

EUROPEAN CARTON PROSPECTS 2019 EDITION



Prepared by NOA-PRISM for the European Carton Makers Association (ECMA)



**EUROPEAN
CARTON MAKERS
ASSOCIATION**



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Please note that there is a glossary and definitions of End-Use markets and regions in Appendix 13.1.

1. Foreword from Jean-François Roche, President of European Carton Makers Association (ECMA)

We are delighted to bring you the latest edition of the European Carton Prospects Report 2019. As the most in-depth consolidated study of its kind for our industry, the aim is to give our members a deeper understanding of the elements that have been influencing our industry over the last year, as well as the current sentiment within the market and a forecast of what the future may look like.

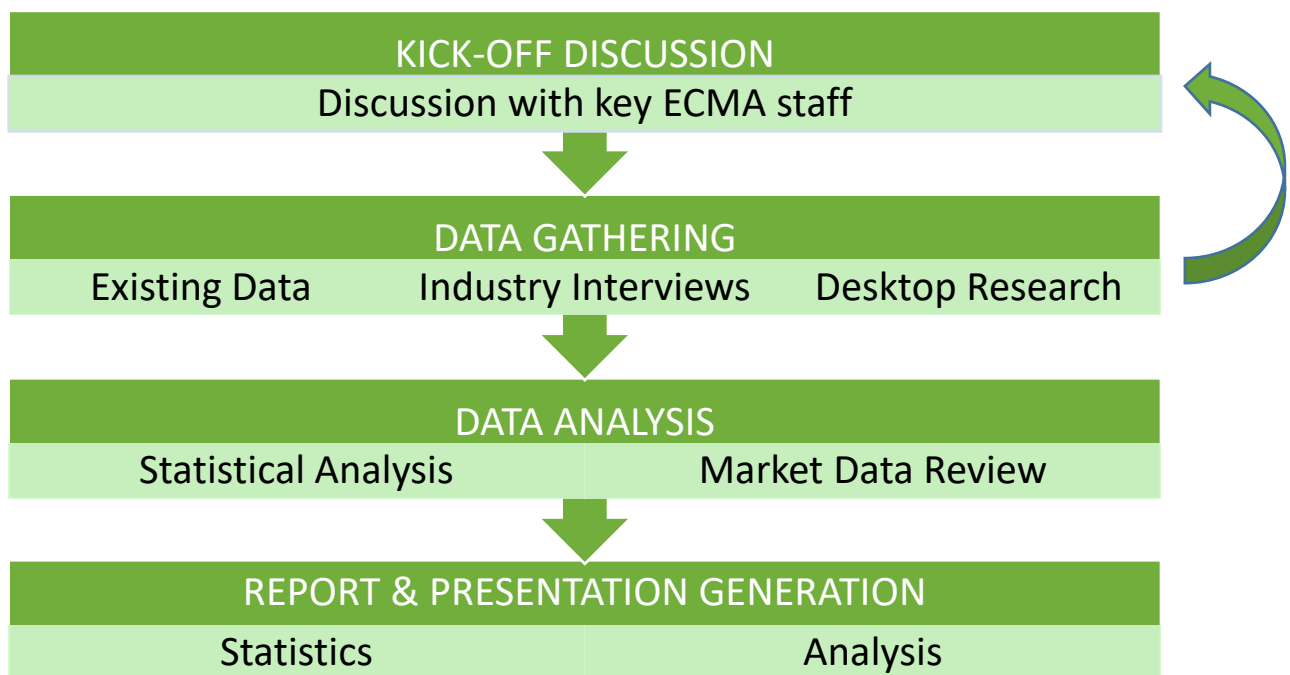
In the data driven world we operate in, we believe it is important now, more than ever, for us to develop a comprehensive shared understanding of our own market and to be able to promote our sector with facts.

The results are a combination of primary interviews from ECMA members, associated industry influencers and market trend reports. It has been five years since the last edition and we can see the significant influence of social, political and economic change, market consolidation, environmental considerations, consumer driven trends, technical innovation and regulatory changes on our businesses.

We hope you see the value in this report, which is supplied free of charge to all fee-paying members and associate national members. In the interest of continuous improvement, we would welcome your feedback. The results of the study clearly show that the prospects for our industry have never looked brighter and the opportunities are ours for the taking!

2. PROJECT APPROACH AND METHODOLOGY

The NOA-PRISM approach was tailored to the specific needs of the European Carton Makers Association (ECMA), in order to achieve the desired outcomes of this project. We followed a similar formula we use for all client projects which includes four main stages as detailed below:



The first stage was a series of discussions with key ECMA staff, to ensure precise outcomes were verified, that key specifics were established, and an exchange of information could be undertaken. These details were made available through a process of sharing ECMA statistics and clarifying data assumptions.

The second stage was a data gathering one where we accessed well-used and well-recognised published data sets (ONS, Eurostat, Euromonitor, UNECE, IMF, etc.) and proprietary data (from sources such as ECMA, CEPI, FEFCO, UTIPULP, Pro-Carton, CPI, etc.) to undertake our desktop research as well as reviewing existing data held in our NOA-PRISM Database. The NOA-PRISM Database is updated through private client and multi-client assignments, utilising readily available information on economic indicators, market statistics and paper packaging output data, and relies heavily on original market research.

