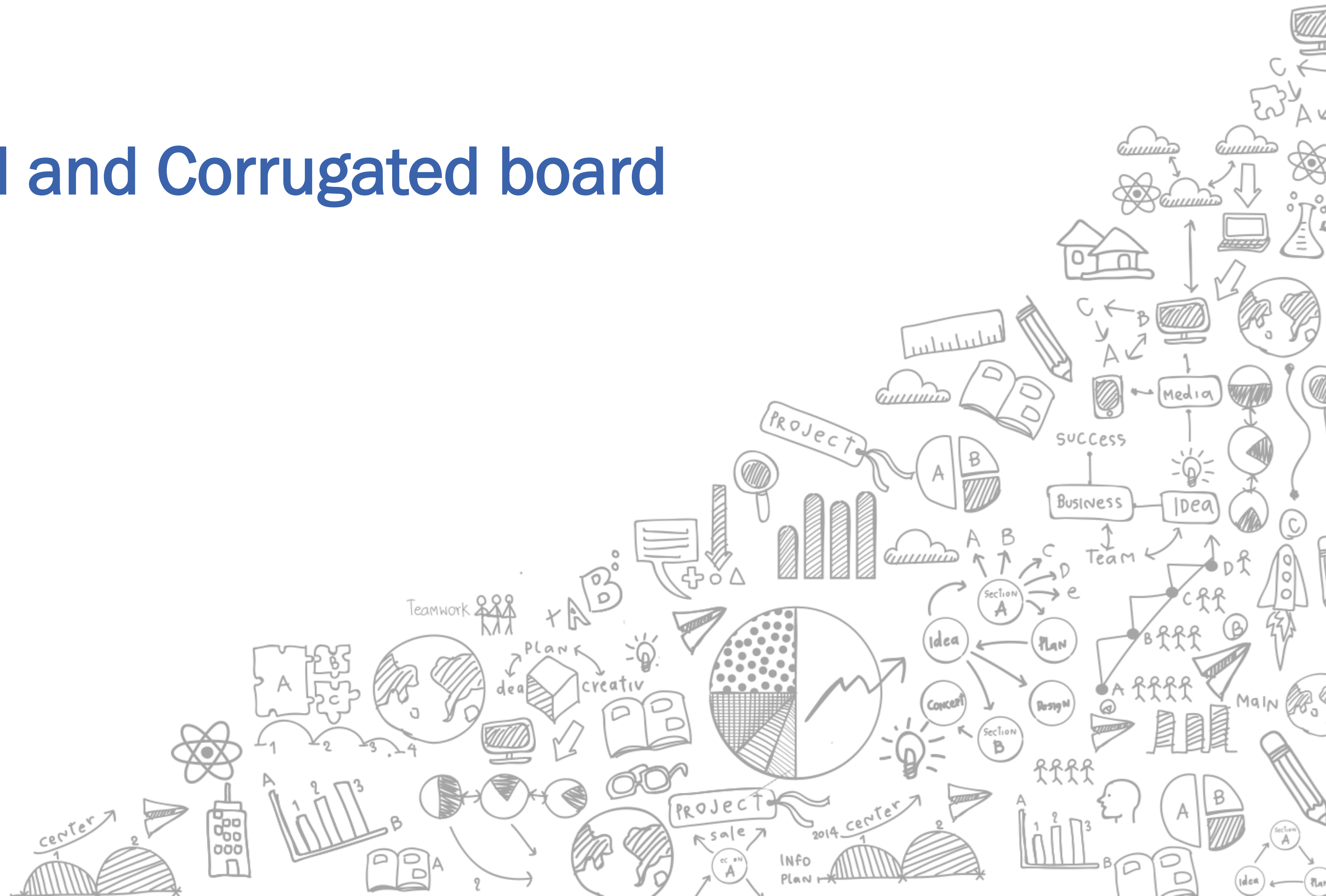
ЦЕНТР
СИСТЕМНЫХ
РЕШЕНИЙ

MS-5B, Containerboard and Corrugated board market study

2017 - 2021



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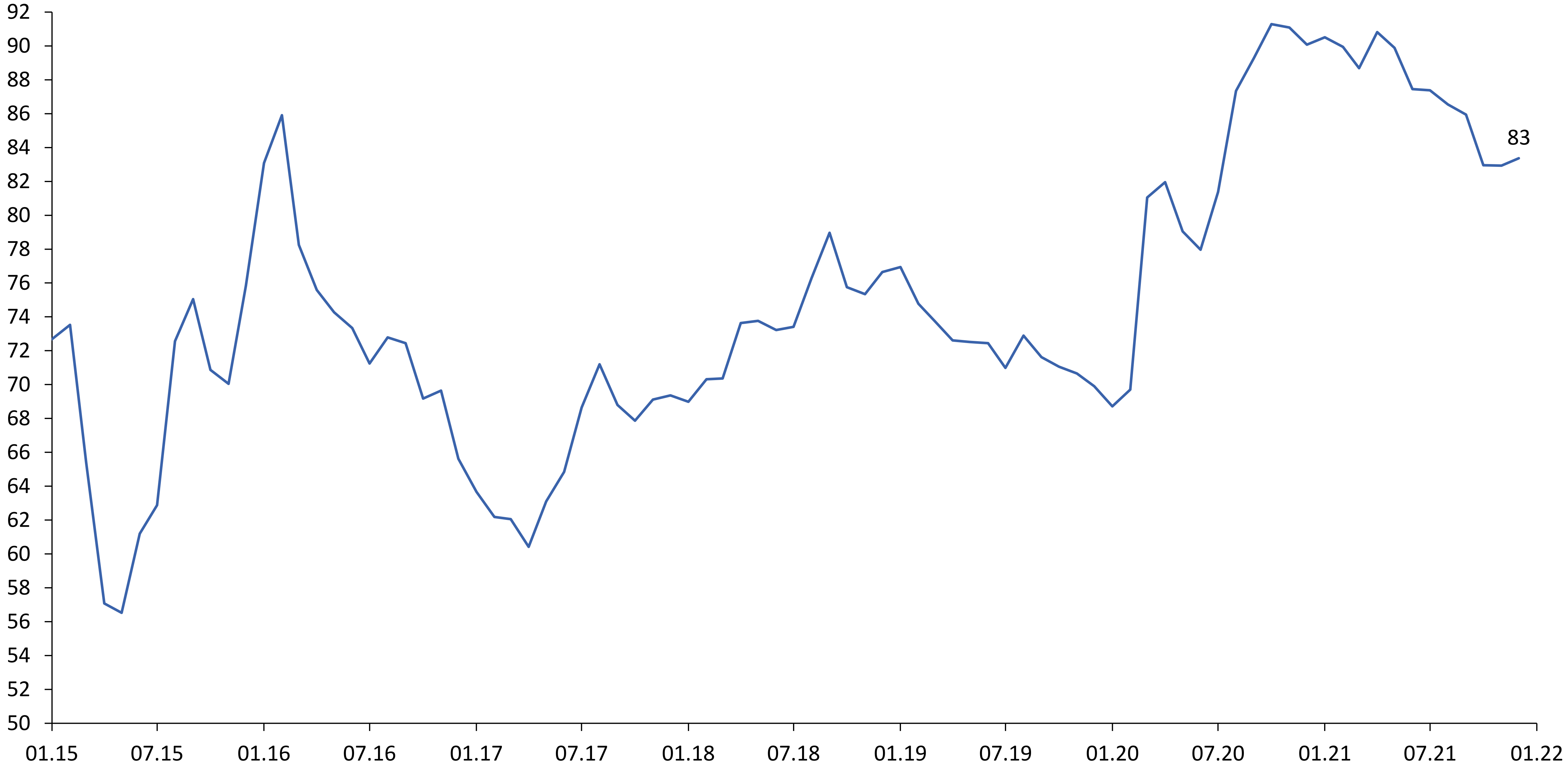
Glossary

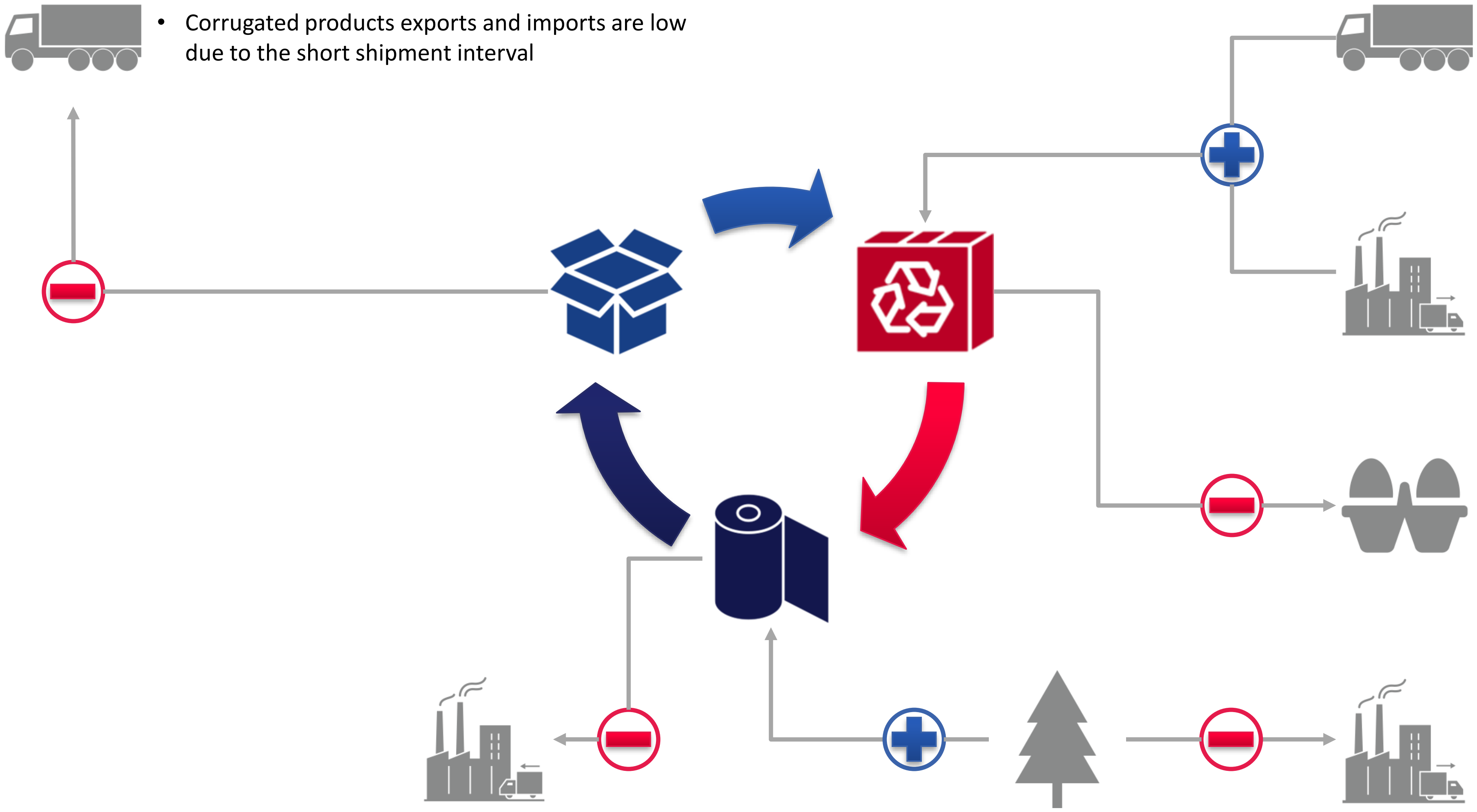
- **PfR** – paper for recycling
- **OCC** – old corrugated containers (waste of corrugated cardboard consumption)
- **MS-5B** – waste of production and consumption of corrugated cardboard, paper and board used in its production
- **EUR** – Euro
- **RUB** – Russian Ruble
- **Recyclables** – recyclable materials or products can be used again after they have been treated using a special industrial process (including PfR, plastic, metal scrap, etc.)
- **EXW** – Ex Works (named place of delivery) (Incoterms)
- **DDP** – Delivered Duty Paid (named place of destination) (Incoterms)
- **Collectability rate** – ratio of PfR collected to generated
- **Containerboard** – common name of cardboard for flat layers of corrugated cardboard (liner) and paper for corrugation (fluting)
    - **RCCM** – recycled containerboard
        - **TL** – testliner, recycled cardboard for flat layers of corrugated cardboard
        - **TL-2** – testliner 2
        - **TL-3** – testliner 3
    - **VCCM** – virgin pulp containerboard
        - **KL** – kraftliner
    - **MCCM** – mixed containerboard (virgin pulp and PfR composition)
- **P&P** – pulp and paper industry
- **RF** – Russian Federation
- **EU** – European Union
- **CIS** – The Commonwealth of Independent States (regional intergovernmental organization in Eastern Europe and Asia. It was formed following the dissolution of the Soviet Union in 1991)
- **PM** – paper machine
- **PPE** – production and procurement enterprise
- **IC** – Individual collector
- **RO** – regional municipal solid waste operator (also – regional operator)
- **CSS price indices** – Price indices for main products of Russian pulp and paper industry published by CSS
- **FSSS** – Federal State Statistics Service (Rosstat)
- **FCS** – Federal Customs Service of Russia
- **FTS** – Federal Taxation Service of Russia
- **FAO** – Food and Agricultural Organization of the United Nations
- **VAT** – value-added tax
- All prices are without VAT
- All PfR values are in fiber equivalent (without humidity and other components like plastic or metal elements)

Euro to Ruble exchange rate



Source: Central Bank of Russian Federation

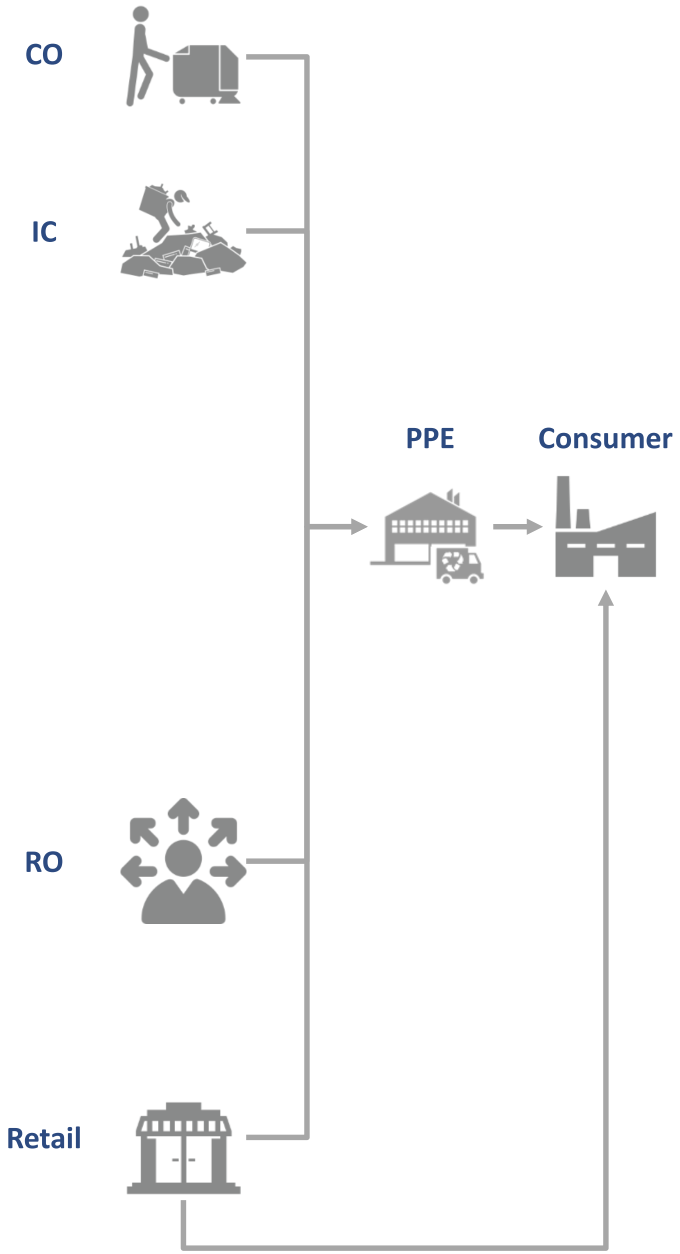
Production of corrugated products and containerboards as well as MS-5B collection are parts of a single cycle



