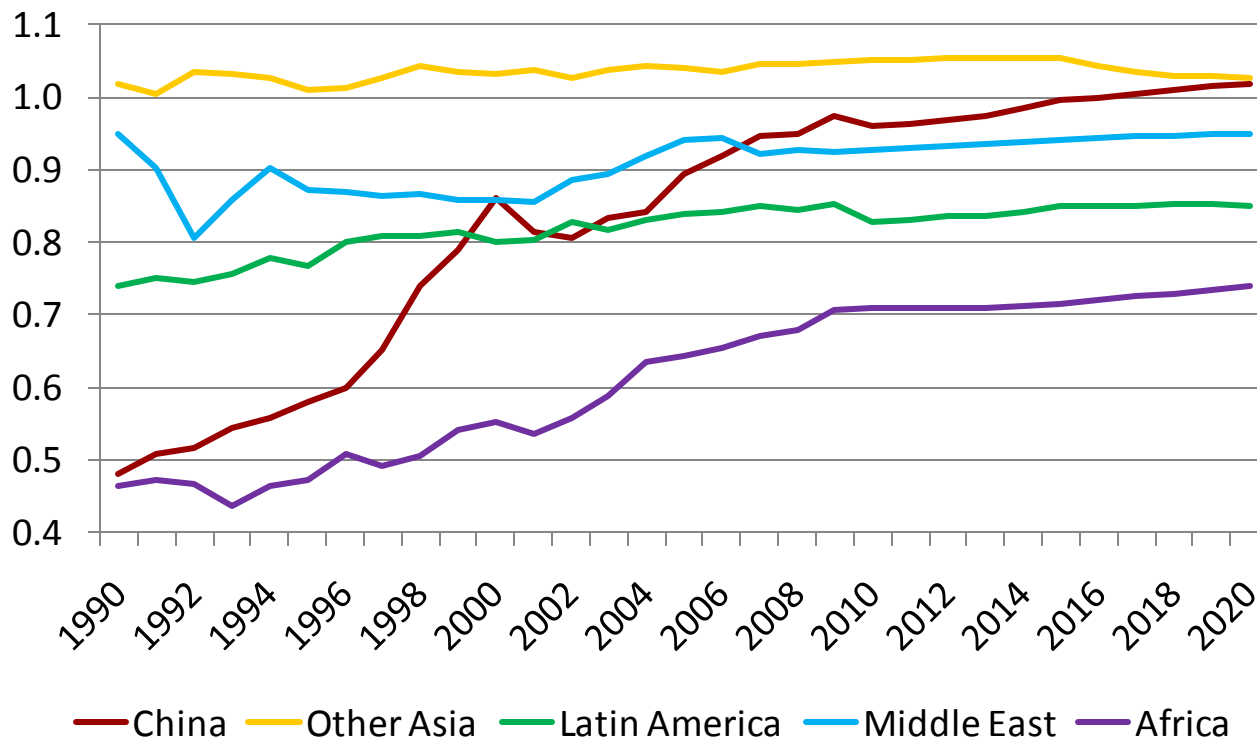


Chinese Production Will Still be Based Heavily on Recovered Paper

- Even Though Recovered Paper Costs Will Rise Relative to Virgin
- Aggressive Efforts to Expand Domestic Collections
- Other Developing Regions Will Remain Dependent on Recovered paper
 - Lack of Virgin Fiber
 - Economics of Building New Capacity
- Developing Regions Will Look to Nonwood Fiber as an Alternative