As part of this second stage we conducted over 45 interviews with industry contacts, key users, retailers and brand owners. Our experience, discretion and professional approach ensured the integrity of the data and confirmed that it was precise, robust and up-to-date.

Thirdly, the data was then analysed both by our statisticians and by our experienced market professionals. Anomalies were found at this stage, debated and then further additional research was undertaken before reaching our conclusions.

Finally, the report was prepared for ECMA, to be available in both electronic report format and in hard copy. The findings will be presented in a business section at the ECMA Conference in Malta in September 2019.



TetraPak (HelloFresh)

3. EXECUTIVE SUMMARY

When we undertook the European Carton Prospects project in 2014, the trends outside of Europe in reality held little threat for European carton demand.

The story remains a similar one as prevailed 5 years ago with Europe being a significant market in the global context, accounting for just over 15% of the global consumption of folding cartons, and seeing market dynamics within Europe having the largest effect on folding carton prospects.

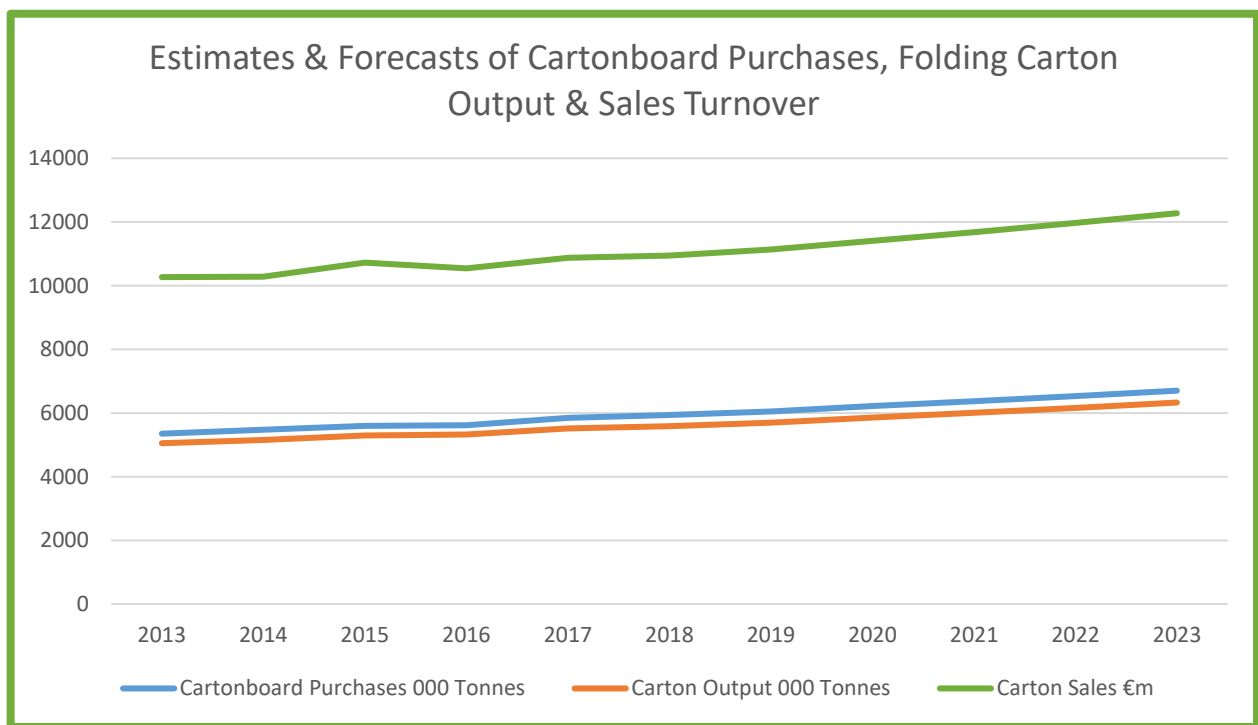
The key subjects that are affecting European folding carton fortunes are:

- Business migration from west to east.
- Plastics substitution by folding cartons.
- Pricing, recovery of cost increases and the overall profitability of the European folding carton market.
- Uncertain business prospects, both in Europe and globally.
- Significant changes in currency parities.
- Increasing importance of environmental and sustainability issues, including pressure on packaging reduction and on cartonboard yields.

The European folding carton market remains an ever more exciting and dynamic place for doing business. As you continue reading, we will elaborate on all the themes mentioned above, going into more depth to highlight the opportunities (and risks) that are available in today's folding carton market; most of all we will be exploring the main opportunity presented for us today, namely the substitution of plastics.