- Corrugated products exports and imports are low due to the short shipment interval
- High amount of corrugated packaging is exported and imported as part of goods (packaging of goods)
- Corrugated packaging imports slightly exceed exports
- MS-5B exports and imports of are insignificant
- Imports slightly exceed exports
- 15% of MS-5B is used in production of other types of products (not containerboards)
- Sales of virgin pulp and mixed containerboards are export-oriented
- About half of the total production amount is exported
- Net exports of recycled containerboard is less than 5% of production
- Share of mixed and virgin pulp containerboards in domestic consumption is less than 30%

Source: Analysis conducted by CSS working group

MS-5B is supplied by PPE or chain retailers



- **Cleaning operators (CO)** provide services that include waste collection
- If there is enough PfR, cleaning operators collect it and sell to PPE

- **Individual collectors (IC)** these are individual entrepreneurs who have a vehicle for transporting PfR
- IC collect PfR wherever possible (buy, pick up for free, or even collect from unsorted waste)
- Some IC buy it from janitors who sort it by hand from mixed waste

- **Production and procurement enterprise (PPE)** is a company operating in the field of handling secondary materials
- Most of PPE don’t limit activities only to PfR. PPE collect and process other types of secondary materials (plastic, metal, glass, etc.)
- PPE perform final sorting, pressing and baling of PfR before sending it to the consumer
- Some PPE have their own vehicle fleet to collect waste paper in the same way as IC
- Some PPE create collection points for secondary materials from people on a reimbursable basis (rare practice)
- Some PfR consumers have their own PPE (there is a rare practice, most PPE are autonomous)
- ***Purchasing***: single deliveries or short-term contracts

- **Regional operator (RO)** control municipal solid waste management system in regions
- Some RO may perform some functions of PPE or have their own PPE or waste sorting facilities
- Development of a separate waste collection system in Russia will allow RO to sell all types of secondary materials

- PfR from retailers is collected by PPE or IC
- Chain retailers can sell PfR directly to consumers
- Large chain retailers, such as Tander, have their own equipment for processing (pressing and baling) PfR in their warehouses
- MS-5B is delivered to warehouses from stores by the same vehicles that deliver goods to stores
- ***Purchasing***: tender

Source: Analysis conducted by CSS working group

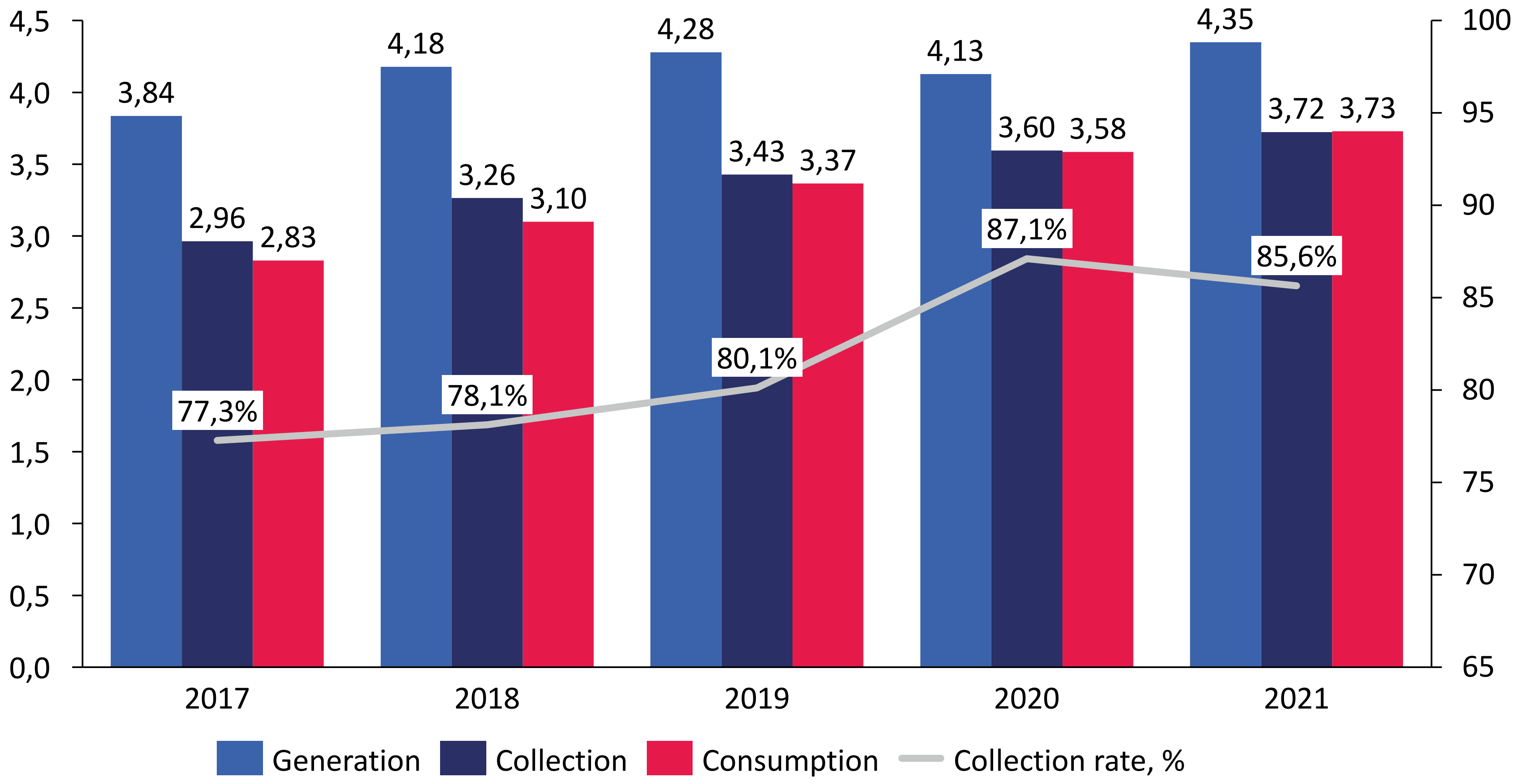
Various MS-5B sources differ in practices

Sources	Collectors: CO	IC	PPE	RO	
Households		✓	✓	✓	• PfR generated by households is collected by janitors who sell it to the PPE or IC • PPE or RO can collect it independently if they have their own vehicle fleet
Industrial enterprises	✓	✓	✓		• PfR generated in industrial enterprises can be collected by cleaning companies • Also PfR can be sold or transferred directly to IC or to PPE
Manufacturers of corrugated products			✓		• Corrugated board manufacturers sell their PfR directly to PPE
Other commercial property	✓	✓	✓	✓	• Other commercial properties sell or give away their waste paper for free to PPE
Waste sorting facilities			✓		• Waste sorting facilities sell PfR to PPE
Retail		✓	✓		• **Non-chain retail** sell or give away their PfR for free to PPE or ICC • **Chain retail** sell their PfR directly to consumers

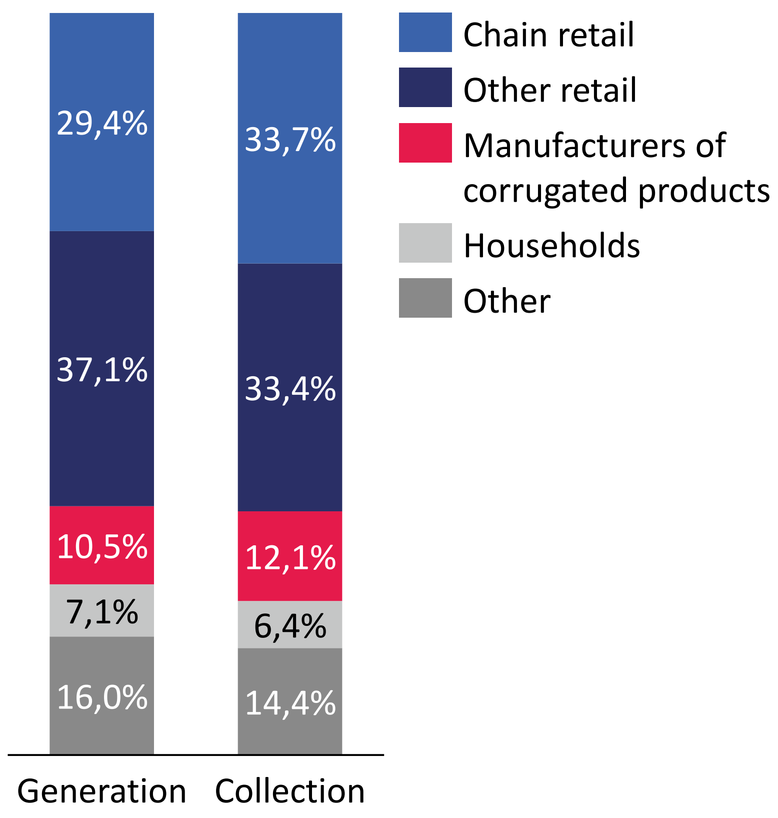
Source: Analysis conducted by CSS working group

MS-5B domestic supply (collection) grew intensively
Collection rate estimated as the highest possible

MS-5B generation, collection and consumption, M tons



MS-5B generation and collection sources

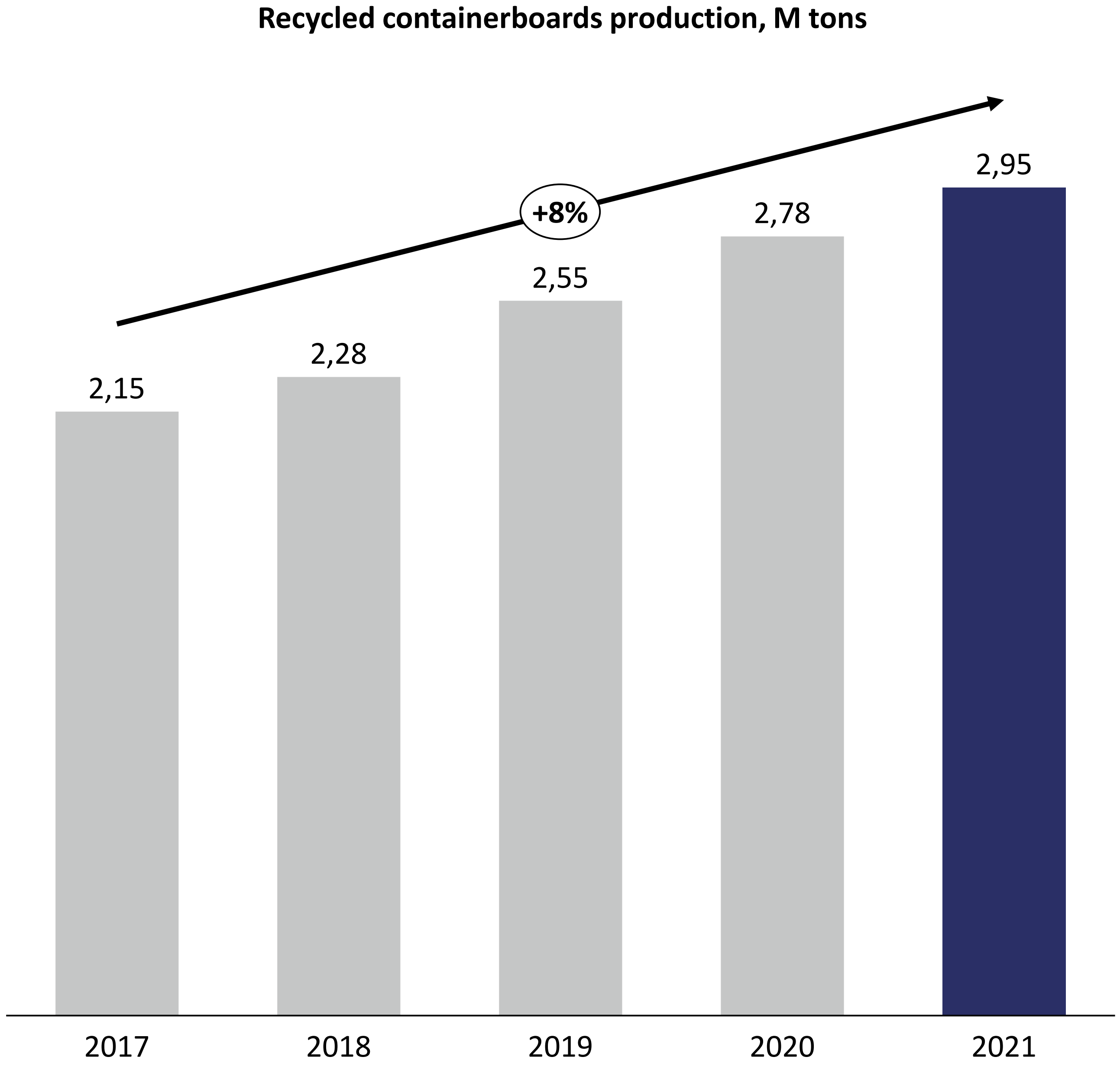


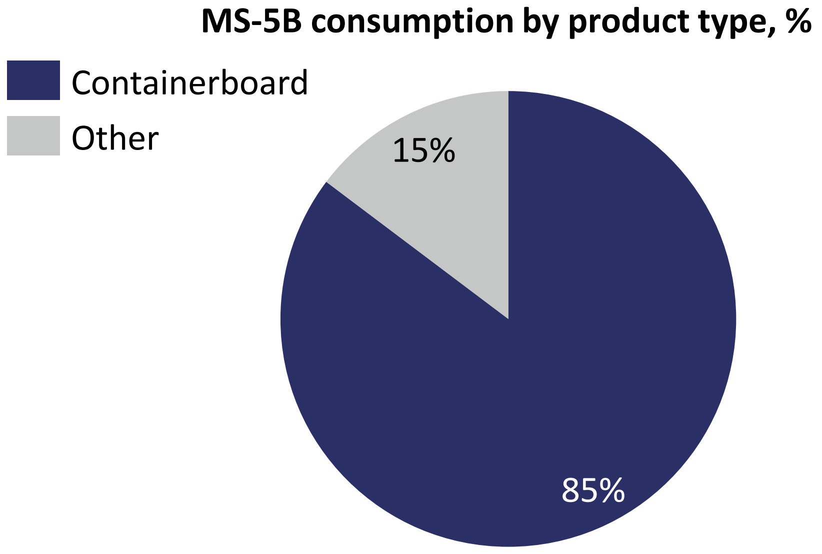
- MS-5B generation was growing rapidly after 2016 driven by growing amount of packaging consumption
- In 2020 due to COVID-19 pandemic restrictions the generation declined
- MS-5B collecting was growing faster then generation driven by high demand
- Current collectability rate is estimated to be close to highest possible level in Russia