Recovered Paper Share of Containerboard Furnishes in Developing Regions

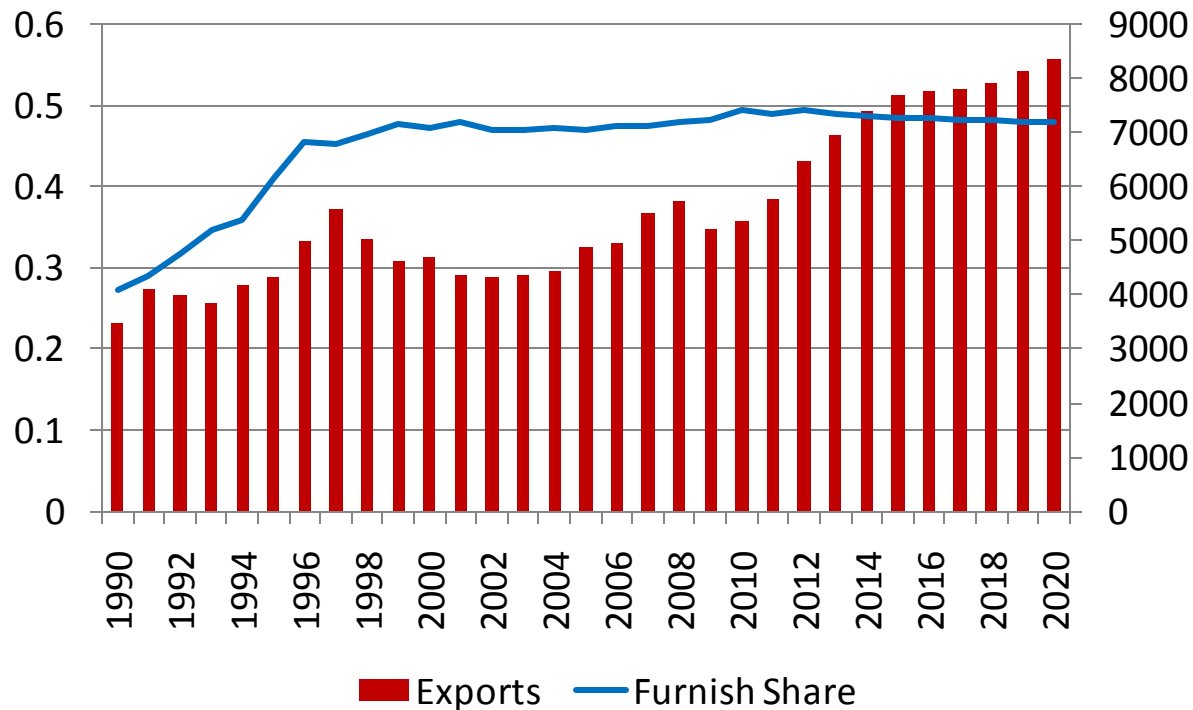


Upward Pressure on Recovered Paper Prices from Rising Usage in Developing World

- Will Make Virgin Fiber an Attractive Alternative in Some Developed Regions
- North America, Particularly the US South, Will See Rising Virgin Share of Furnish
 - Recovered Paper Costs Stay Considerably Higher Than Wood Costs
 - Opportunity to Shift Output from Woodfree Papers to Containerboard
 - Limited Growth in Domestic Demand Will Encourage Incremental Expansion
- However, Virgin Share Will be Constrained by:
 - Need to Install New Recovery Boiler Capacity
 - Environmental Credentials of Recycled Containerboard



Recovered Paper Share of North American Containerboard Fiber Furnish and Containerboard Exports (Thousand Tonnes)

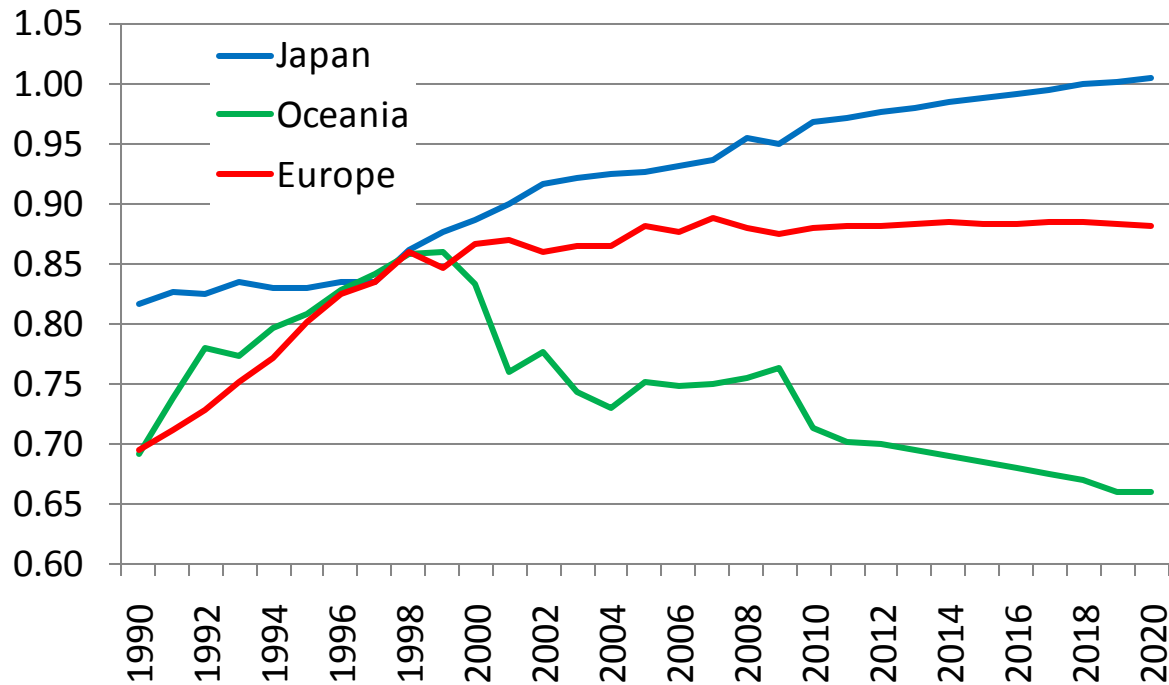


Europe Will be Hit by Cross Currents

- Limited Virgin Supplies in the West Will be a Problem
- Accelerating Move Toward Lightweight Recycled Products
- Increasing Recycled Containerboard Demand in the East
- Investment in Virgin Capacity in Russian Far East
- Oceania Will Likely See More Virgin Capacity
 - While Japan Will Remain Recycled Based