4. EUROPEAN OVERVIEW

4.1 Summary forecasts of carton production.

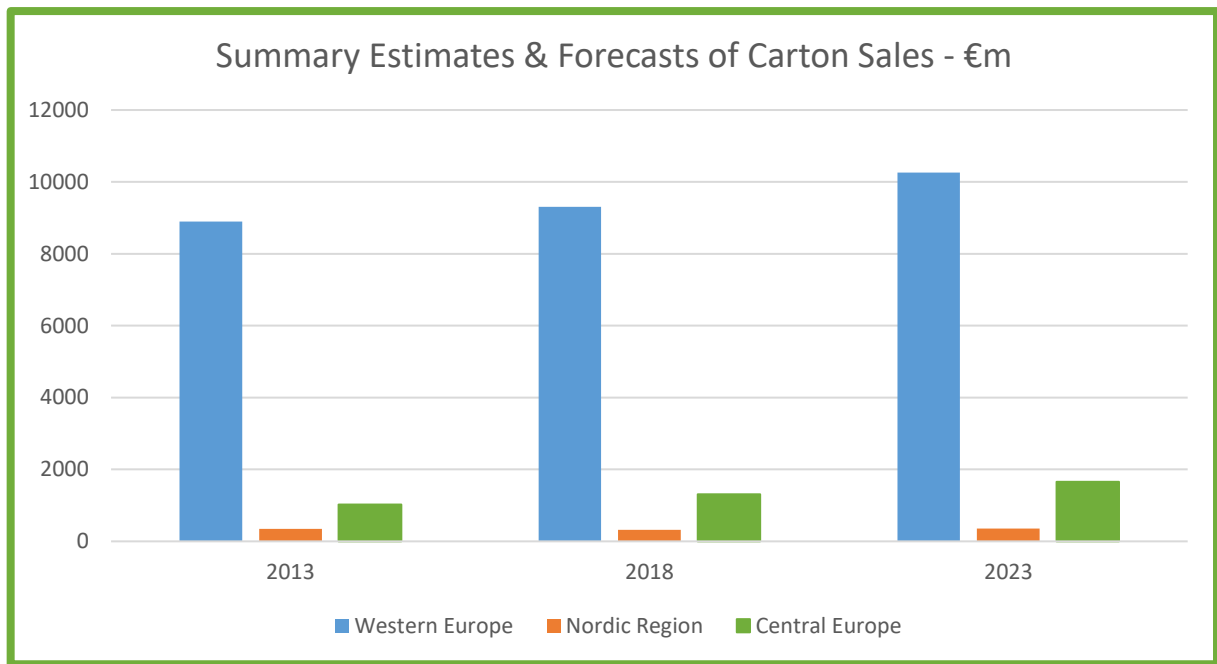


Following a slow start in 2013, European carton production output grew by an average of 2.0% per annum (p.a.) over the following years to our base year in 2018, with a significant boost in volumes by 3.7% in 2017.

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - All Countries – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|--|-----------------------|-----------|-----------------|---------------|-----------|-----------------|------------------------|--------------|-----------|-----------------|
| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 5351 | 0.3 | 100 | 5051 | 0.5 | 100 | 100.0 | 10267 | 0.8 | 100 |
| 2014 | 5472 | 2.3 | 102 | 5155 | 2.1 | 102 | 101.9 | 10285 | 0.2 | 100 |
| 2015 | 5593 | 2.2 | 105 | 5292 | 2.7 | 105 | 104.2 | 10722 | 4.2 | 104 |
| 2016 | 5616 | 0.4 | 105 | 5321 | 0.5 | 105 | 106.4 | 10545 | -1.7 | 103 |
| 2017 | 5846 | 4.1 | 109 | 5518 | 3.7 | 109 | 109.4 | 10877 | 3.2 | 106 |
| 2018 | 5934 | 1.5 | 111 | 5583 | 1.2 | 111 | 111.5 | 10944 | 0.6 | 107 |
| 2019 | 6053 | 2.0 | 113 | 5699 | 2.1 | 113 | 112.8 | 11136 | 1.8 | 108 |
| 2020 | 6215 | 2.7 | 116 | 5855 | 2.7 | 116 | 114.7 | 11404 | 2.4 | 111 |
| 2021 | 6370 | 2.5 | 119 | 6007 | 2.6 | 119 | 116.7 | 11682 | 2.4 | 114 |
| 2022 | 6530 | 2.5 | 122 | 6162 | 2.6 | 122 | 118.7 | 11968 | 2.4 | 117 |
| 2023 | 6702 | 2.6 | 125 | 6329 | 2.7 | 125 | 120.8 | 12274 | 2.6 | 120 |
| Average % p.a.13 to 18 | 2.1 | | | 2.0 | | | 2.2 | 1.3 | | |
| Average % p.a. 18 to 23 | 2.5 | | | 2.5 | | | 1.6 | 2.3 | | |

Over that same period sales value rose by a much smaller 1.3% p.a., largely due to a highly competitive marketplace, with an overall more modest rise in sales turnover. The gap of 0.7% is significant as cartonboard prices were increased by single digit percentages by board mills in both 2017 and 2018.

Fortunes going forward are predicted to be better in volume terms at 2.3% p.a. for the next 5 years; however, the depressed nature of price growth is still predicted to remain below that of production growth.