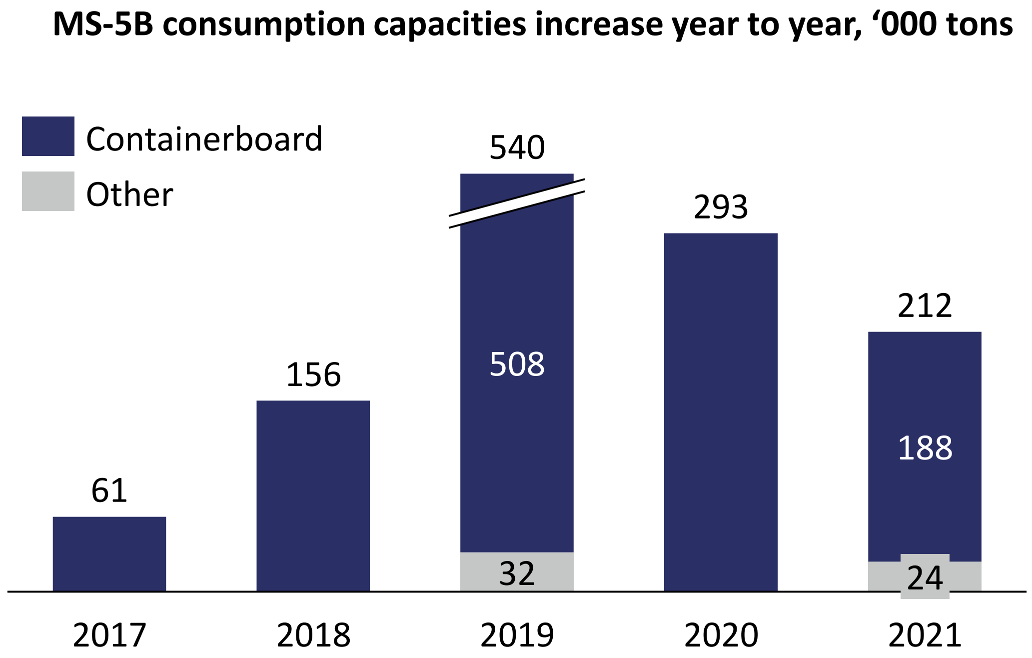
- Retail is the largest source of MS-5B with a total collection share of 67%
- Collection rate at chain retail and manufacturers of corrugated products is the highest

Source: Analysis conducted by CSS working group

Core driver of MS-5B consumption and collection was growing market of recycled containerboard







Source: Analysis conducted by CSS working group

Depreciation of RUB during the pandemic led to a significant increase in MS-5B price and collection

Depreciation of RUB during the pandemic

Growth in exports of goods in corrugated packaging

Growing demand for corrugated products

Growth in exports of recycled containerboards

Growing demand for recycled containerboards

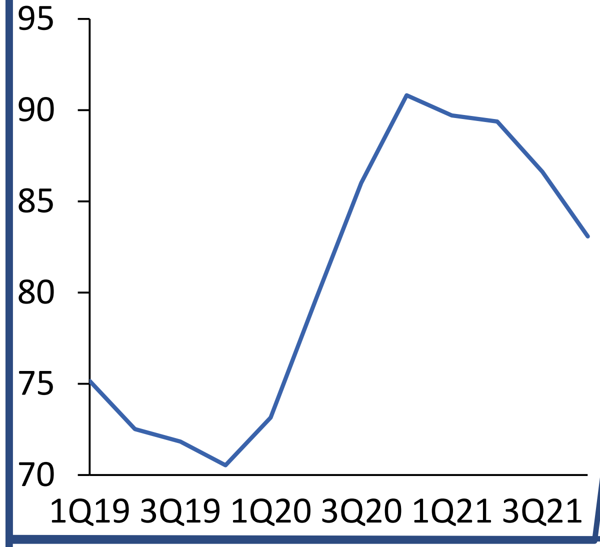
Growing demand for MS-5B

Rise of MS-5B price

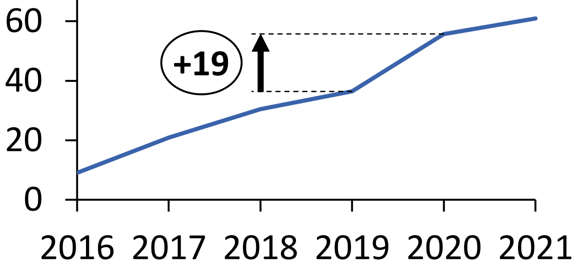
Rise of MS-5B collection

Reducing of MS-5B generation during a pandemic

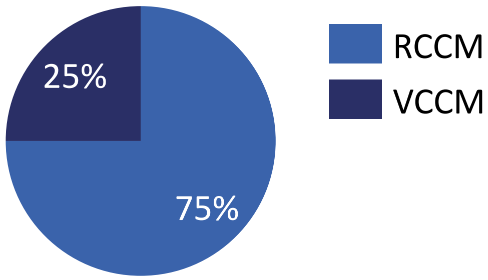
EUR to RUB exchange rate



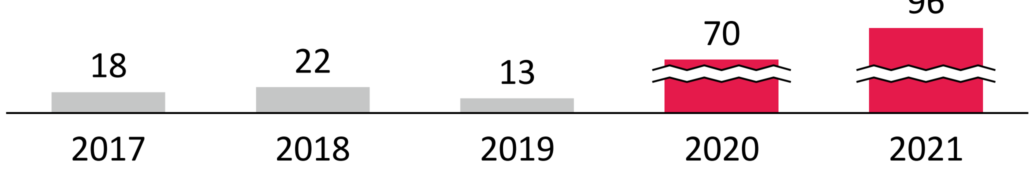
Russian goods in corrugated packaging (year to 2015) exports NETTO growth rate, %



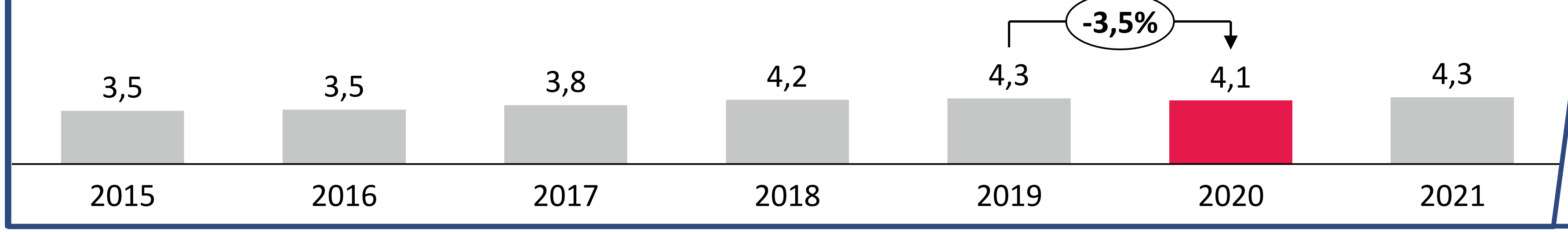
Containerboard consumption structure in Russia in 2020, %



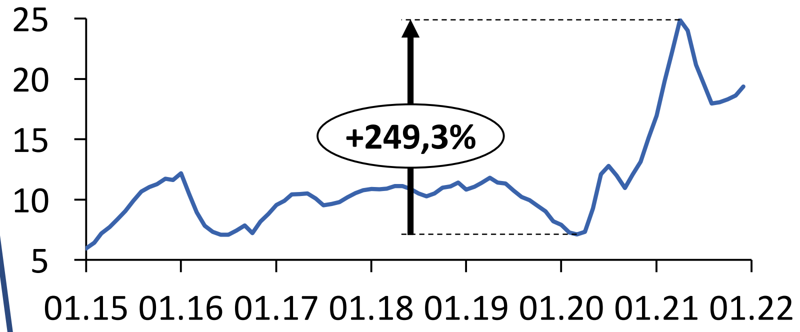
Recycled containerboards exports, '000 tons



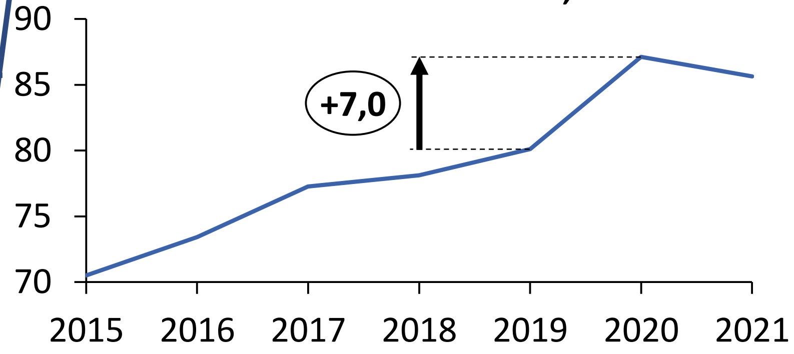
MS-5B generation, M tons



MS-5B price, DDP, '000 RUB

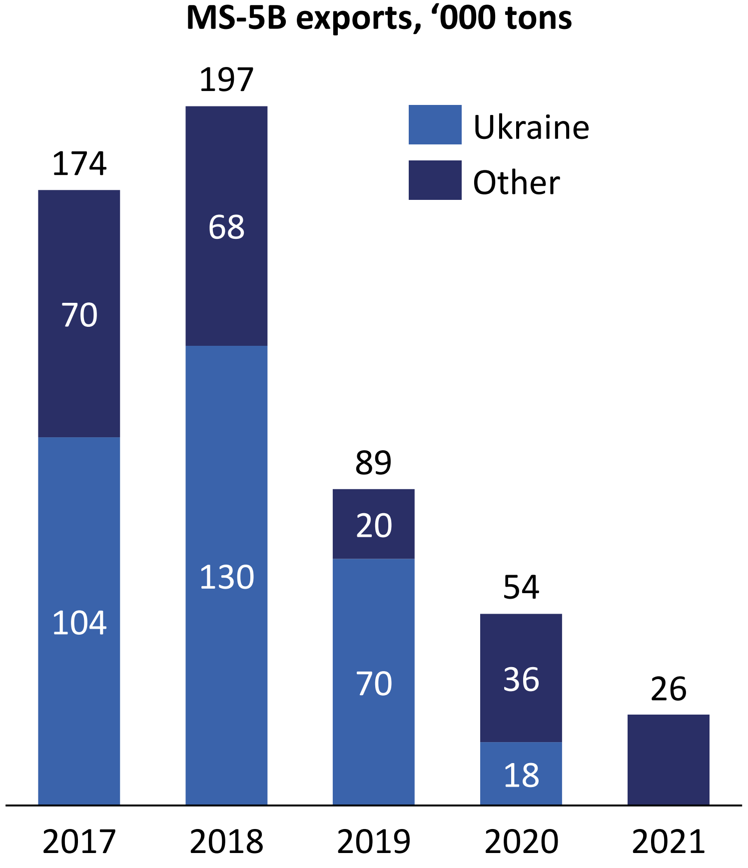


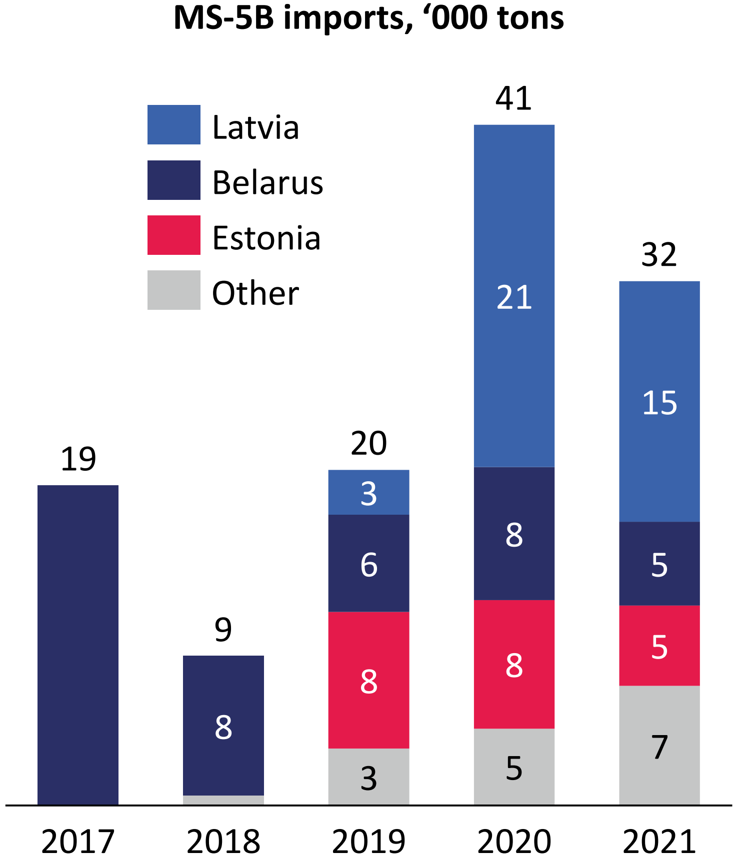
MS-5B collection rate, %

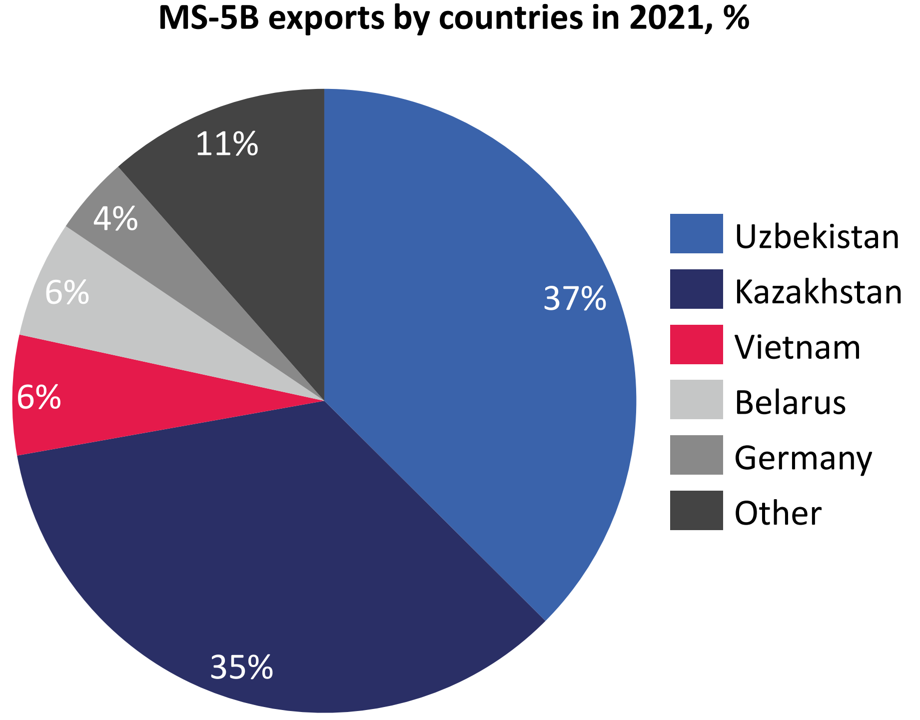


Source: Analysis conducted by CSS working group based on FCS RF data; PI CSS data; CB RF data