Recovered Paper Share of Containerboard Fiber Furnish in Developed Regions

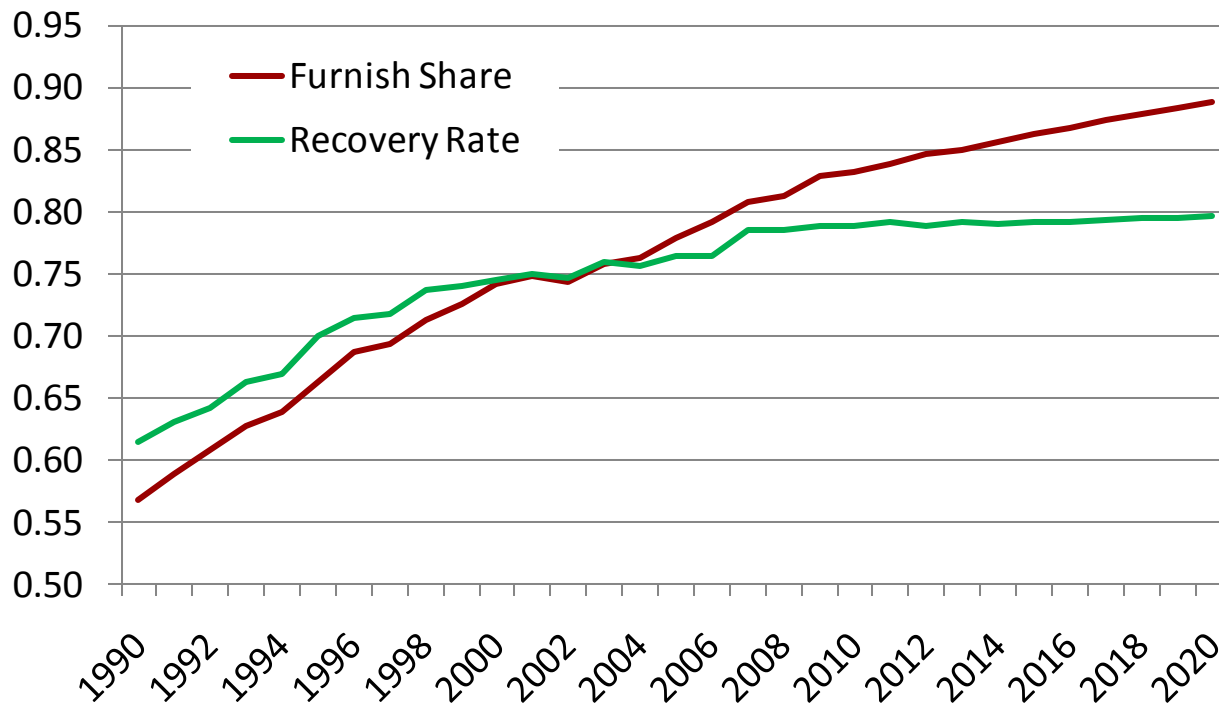


On a Worldwide Basis, Recovered Paper Share of Containerboard Fiber Furnish

- Has Not Yet Already Reached a Critical Level, at 83%
- And 72% After Fiber Losses in Pulping Process
- Leaving 28% as Virgin Fiber, With 24% Being Wood
- Regionally, There Are Already Problems
 - Requiring Imports of Higher Virgin-Content Recovered Paper
- However, the Recovery Rate of OCC Has Reached a Critical Level
 - At 80% on a Worldwide Basis
 - Leaving Little Room for Further Increases



Recovered Paper Share of World Containerboard Furnish and OCC Recovery Rate



Further Discussion Points:

- How Low Can Basis Weights Go for Containerboard?
- How Can Papermaking Technology Better Utilize Fiber?
- How Much Hardwood Can Be Used in Kraftliner?
- Will a Cost-Effective Nonwood Pulping Technology be Developed?
- To What Extent Will Energy Uses Impact Virgin Fiber Pricing?
- Which Paper Grades Will be Affected First by High Recovered Paper Prices?
- Will Virgin Containerboard Prices Drop Below Recycled Prices?
- Will a More Cost-Effective Technology be Developed to Incrementally Expand Recovery Boiler Capacity?