The average value per tonne graph shows how competitive the carton market is, and says a lot about the likely profitability of carton making today.

N.B. historical prices are based on current prices prevailing at the time, our forecasts of sales value are based on values at constant prices.

The profitability for folding cartons is set against a trend of lower order run lengths, and in turn has had a significant impact on waste (average 5 years ago was 16.5% and now has grown to 17.8% in 2018, with some countries exceeding 20% waste as a regional average).

| Estimates of Waste % - Analysed by Country - 2018 | |
|---|-------------|
| Country | % |
| Austria | 18.5 |
| Belgium | 18.2 |
| France | 17.1 |
| Germany | 17.1 |
| Italy | 17.4 |
| Netherlands | 17.3 |
| Spain | 17.3 |
| Switzerland | 17.3 |
| Turkey | 21.0 |
| U.K. | 16.8 |
| Other Western Europe | 17.3 |
| Sub-total West Europe | 17.7 |
| Nordic Region | 16.7 |
| Poland | 18.3 |
| Other Central Europe | 18.3 |
| Sub-total Central Europe | 18.3 |
| Total Europe | 17.8 |

The waste trend highlights the difference between food and non-food applications when viewing the differences by end use markets; non-food showing a significantly higher waste rate at 22.5% versus food at 14.2% as an average.

| Estimates of Waste % - Analysed by Market - Total Europe - 2018 | |
|---|-------------|
| | % |
| Food | |
| Breakfast cereal products | 9.9 |
| Cakes, biscuits, baked products | 14.2 |
| Chocolate & sugar confectionery | 15.2 |
| Chilled foods | 15.2 |
| Dry beverages | 12.0 |
| Food to go | 15.2 |
| Frozen food | 15.2 |
| Soft drinks & beer | 14.2 |
| Wines & spirits | 14.2 |
| Other foods | 14.2 |
| Sub-total Food | 14.2 |
| Non-Food | |
| Cigarettes, tobacco, accessories | 11.0 |
| Cleaning & laundry products | 20.5 |
| Cosmetics & beauty | 22.6 |
| Misc household products | 22.6 |
| Paper, stationery & related goods | 14.2 |
| Personal hygiene | 22.6 |
| Pharmaceuticals & medical products | 28.9 |
| Other non-foods | 20.5 |
| Sub-total Non-food | 22.5 |
| TOTAL | 17.8 |

NB: 1 Soft drinks & beer includes multipacks

NB: 2 Cigarettes, tobacco & accessories includes vaping & tobacco substitutes

We now go on to look at other key factors influencing the prospects for folding cartons.

4.2 Key Factors influencing folding carton demand.

The following table summarises our estimates and forecasts of cartonboard purchases, carton output and sales value for the period 2013 to 2018, and 2018 to 2023.

| Summary Estimates & Forecasts of Carton Production, Cartonboard Purchases, & Carton Sales - Main European Regions - 2013, 2018 & 2023 - 000 Tonnes, € Million | | | | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|--------------|------------|------------|
| | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | Vol/Val | % | Vol/Val | % | Vol/Val | % | 13 to 18 | 18 to 23 |
| Cartonboard Purchases - 000 Tonnes | | | | | | | | |
| Western Europe | 4460 | 83.4 | 4831 | 81.4 | 5363 | 80.0 | 1.6 | 2.1 |
| Nordic Region | 166 | 3.1 | 178 | 3.0 | 196 | 2.9 | 1.4 | 1.9 |
| Central Europe | 725 | 13.5 | 925 | 15.6 | 1143 | 17.1 | 5.0 | 4.3 |
| TOTAL | 5351 | 100.0 | 5934 | 100.0 | 6702 | 100.0 | 2.1 | 2.5 |
| Carton Production - 000 Tonnes | | | | | | | | |
| Western Europe | 4241 | 84.0 | 4577 | 82.0 | 5103 | 80.6 | 1.5 | 2.2 |
| Nordic Region | 154 | 3.1 | 165 | 3.0 | 182 | 2.9 | 1.4 | 1.9 |
| Central Europe | 656 | 13.0 | 840 | 15.0 | 1044 | 16.5 | 5.1 | 4.4 |
| TOTAL | 5051 | 100.0 | 5583 | 100.0 | 6329 | 100.0 | 2.0 | 2.5 |
| Carton Sales - € Million | | | | | | | | |
| Western Europe | 8895 | 86.6 | 9311 | 85.1 | 10261 | 83.6 | 0.9 | 2.0 |
| Nordic Region | 344 | 3.4 | 321 | 2.9 | 359 | 2.9 | -1.4 | 2.3 |
| Central Europe | 1028 | 10.0 | 1312 | 12.0 | 1654 | 13.5 | 5.0 | 4.7 |
| TOTAL | 10267 | 100.0 | 10944 | 100.0 | 12274 | 100.0 | 1.3 | 2.3 |

Central Europe has experienced significantly greater growth than Western Europe.