Growing MS-5B domestic market demand pulled exports down to it minimum Imports remains low due to technological and legislative barriers





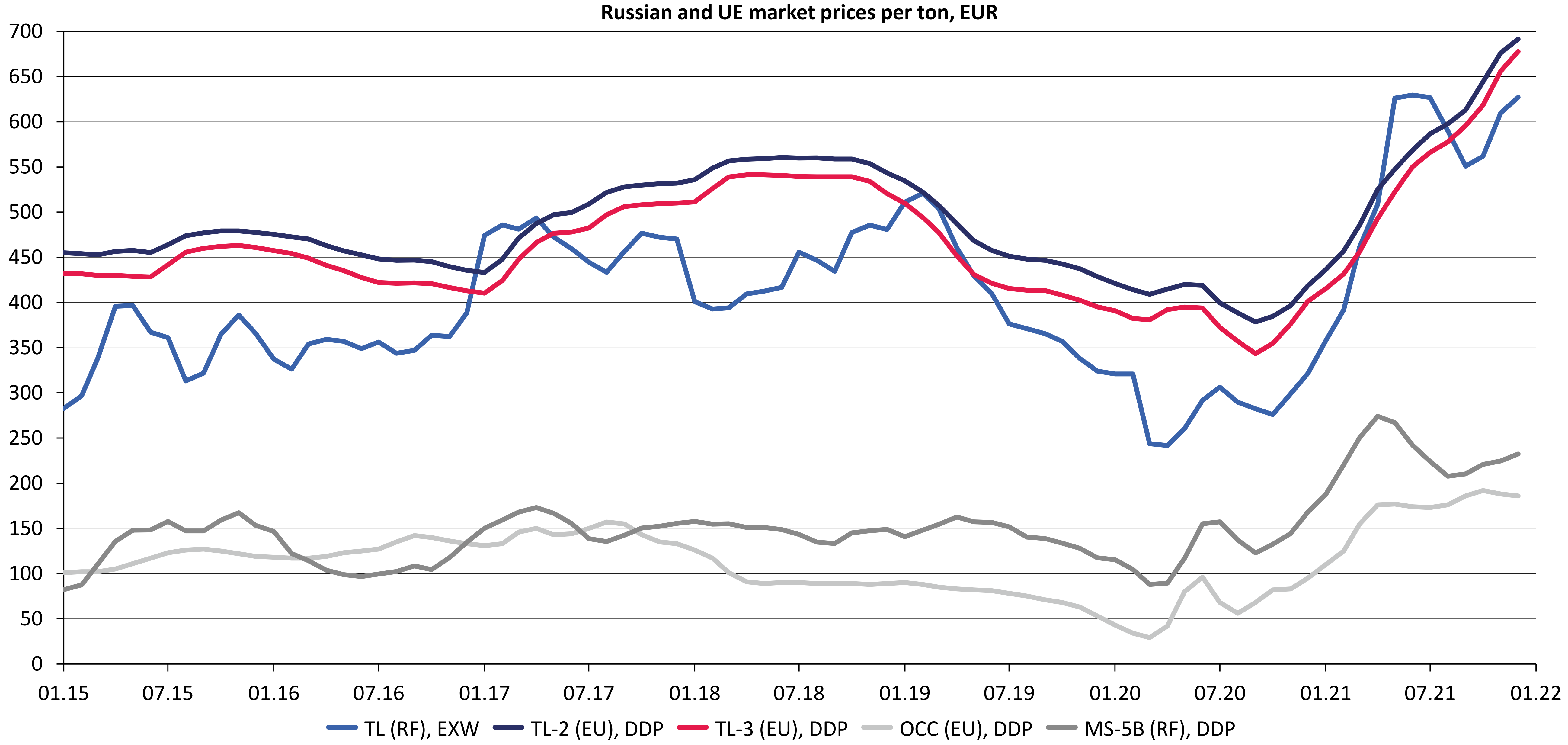


- Ukraine used to be the largest importer of Russian PfR (MS-5B mostly) before the exports to Ukraine was banned in 2020
- Overall MS-5B exports declined due to growing domestic market demand

- Belarus has the largest share in Russian PfR imports and used to be the main exporter of MS-5B to Russia
- MS-5B generation in Belarus is low, so no significant amount could be imported
- More significant amount of OCC could be imported from EU countries, but the imports is restricted with 2 major factors:
  - The Basel Convention restrictions
  - Lower quality of OCC from EU: due to higher recyclability OCC from EU contains less long fiber, so that most part Russian consumers can use no more than 15% in overall MS-5B consumption

Source: Analysis conducted by CSS working group based on FCS RF data

Russian price for MS-5B is greater then in EU
Price dynamics is similar



Source: Analysis conducted by CSS working group based on PI CSS and RISI data

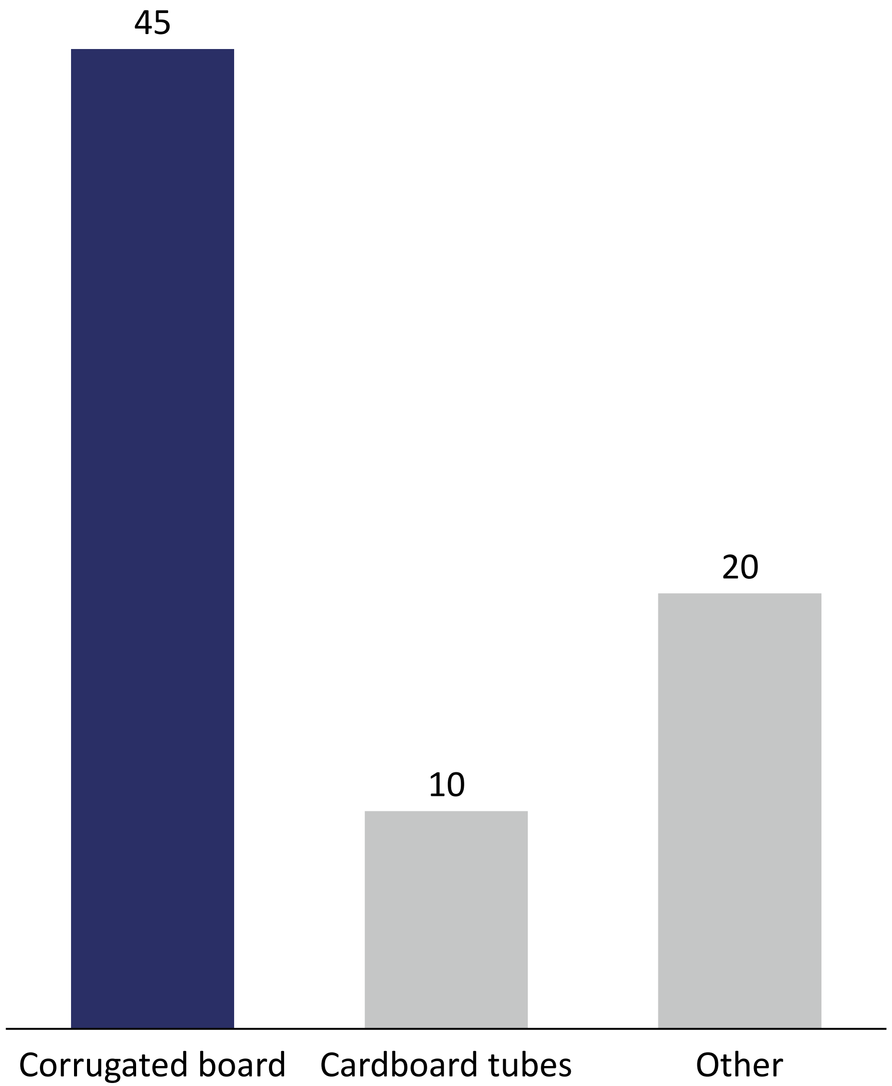
One of the major issues in Russian waste management legislation is extended producer responsibility (EPR)

- All manufacturers and importers must either recycle waste from use of their products themselves (except for those that are exported), or pay the recycling fee in an amount (share) equal to the recycling rate
- Fee per ton for all paper and board products is 2 378 RUB (≈20 EUR)

Paper and board products include:

- Corrugated cardboard
- Paper bags and sacks
- Other paper and board packaging
- Paper and cardboard products for in home use
- Stationery paper products
- Cardboard tubes
- Printed publishing products

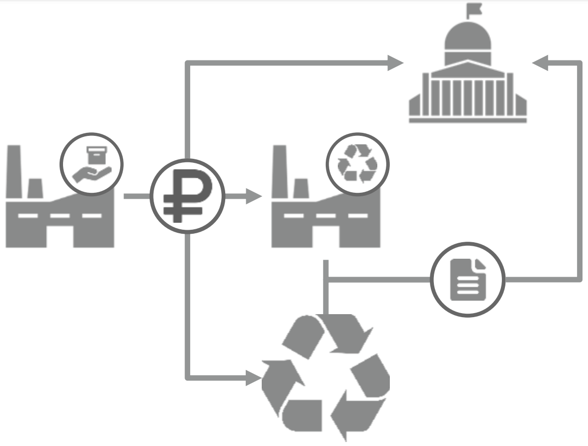
Recycling rate, %



Source: Analysis conducted by CSS working group based on Federal Law N 89-FL (dated 24.06.98)

EPR system in Russia is expected to change in the nearest years

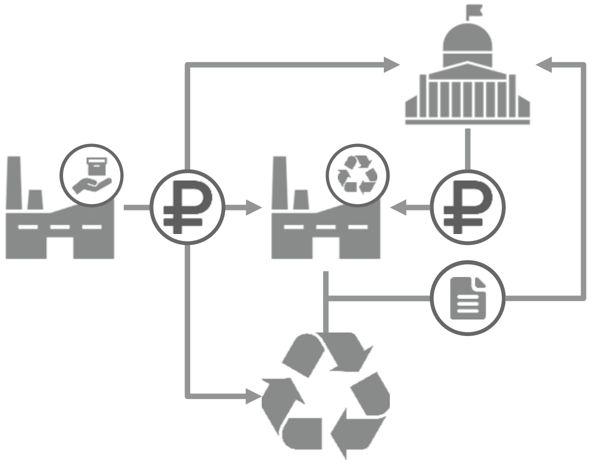
EPR existing model



- **Paying recycling fee (non-tax federal payment)**
- Those fees are used on waste management purpose
- **Making a direct contract with recycler**
- Recycler provides a confirming document (act of recycling)
- Producer or importer provides this document to supervising service instead of paying recycling fee
- **Own recycling**
- Producer or importer can recycle the waste by itself
- Afterwards the confirming document is provided to supervising service

Recycling fee = Goods produced or/and imported * Fee per unit * Recycling rate

EPR changing model



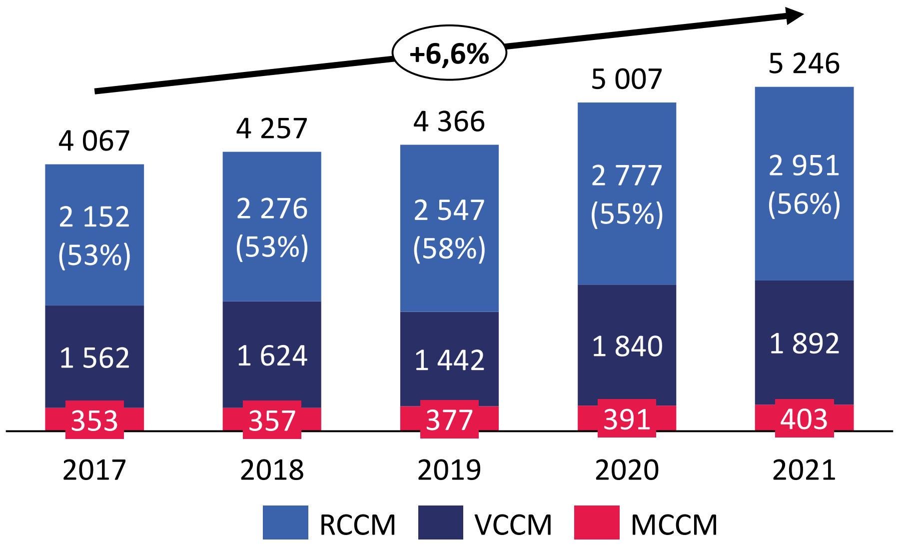
- **Paying recycling fee**
- Collected fee is spread among recyclers ton per ton
- Rest of the sum is used on EPR system maintenance, waste management initiatives and other field-specific needs
- **Making a direct contract with recycler**
- Recycler provides a confirming document (act of recycling)
- Producer or importer provides this document to supervising service instead of paying recycling fee
- **Own recycling**
- Producer or importer can recycle the waste by itself
- Afterwards the confirming document is provided to supervising service
- In case if amount of recycled material is higher than amount of production/imports, producer or importer gets the difference as recycler or pays it if it is less

Recycling fee = Goods produced or/and imported * Fee per unit

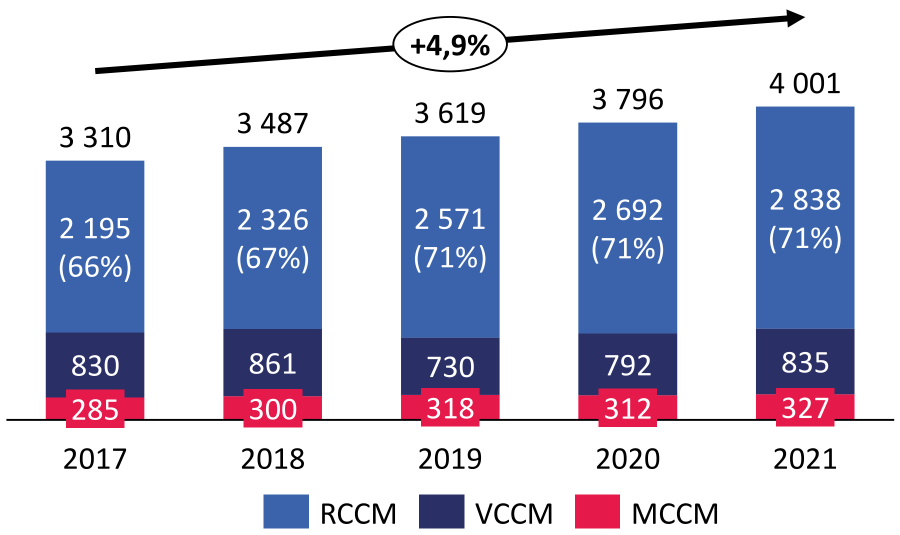
Source: Analysis conducted by CSS working group based on Federal Law N 89-FL (dated 24.06.98)

Exports and domestic market demand was growing during the recent years
Domestic market mostly supplied with RCCM