If we extracted Turkey from the Western European growth figures, the Western European production growth reduces significantly from 1.5% p.a. to 1.1% p.a. after removal.

| Primary Pack Substitution Trends in Folding Carton Primary Pack Markets in Europe - 2013, 2018 & 2023 - % of Units | | | |
|--|--------------|--------------|--------------|
| Pack Type | 2013 | 2018 | 2023 |
| Folding Cartons | 25.4 | 24.8 | 27.6 |
| Flexible Pack | 57.1 | 57.4 | 56.4 |
| Other Primary Packs | 17.5 | 17.8 | 16.0 |
| TOTAL | 100.0 | 100.0 | 100.0 |

NB: Table refers to folding carton markets, not FMCG markets and excludes canned bottled foods and drinks packaging
Estimates for folding cartons excludes multiple packaging. (i.e. refers to primary packs only)

There was a -0.6% p.a. reduction in share held for folding carton between 2013 to 2018 due to substitution by other primary packs (mainly flexibles).

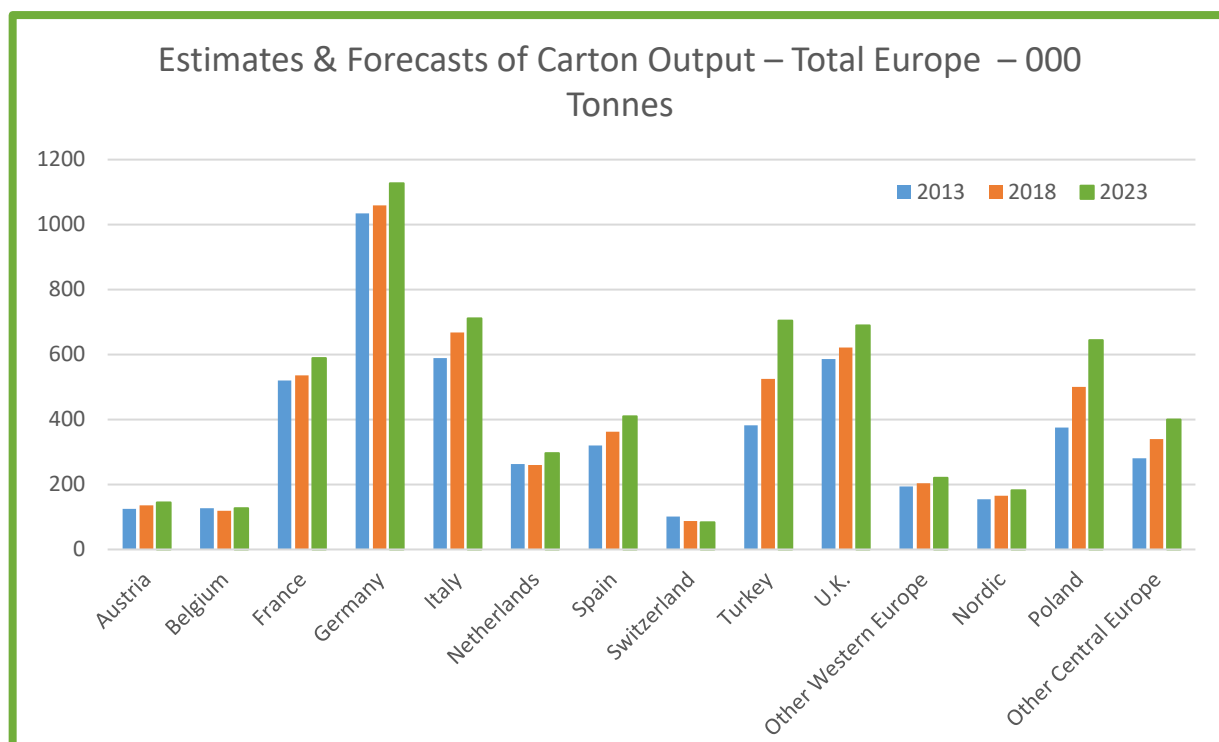
With the likely reverse of this trend happening over the next 5 years, substitution of plastics by folding cartons will be the most significant factor affecting carton volume growth.

4.3 The main opportunities for folding cartons, including end use market prospects.

Country prospects

| Estimates & Forecasts of Carton Output – Total Europe Analysed by Country – 2013, 2018 & 2023 – 000 Tonnes | | | | | | | | |
|--|-------------|--------------|-------------|--------------|-------------|--------------|------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | 000 Tonnes | % | 000 Tonnes | % | 000 Tonnes | % | 13 to 18 | 18 to 23 |
| Austria | 125 | 2.5 | 136 | 2.4 | 144 | 2.3 | 1.7 | 1.2 |
| Belgium | 127 | 2.5 | 119 | 2.1 | 127 | 2.0 | -1.3 | 1.3 |
| France | 520 | 10.3 | 536 | 9.6 | 589 | 9.3 | 0.6 | 1.9 |
| Germany | 1035 | 20.5 | 1059 | 19.0 | 1127 | 17.8 | 0.5 | 1.2 |
| Italy | 589 | 11.7 | 668 | 12.0 | 712 | 11.2 | 2.6 | 1.3 |
| Netherlands | 263 | 5.2 | 260 | 4.7 | 297 | 4.7 | -0.2 | 2.7 |
| Spain | 320 | 6.3 | 362 | 6.5 | 409 | 6.5 | 2.5 | 2.5 |
| Switzerland | 101 | 2.0 | 87 | 1.6 | 83 | 1.3 | -2.9 | -0.9 |
| Turkey | 382 | 7.6 | 525 | 9.4 | 705 | 11.1 | 6.5 | 6.1 |
| U.K. | 586 | 11.6 | 621 | 11.1 | 690 | 10.9 | 1.2 | 2.1 |
| Other Western Europe | 194 | 3.8 | 204 | 3.6 | 221 | 3.5 | 1.0 | 1.6 |
| Sub-total West Europe | 4241 | 84.0 | 4577 | 82.0 | 5103 | 80.6 | 1.5 | 2.2 |
| Nordic | 154 | 3.1 | 165 | 3.0 | 182 | 2.9 | 1.4 | 1.9 |
| Poland | 375 | 7.4 | 500 | 9.0 | 644 | 10.2 | 5.9 | 5.2 |
| Other Central Europe | 281 | 5.6 | 340 | 6.1 | 400 | 6.3 | 3.9 | 3.3 |
| Sub-total Central Europe | 656 | 13.0 | 840 | 15.0 | 1044 | 16.5 | 5.1 | 4.4 |
| Total Europe | 5051 | 100.0 | 5583 | 100.0 | 6329 | 100.0 | 2.0 | 2.5 |

Turkey's growth at 6.5% p.a. has been a significant contributor to the Western Europe growth figures.



Business migration away from the main Western European countries has been happening for over 5 years, moving volumes into the Central European region. Main growth has focussed on 2 countries, that of Poland at 5.9% p.a. and Turkey 6.5% p.a. Predicted production growth for these two are equally positive at 5.2% p.a. and 6.1% p.a.

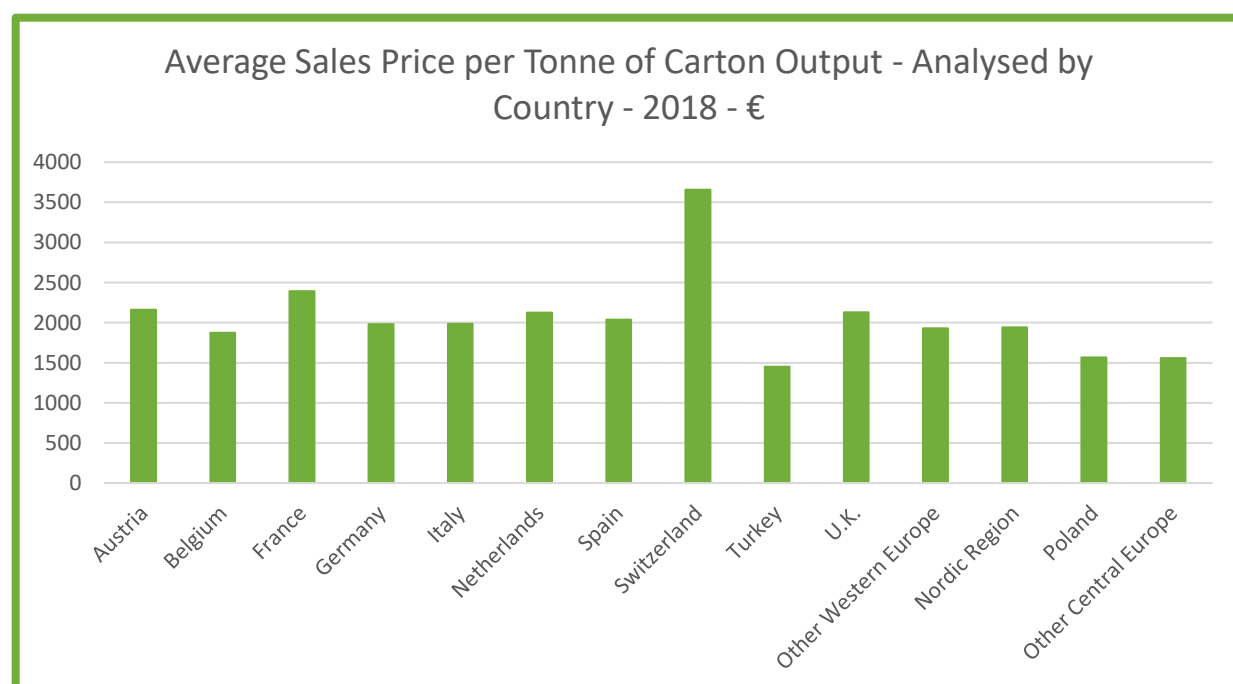
Growth opportunities are graphically indicated in the following sales table