Containerboards production, '000 tons

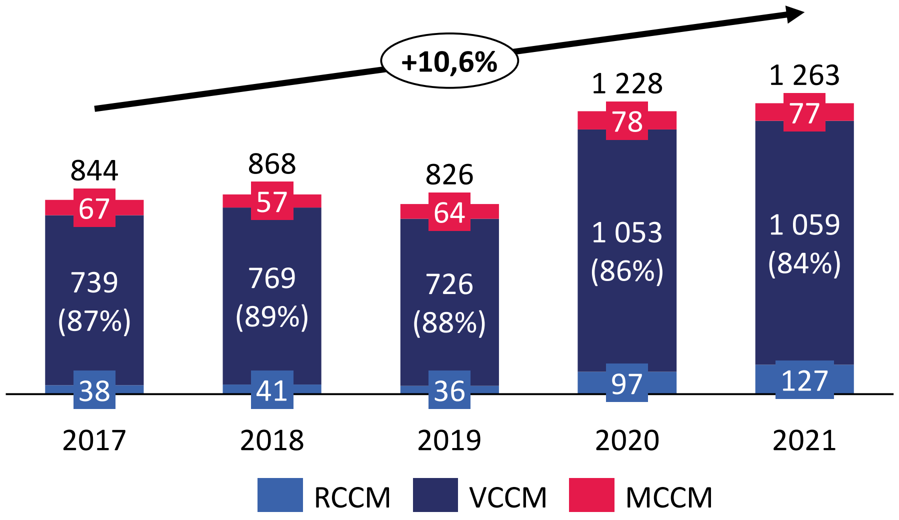


Containerboards consumption, '000 tons

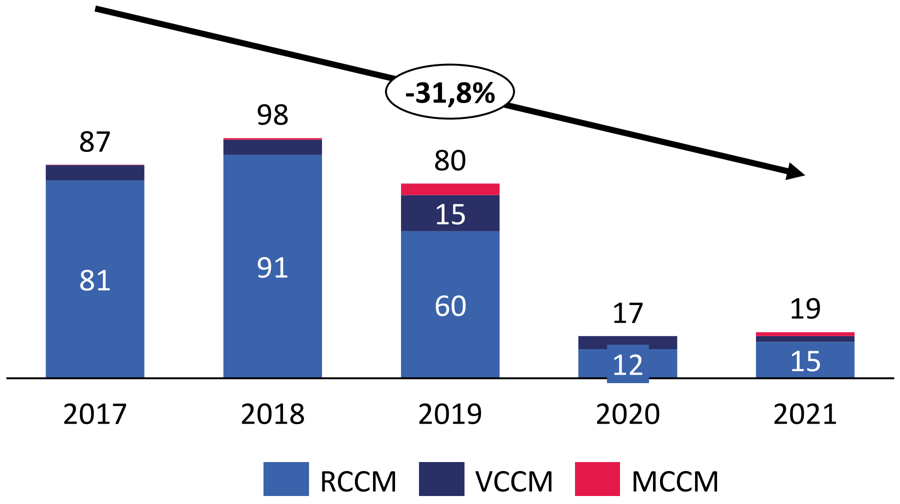


- Containerboard market was driven mostly by growth in demand both for exports and domestic market
- Share of recycled containerboard in total production has grown rapidly
- While recycled containerboard mostly covers domestic market supply, virgin containerboard market is exports-oriented

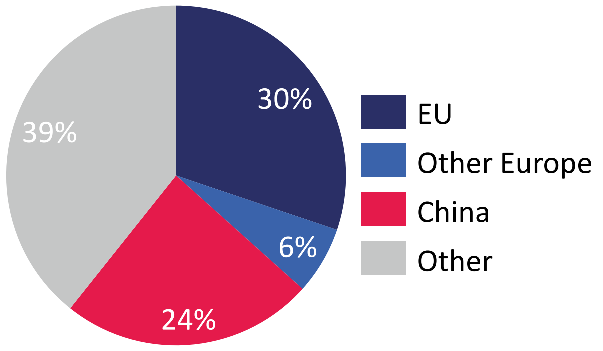
Containerboards exports, '000 tons



Containerboards imports, '000 tons



Containerboards exports in 2021, %

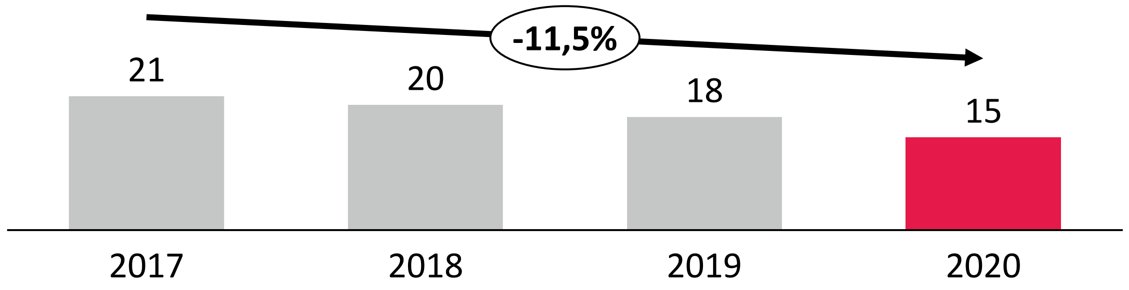


- Europe and China are largest consumers of Russian containerboard

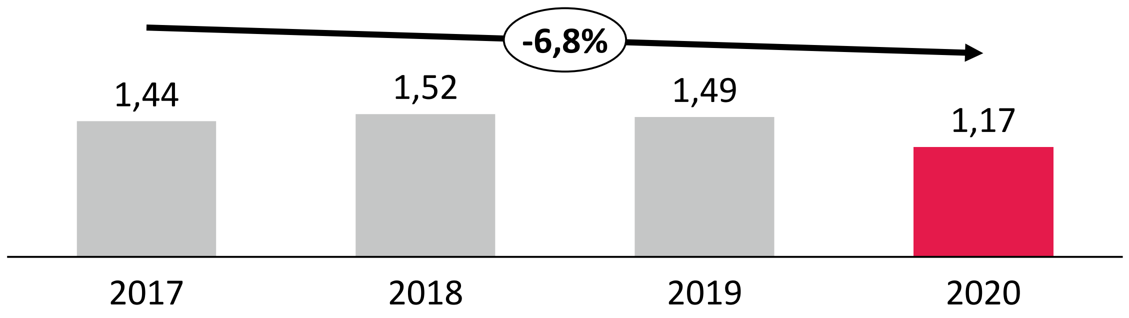
Source: Analysis conducted by CSS working group based on FSSS RF and FCS RF data

New containerboard segment based on TMP has been formed in market in recent years

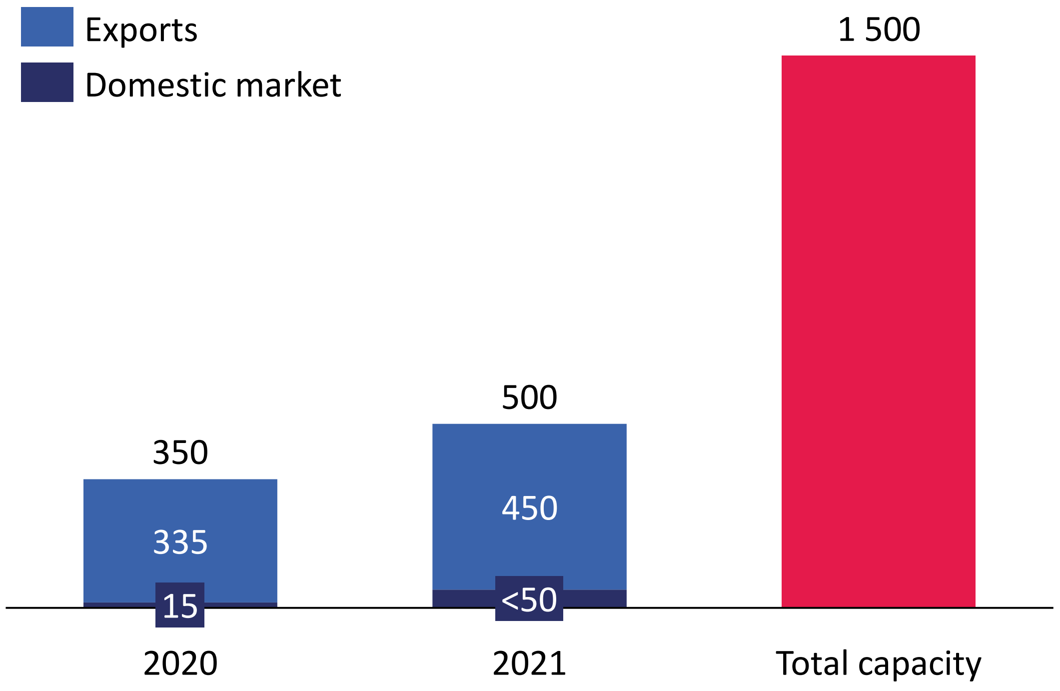
Global newsprint production, M tons



Newsprint production in Russia, M tons



Production of containerboard by newsprint producers in Russia, ‘000 tons

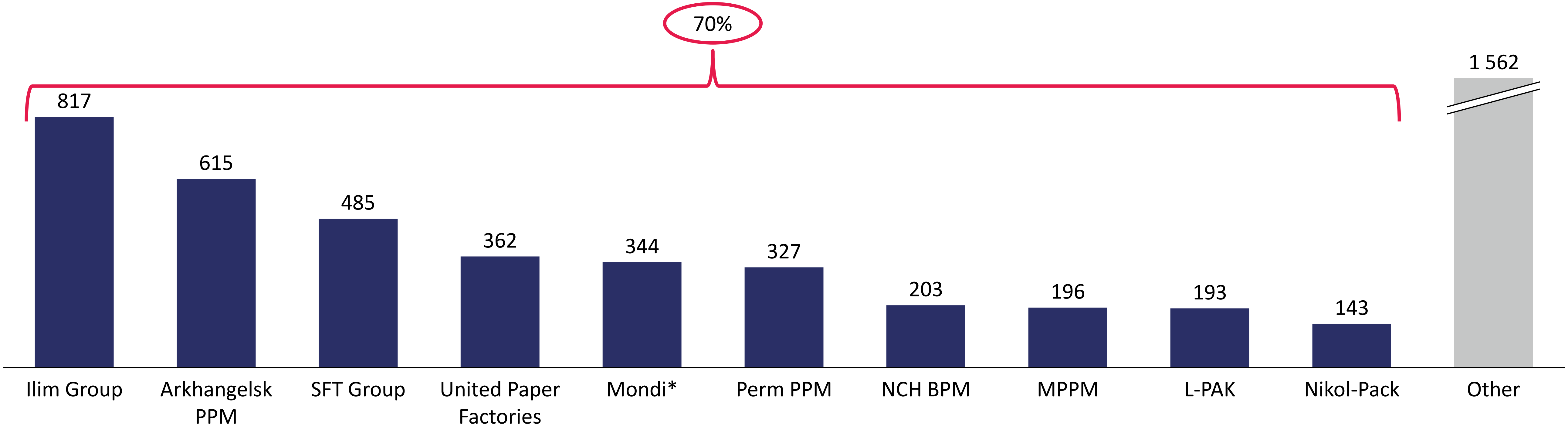


- As newsprint demand reduces rapidly, all Russian newsprint producers with total capacity of 1,5 M tons are now working on entering containerboard market
- All producers are going to produce containerboard with thermomechanical pulp, that is originally used in newsprint production
- Thermomechanical pulp has shorter fiber than chemical pulp and much lower paper-forming properties
- That means, that use of it may affect the properties of MS-5B (this containerboard is used in production of packaging which becomes MS-5B)
- However domestic market supply of this cardboard remains low yet
- But there is a threat that more of this containerboard will be used in Russian corrugated production, affecting the quality of MS-5B

Source: Analysis conducted by CSS working group based on FAO data

TOP-10 largest companies had a 70% share in total containerboard production in 2021

TOP-10 largest containerboard producers in Russia 2021 output, '000 tons



- By the end of 2021 Top-10 largest players (of overall 50+ producers) produced 70% of containerboards,
- During the recent years leading positions were held by VCCM producers – Ilim Group and Arkhangelsk PPM
- Top-3 also include the largest RCCM producer – SFT Group
- VCCM segment has a significantly higher market concentration: 3 largest companies (Ilim Group, Arkhangelsk PPM and Mondi Syktyvkar) provide more than 90% VCCM production
- RCCM segment has a significantly lower concentration: main producers (SFT Group, United Paper Mills and Naberezhnye Chelny BPM) share is 35% of total RCCM output
- MCCM production (virgin pulp and PfR composition) is the least significant segment, represented in TOP 10 by Perm PPM and Mari PPM

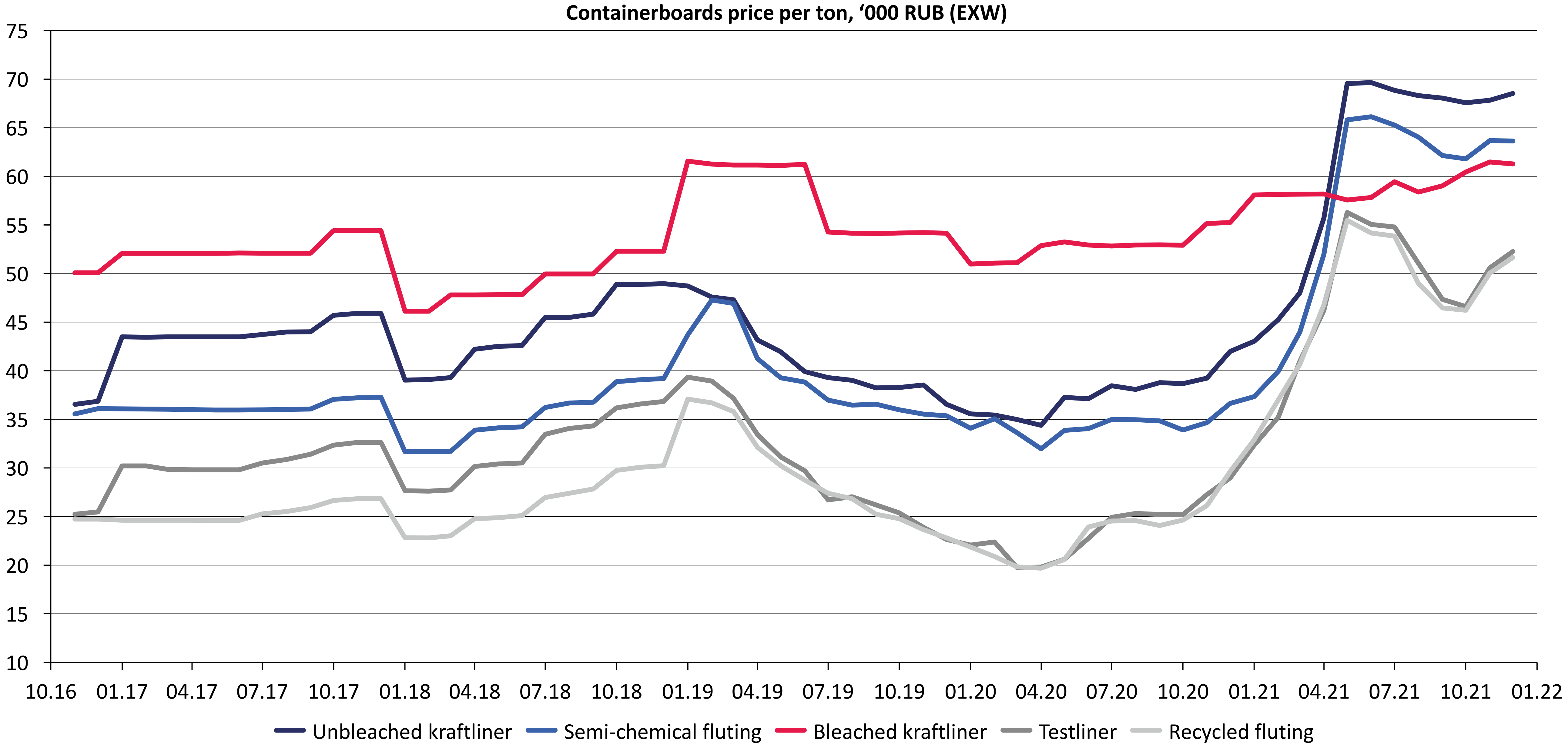
Source: Analysis conducted by CSS working group