| Estimates & Forecasts of Carton Sales – Total Europe Analysed by Country – 2013, 2018 & 2023 – € Million | | | | | | | | |
|--|--------------|--------------|--------------|--------------|--------------|--------------|-------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Austria | 267 | 2.6 | 294 | 2.7 | 304 | 2.5 | 1.9 | 0.7 |
| Belgium | 246 | 2.4 | 223 | 2.0 | 235 | 1.9 | -1.9 | 1.1 |
| France | 1237 | 12.0 | 1281 | 11.7 | 1409 | 11.5 | 0.7 | 1.9 |
| Germany | 2111 | 20.6 | 2100 | 19.2 | 2172 | 17.7 | -0.1 | 0.7 |
| Italy | 1163 | 11.3 | 1327 | 12.1 | 1413 | 11.5 | 2.7 | 1.3 |
| Netherlands | 536 | 5.2 | 553 | 5.1 | 634 | 5.2 | 0.6 | 2.8 |
| Spain | 670 | 6.5 | 737 | 6.7 | 846 | 6.9 | 1.9 | 2.8 |
| Switzerland | 363 | 3.5 | 319 | 2.9 | 284 | 2.3 | -2.5 | -2.3 |
| Turkey | 650 | 6.3 | 761 | 7.0 | 1041 | 8.5 | 3.2 | 6.5 |
| U.K. | 1279 | 12.5 | 1322 | 12.1 | 1489 | 12.1 | 0.7 | 2.4 |
| Other Western Europe | 373 | 3.6 | 393 | 3.6 | 432 | 3.5 | 1.0 | 1.9 |
| Sub-total West Europe | 8895 | 86.6 | 9311 | 85.1 | 10261 | 83.6 | 0.9 | 2.0 |
| Nordic | 344 | 3.4 | 321 | 2.9 | 359 | 2.9 | -1.4 | 2.3 |
| Poland | 588 | 5.7 | 783 | 7.2 | 1023 | 8.3 | 5.9 | 5.5 |
| Other Central Europe | 440 | 4.3 | 529 | 4.8 | 631 | 5.1 | 3.8 | 3.6 |
| Sub-total Central Europe | 1028 | 10.0 | 1312 | 12.0 | 1654 | 13.5 | 5.0 | 4.7 |
| Total Europe | 10267 | 100.0 | 10944 | 100.0 | 12274 | 100.0 | 1.3 | 2.3 |

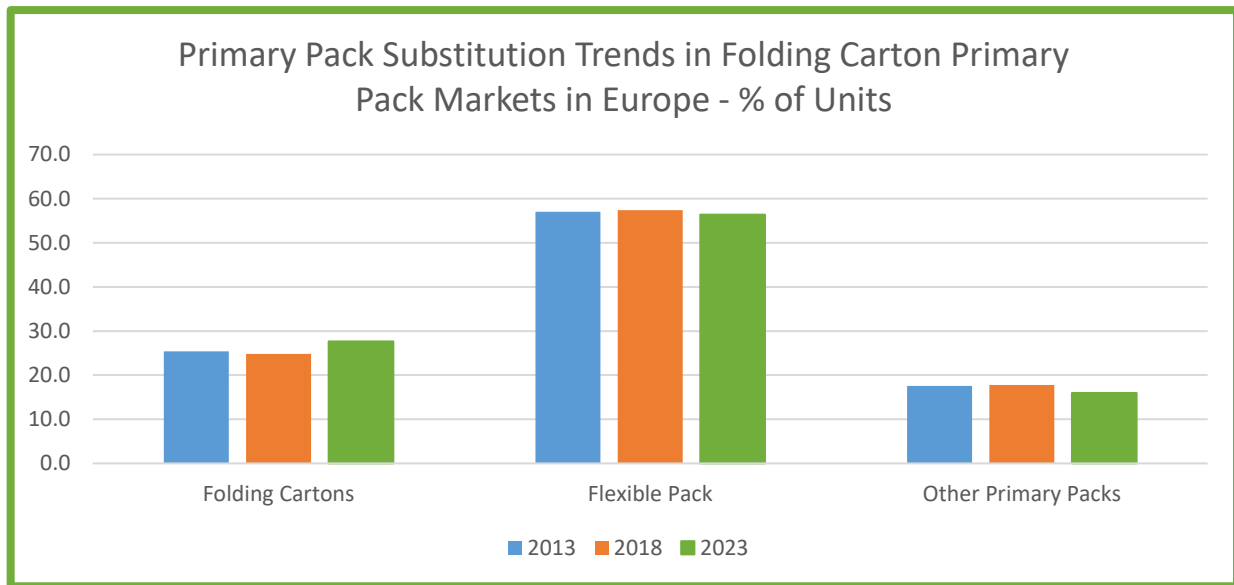
Sales growth remains -0.7% p.a. behind production growth for the last 5 years. That gap closes a little to -0.2% p.a. for the next 5 years.