By the end of 2021 there were numerous containerboard production capacity increase projects announced, that are questioned to be launched

Company name	Region	Project type	Product	Capacity, '000 tons				
				2022	2023	2024	2025	2026+
Ilim Group	SFD, Irkutsk region	New PM	VCCM	600 In process	-	-	-	-
Kuzbasskiy scarabey	SFD, Kemerovo region	New PM	RCCM	72 In process	-	-	-	-
Aleksinskaya PBM (SFT Group)	CFD, Tula region	Upgrade	RCCM	25 finished	-	-	-	-
Volga	VFD, Nizhny Novgorod region	Upgrade	RCCM	-	140	-	-	170
Borovichskaya PBM	NWFD, Novgorod region	New PM	RCCM	-	60	-	-	-
Selenginskiy PPM	FEFD, Buryatia Republic	Upgrade	VCCM	-	40	-	-	-
Perm PPM	VFD, Perm region	Upgrade	MCCM	-	19	-	-	-
Arkhangelsk PPM	NWFD, Arkhangelsk region	New PM	RCCM	-	-	400	-	-
Kondrovskaya PM	CFD, Kaluga region	New PM	RCCM	-	-	180	-	-
Kuban PBM	SFD, Krasnodar region	New PM	RCCM	-	-	120	-	-
Pavlovo-Posad CM	CFD, Moscow region	New PM	RCCM	-	-	-	400	-
Kartontara (SFT Group)	SFD, Adygea Republic	New PM	RCCM	-	-	-	300	-
Proletariy	CFD, Bryansk region	New PM	RCCM	-	-	-	185	-
Nikol-Pack	CFD, Vladimir region	New PM	RCCM	-	-	-	150	-
PZPPM (UPF)	CFD, Kaluga region	New PM	RCCM	-	-	-	-	200
			Total	**697**	**259**	**700**	**1 035**	**370**

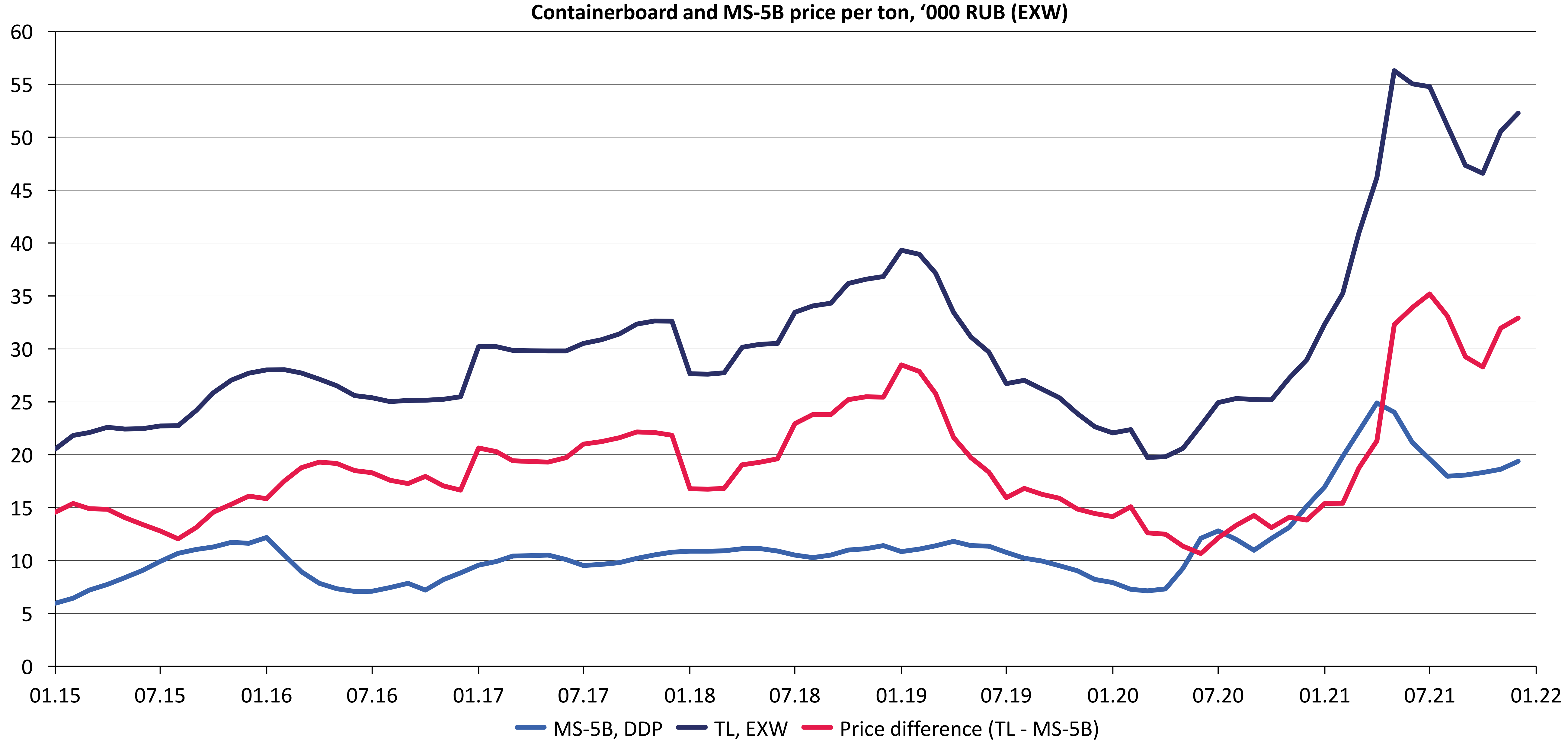
Source: Analysis conducted by CSS working group

Intensive growth of demand stimulated the growth of containerboards prices in 2020 and in 2021



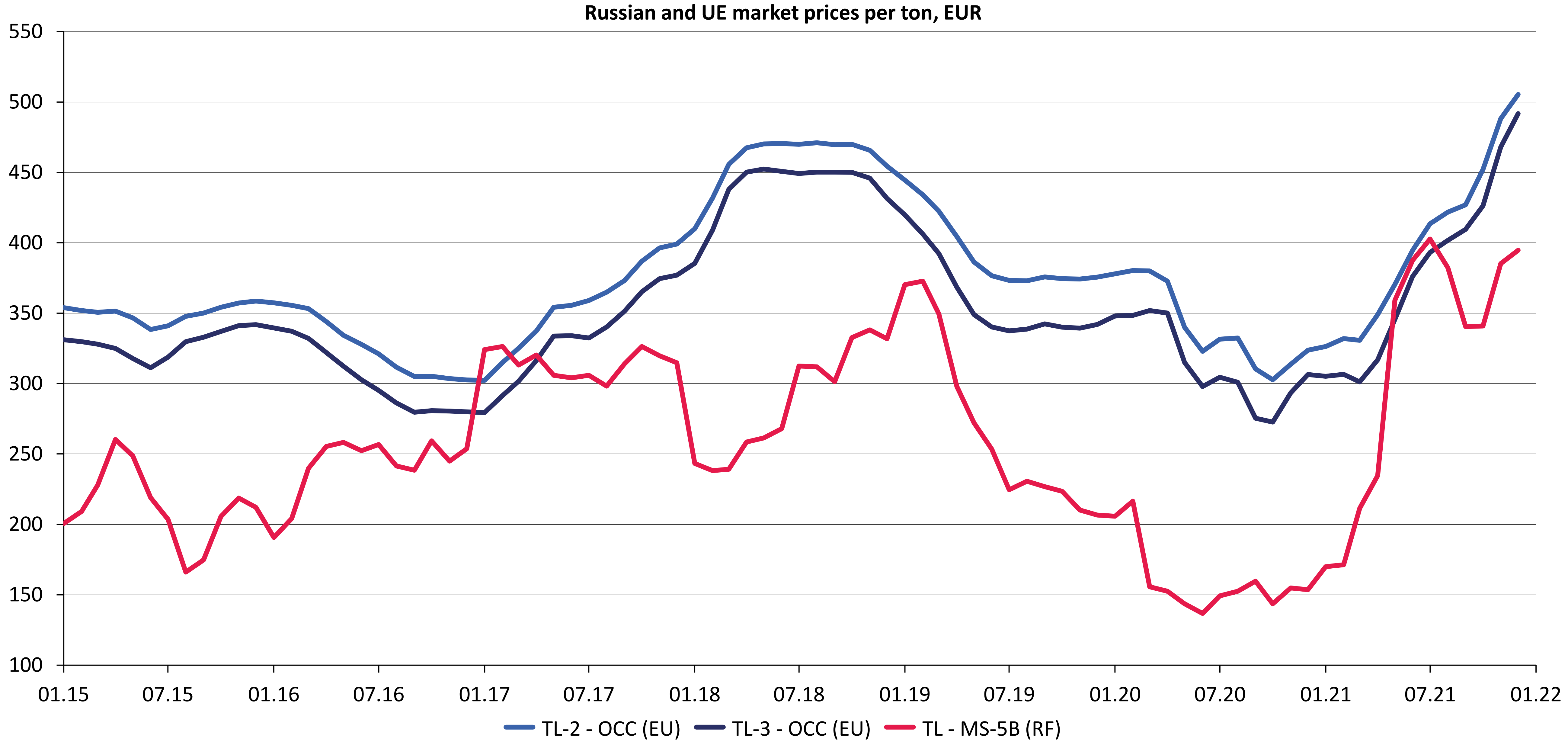
Source: Analysis conducted by CSS working group based on PI CSS

Testliner (TL) and MS-5B prices were growing rapidly during 2020
Difference between prices per ton for testliner and MS-5B has reached its peak in 2021



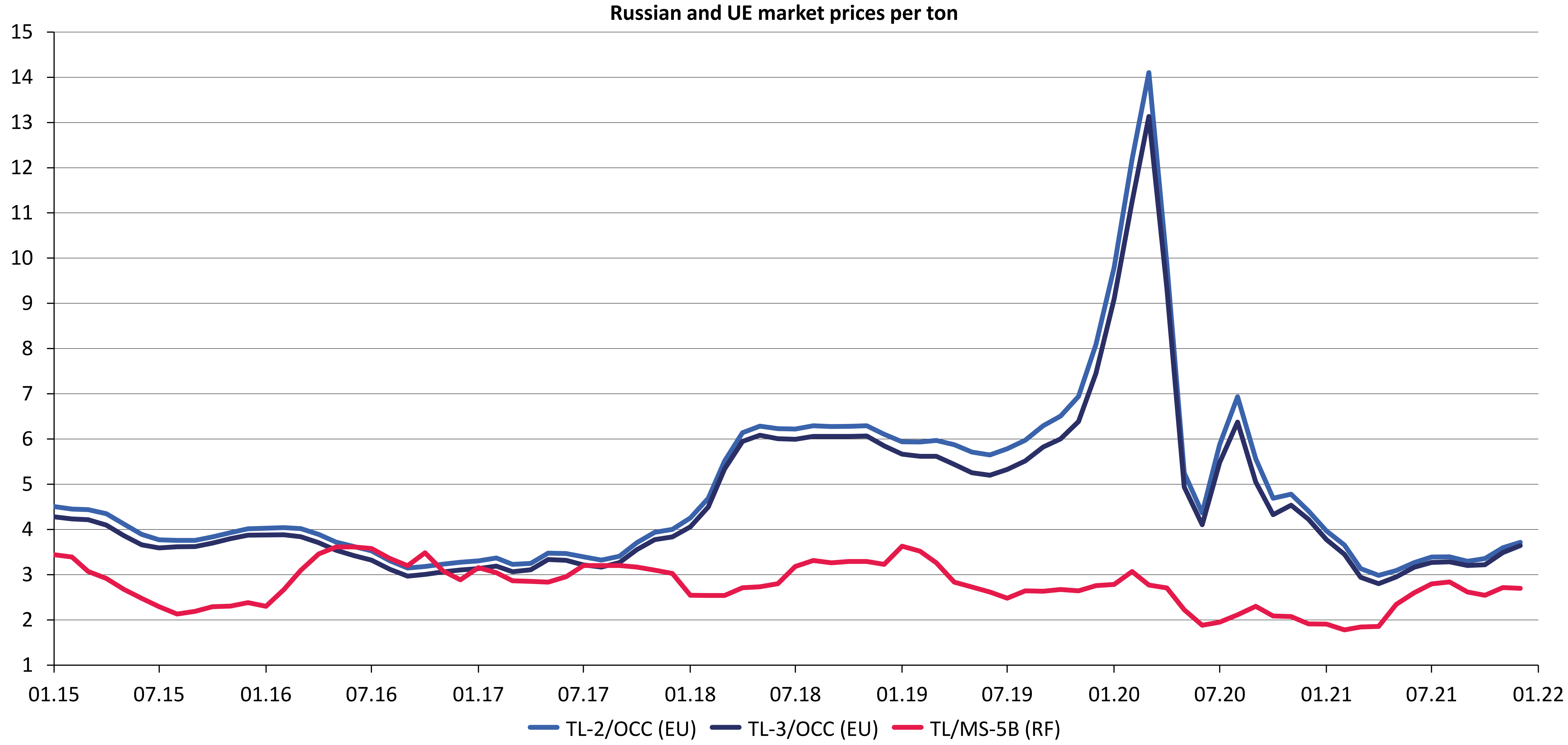
Source: Analysis conducted by CSS working group based on PI CSS

Difference in price of testliner and OCC (MS-5B) in EU is higher than in Russia



Source: Analysis conducted by CSS working group based on PI CSS, RISI

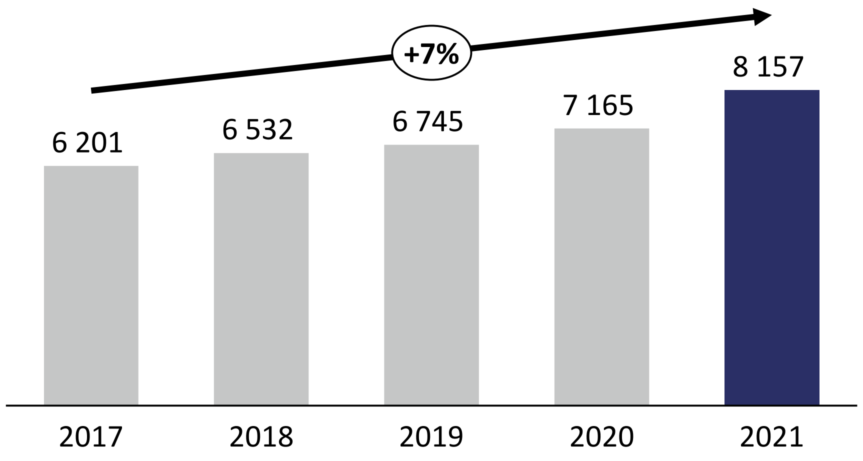
Testliner to OCC (MS-5B) price ration in Russia recovered faster then in EU after drop during pandemic



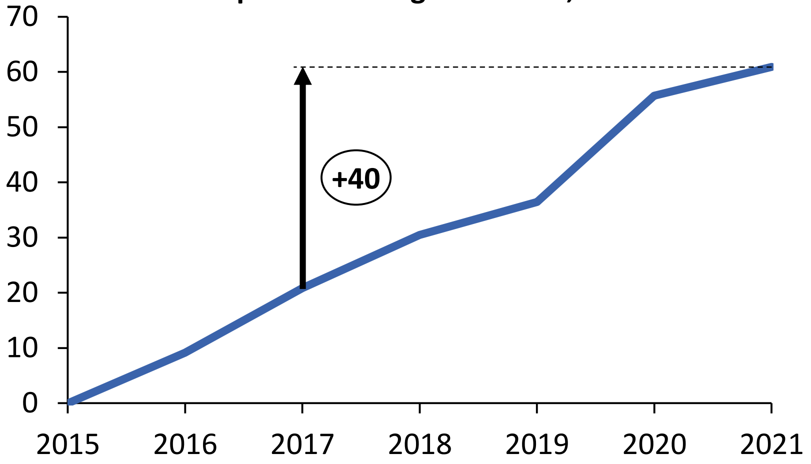
Source: Analysis conducted by CSS working group based on PI CSS, RISI

Corrugated board market grew significantly in 2021 as a result of deferred demand during COVID-19 pandemic

Corrugated board production, M m2

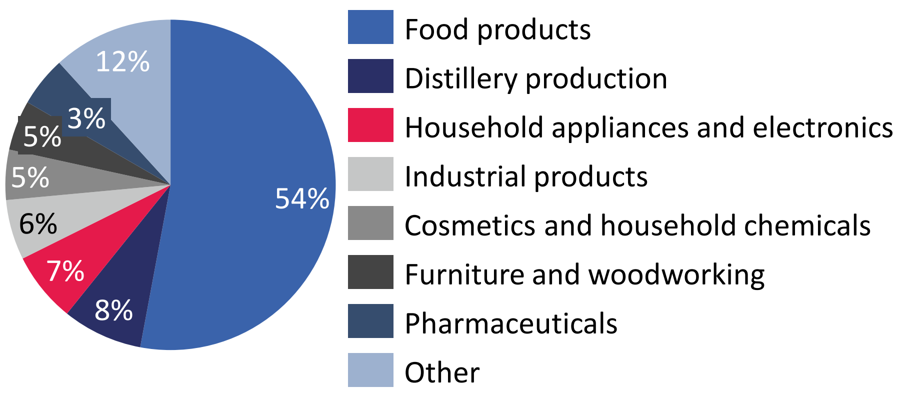


Russian goods in corrugated packaging (year to 2015) exports NETTO growth rate, %

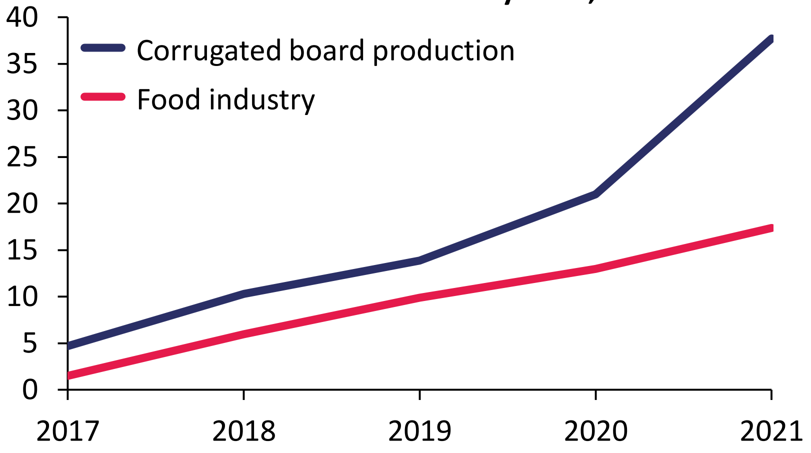


- Demand for corrugated board products is driven by the domestic market development
- Exports and imports are insignificant
- During the last 7 years core demand driver of corrugated board market was imports substitution policy (triggered by Ruble exchange ratio decline) as well as growth in exports of goods in corrugated packaging
- In 2020 there was a significant decline in Ruble exchange rate, which led to growth in exports of corrugated products
- Corrugated products market grew significantly in 2021 as a result of deferred demand during the pandemic

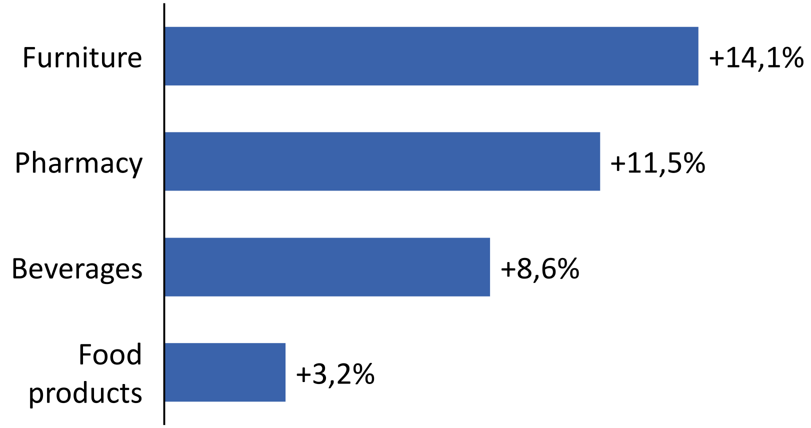
Structure of final consumption of corrugated products, %



Production increase by 2016, %



Growth of industries consuming corrugated products in 2021

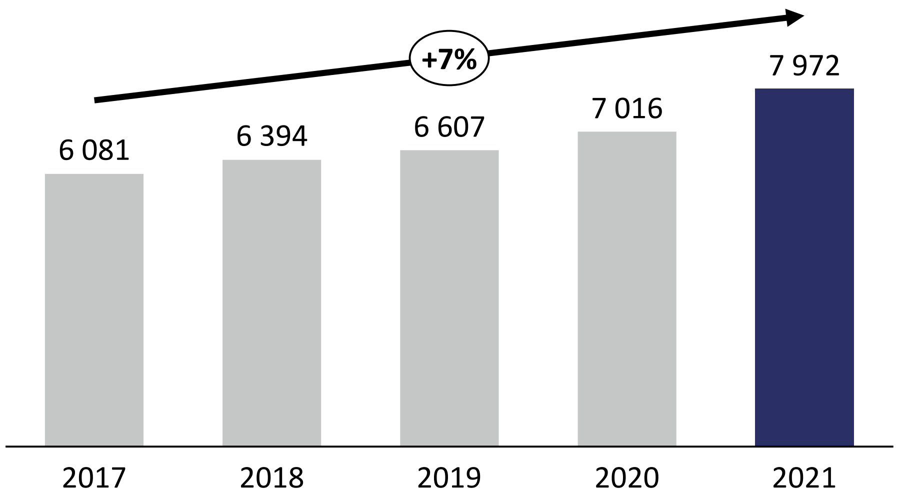


- Historically food industry used to be the core driver of corrugated board market

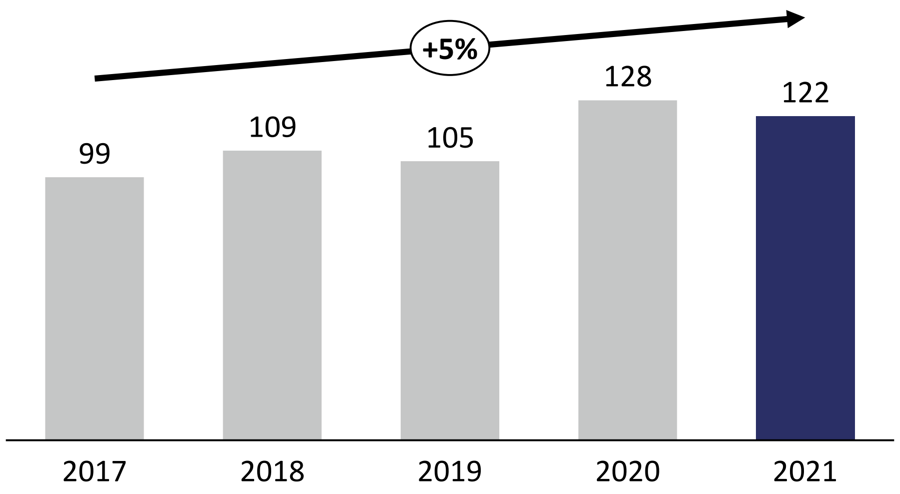
Source: Analysis conducted by CSS working group based on FSSS RF and FCS RF data

Import and export of corrugated products are minimal
Consumption of corrugated products is almost identical to production

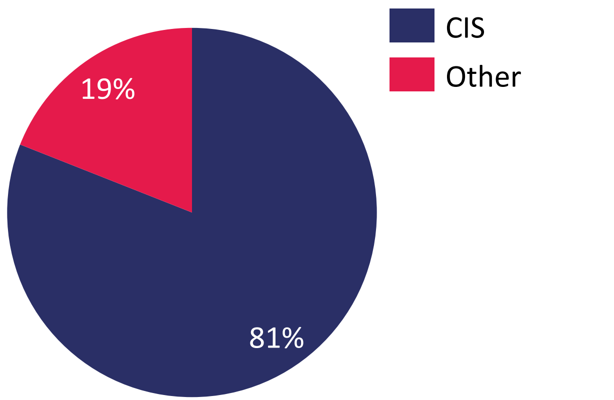
Corrugated products consumption, M m2



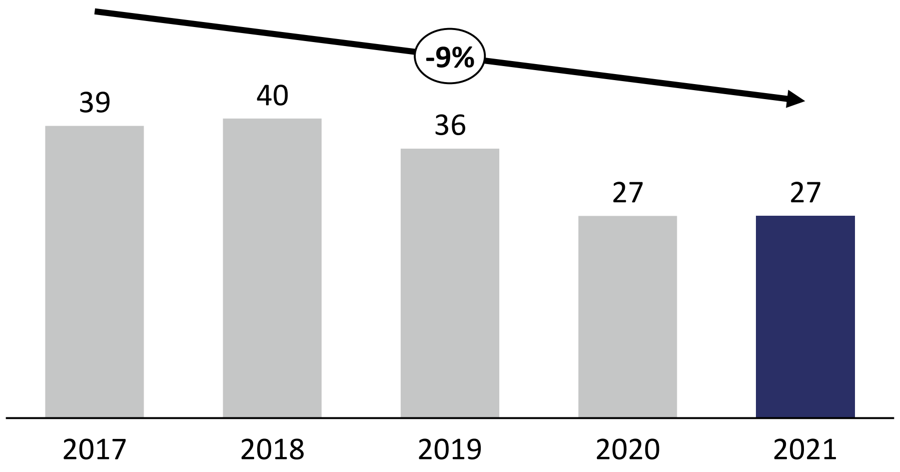
Corrugated products exports, M m2



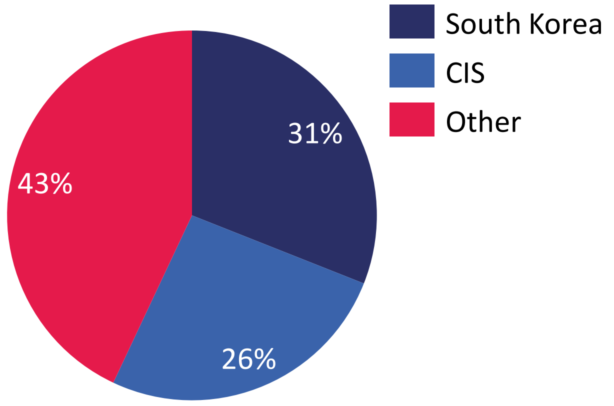
Corrugated products exports in 2021, %



Corrugated products imports, M m2



Corrugated products imports in 2021, %



- Corrugated products exports and imports are low due to the short shipment interval
- CIS is the largest importer of Russian corrugated board

Source: Analysis conducted by CSS working group based on FSSS RF and FCS RF data

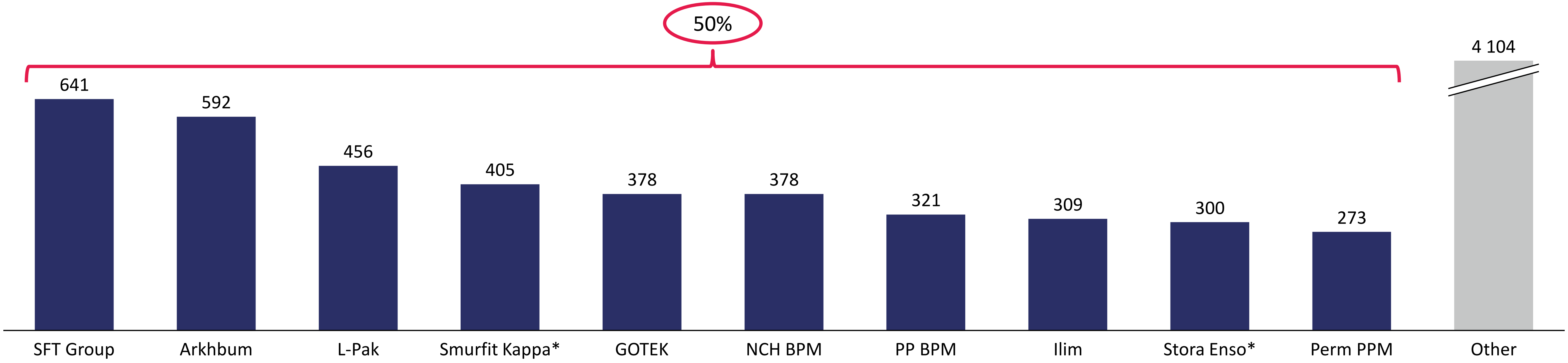
Changes in consumer behavior and retail drive demand for corrugated products

Consumer behavior	Real households incomes	• The long-term decline in real households incomes, exacerbated by the pandemic, has made consumers much more attentive to the level of prices in retail: buyers look for goods at the usual price, follow retailers' promotions, track discounts
	Consumption psychology	• Consumers seek to make purchases with maximum convenience as well as to save time, effort or receive any other benefits
	Caring for health and environment	• Concern for health and environment affects consumers’ formation of needs
Retail transformation	Changing retail formats	• Before the pandemic, there was a trend to change in retail formats: reduction in hypermarkets share and an increase in convenience stores and discounters share
	Growth of e-commerce	• There has been a rapid increase in online shopping and demand for delivery services
	Growth of retail chains market share	• Diversification of sales channels leads to the expansion of the range of packaging • Packaging is involved in trade promo: co-promo/layouts, new packaging solutions are constantly being developed, the segment of packaging for online trading and marketplaces is developing
Sustainable development	Responsible production and consumption	• These aspects determine trends in the raw materials consumption - increasing the share of recycled materials in the production of packaging, developing new types of packaging that are more suitable for recycling and environmentally friendly

Source: Analysis conducted by CSS working group

TOP-10 largest companies had a 50% share in total corrugated board production in 2021

TOP-10 largest corrugated board producers in Russia 2021 output, M m2



- Growth of e-commerce have allowed medium and small regional producers to expand their packaging output by meeting local demand, characterized by small volumes of one-time orders with a wide variety of assortment
- In turn, large packaging producers have advantages when working with industry leaders
- Most of the major players are vertically integrated companies with their own raw material base: SFT Group, Arkhbum, L-Pak, NCH BPM, Pavlovo-Posad Gofrokombinat, Ilim and Perm PPM
- There are large non-integrated domestic (GOTEK) and foreign companies (Stora Enso, Smurfit Kappa)
- Many of the largest producers have several production sites located in different regions
- * In May 2022 Stora Enso (Finland) announced the sale of corrugated packaging mills in Russia - production mill in Lukhovitsy (Moscow region), Arzamas (Nizhny Novgorod region) and Balabanovo (Kaluga region)
- * In April 2022 Smurfit Kappa Group announced its decision to leave Russian market, the company owns three corrugated packaging mills located in Moscow, Vsevolozhsk and Kommunar (Leningrad region)

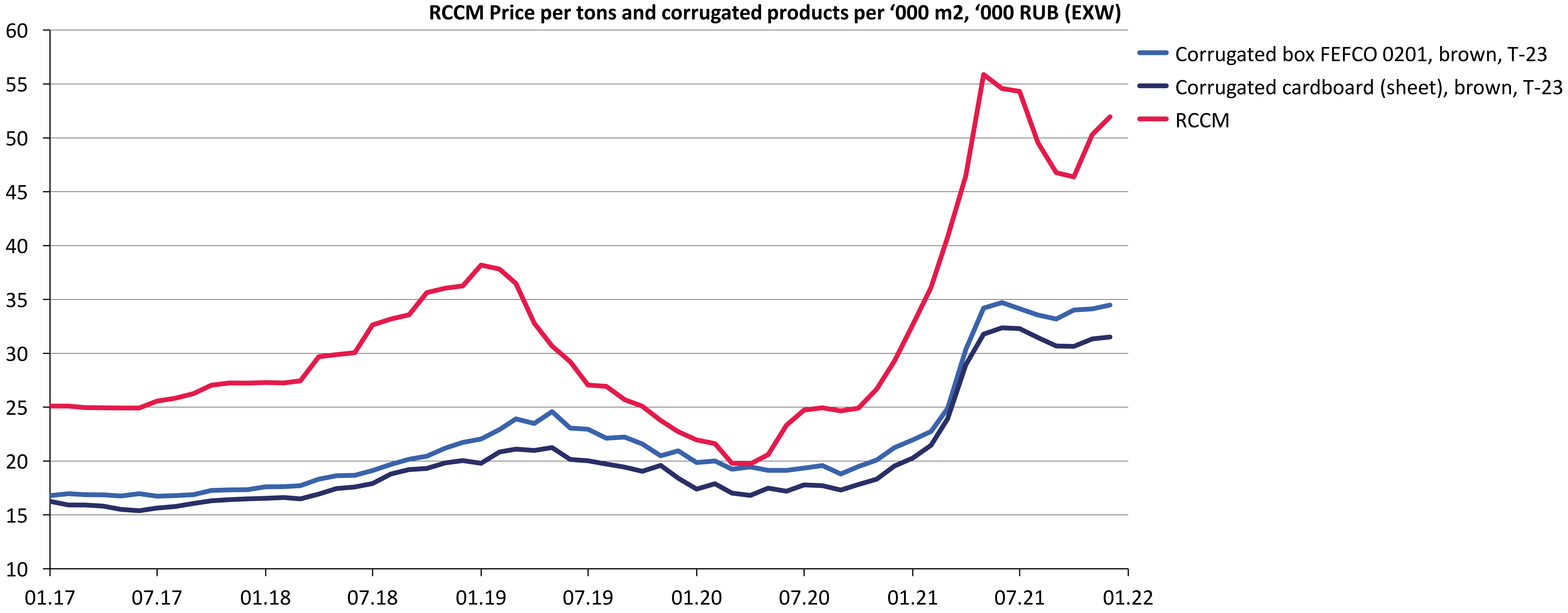
Source: Analysis conducted by CSS working group

By the end of 2021 there were numerous corrugated board production capacity increase projects announced, that are questioned to be launched

Company name	Region	Capacity, M m2			
		2021	2022	2023	2024
L-Pak	CFD, Lipetsk region	215 finished	-	-	-
Arkhbum-Ulyanovsk	VFD, Ulyanovsk region	192 finished	-	-	-
Dmitrovograd BPM	VFD, Ulyanovsk region	120 finished	-	-	-
EcoTar	NCFD, Dagestan Republic	50 finished	-	-	-
NCH BPM	VFD, Tatarstan Republic	-	180 finished	-	-
Formabox	CFD, Vladimir region	-	144 in process	-	-
Transpack	NWFD, Leningrad region	-	120 in process	-	-
Prominvest	UFD, Sverdlovsk region	-	120 finished	-	-
Pavlovo-Posad BPM	CFD, Moscow region	-	190 in process	-	-
Kroptara	SFD, Krasnodar region	-	100 in process	-	-
Arkhbum-Voronezh-2	CFD, Voronezh region	-	-	188	-
Kartontara (SFT Group)	SFD, Krasnodar region	-	-	-	190
Sukhonskiy BPM (UPF)	NWFD, Vologda region	-	-	25	-
Total		**577**	**854**	**213**	**190**

Source: Analysis conducted by CSS working group

Corrugated board price was driven by containerboard prices



- Explosive rise in containerboard prices in the first half of 2021 fueled a growth in corrugated products prices
- In the second half of 2021 the dynamics of prices for corrugated products was multidirectional, despite this prices remained high and similar to containerboard prices dynamics
- Additional packaging price increase factor was the seasonal increase in demand for packaging from key consumer industries and an increase in the export of packaged goods from Russia, which was caused by the opening of borders between states and the restoration of business activity of the main trading partners

Source: Analysis conducted by CSS working group based on PI CSS

The current situation in 2022 had a negative impact on international trade

- Large logistics operators left Russian market
- Refusal of some foreign companies to work in Russia
- 5th sanctions package against Russia
- Revocation of international certificates (FSC, etc.)
- Strengthening of RUB

- Complicating the supply of products to many countries (not only Europe)
- Complicating the supply of Russian producers with equipment, components and raw materials (mainly chemicals)
- Complicating of importing certain types of products

- Difficulties for companies
  - with modern equipment, dependent on the supply of components (most enterprises)
  - dependent on imports of raw materials (most; especially white and bleached paper and paperboard markets)
  - export-oriented
- Contraction of markets dependent on imports of products

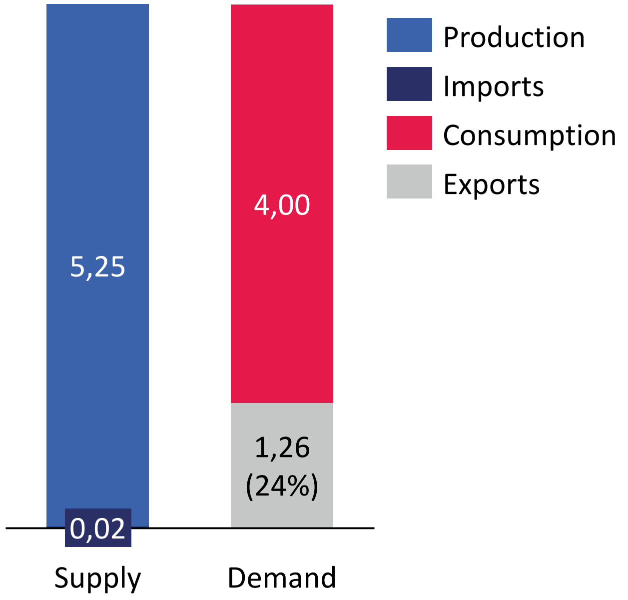
International logistics operators restricting operations in Russia in 2022

Company	Country	Note
FedEx	USA	Suspended all deliveries
UPS	USA	Suspended all deliveries
DHL	Germany	Stopped importing to Russia, but still exporting
Hapag-Lloyd	Germany	Suspended orders
Maersk	Denmark	Suspended orders for containers transportation
Shipco	Denmark	Suspended orders
MSC	Switzerland	Suspended orders
Cyprus Post	Cyprus	Stopped providing postal services to Russia
CMA CGM	France	Suspended orders
Ocean Network Express	Japan	Suspended orders
Yang Ming	Taiwan	Suspended orders

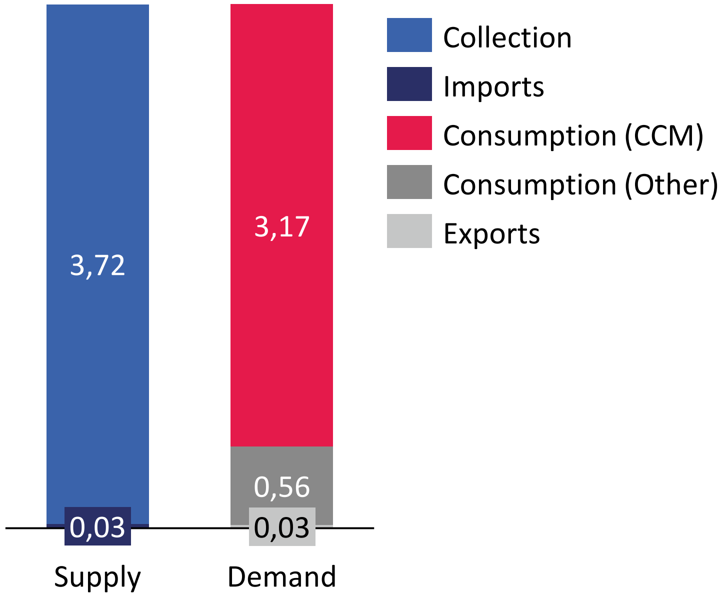
Source: Analysis conducted by CSS working group

Foreign trade restrictions led to a decrease in demand and prices for corrugated products, containerboards and MS-5B

Containerboards market indicators in 2021, M tons

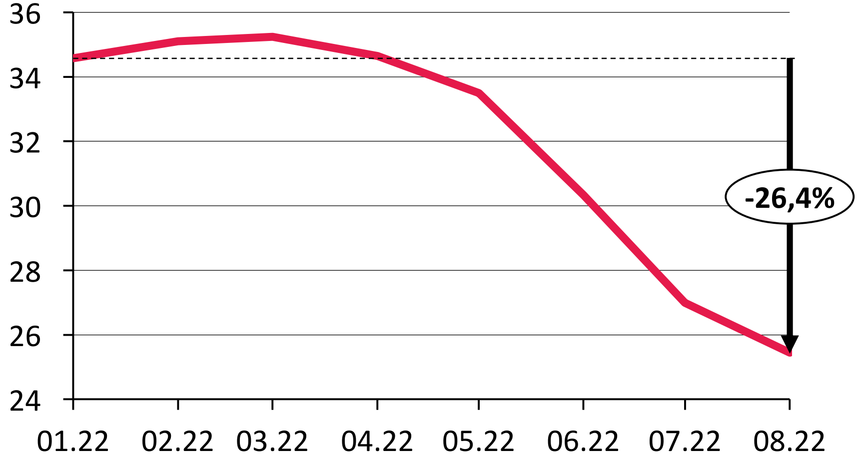


MS-5B market indicators in 2021, M tons

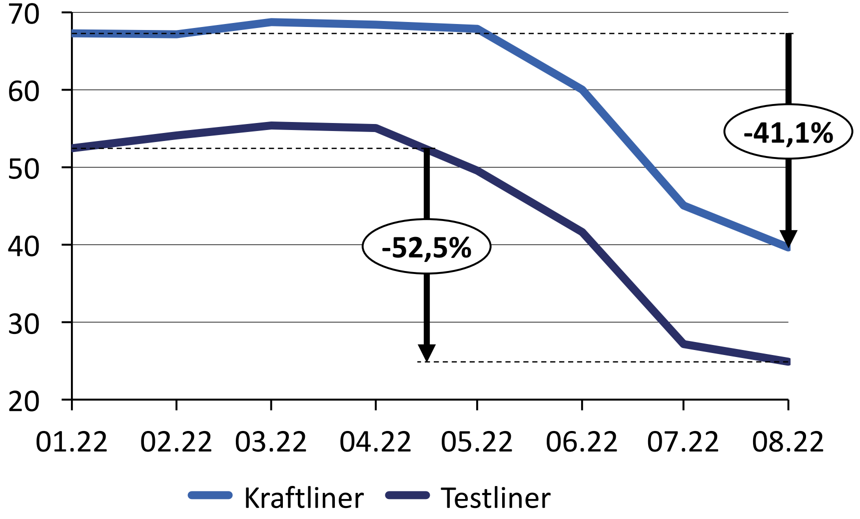


- Restrictions in the export of goods in packaging led to a decrease in demand for corrugated packaging and accordingly for containerboards
- Containerboards exports also decreased
- Decreased demand for containerboards and corrugated products led to a decrease in demand for MS-5B, the main sales segment of which is the containerboards market
- Decreased demand led to a drop in prices

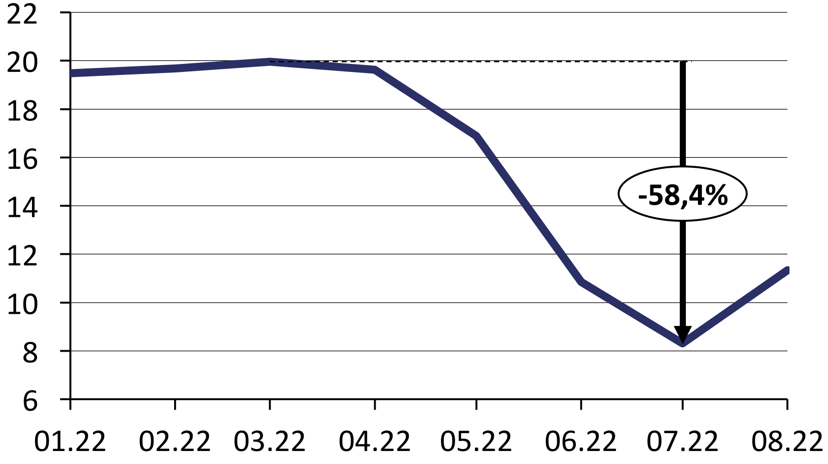
Corrugated board price per m2, RUB



Containerboards price per ton, '000 RUB



MS-5B price per ton, '000 RUB



Source: Analysis conducted by CSS working group based on PI CSS

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