The following table and graph show the breakdown of sales prices per tonne for each country under review in this report.

| Average Sales Price per Tonne of Carton Output - Analysed by Country - 2018 - € | |
|---|-------------|
| Country | € per Tonne |
| Austria | 2161 |
| Belgium | 1873 |
| France | 2392 |
| Germany | 1982 |
| Italy | 1986 |
| Netherlands | 2126 |
| Spain | 2037 |
| Switzerland | 3658 |
| Turkey | 1450 |
| U.K. | 2128 |
| Other Western Europe | 1929 |
| Sub-total West Europe | 2034 |
| Nordic Region | 1942 |
| Poland | 1565 |
| Other Central Europe | 1557 |
| Sub-total Central Europe | 1562 |
| Total Europe | 1960 |



Plastic Substitution



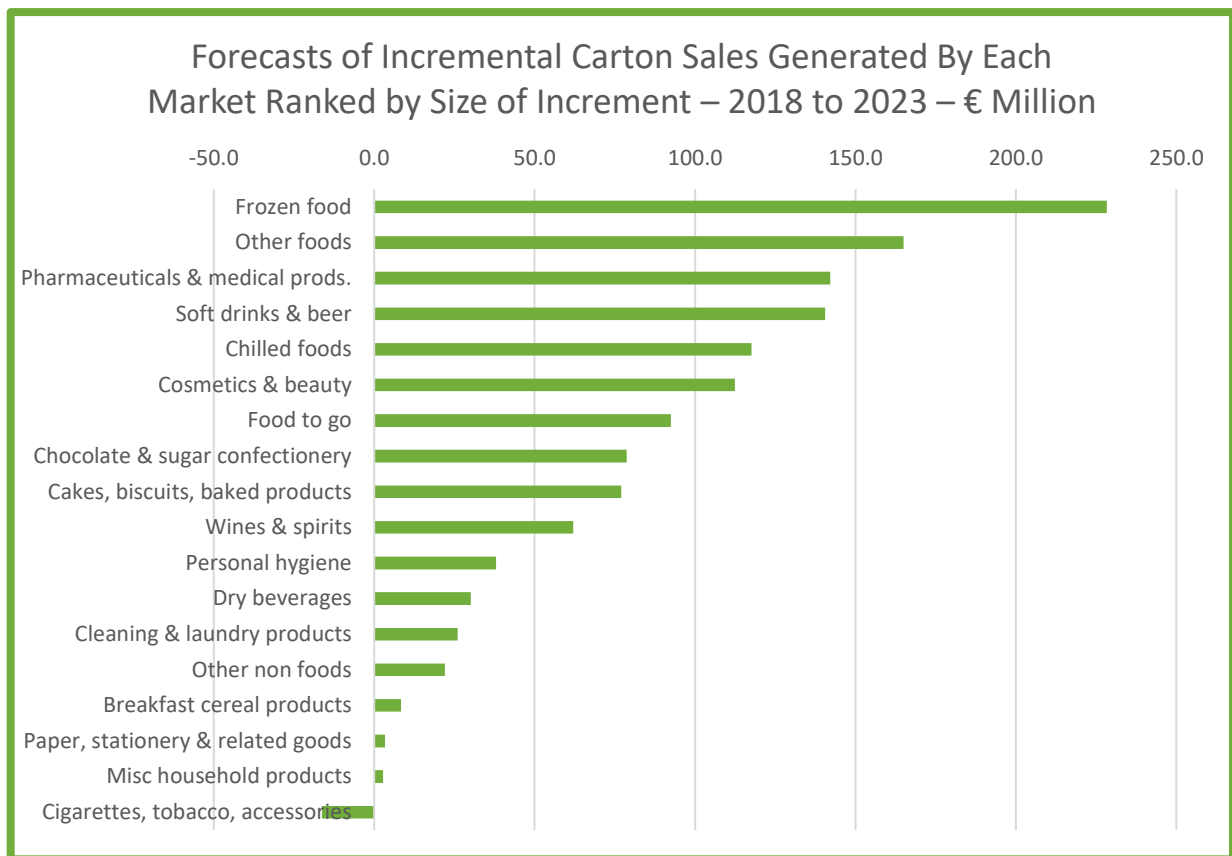
The subject of plastic substitution, in the wake of an environmental awakening by consumers, is already showing positive signs for carton growth for the 5 years ahead. Share of primary packs are indicating a reversal of fortunes from the last 5 years (where share dropped by -0.6% p.a.), with a predicted share rise of primary packs held by cartons increasing by a huge, and very positive 2.8% p.a. swing back.

| Estimates & Forecasts of Folding Carton Primary Pack Output – Total Europe Analysed by Barrier & Non-barrier Applications – 2013, 2018 & 2023 – 000 Tonnes | | | | | | | | |
|--|-------------|--------------|-------------|--------------|-------------|--------------|------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | 000 Tonnes | % | 000 Tonnes | % | 000 Tonnes | % | 13 to 18 | 18 to 23 |
| Barrier | 276 | 5.5 | 439 | 7.9 | 649 | 10.3 | 9.7 | 8.2 |
| Non barrier | 4775 | 94.5 | 5144 | 92.1 | 5680 | 89.7 | 1.5 | 2.0 |
| TOTAL | 5051 | 100.0 | 5583 | 100.0 | 6329 | 100.0 | 2.0 | 2.5 |

NB: Barrier cartons includes cartons produced from coated and laminated cartonboard grades

The significant growth with barrier applications for the next 5 years at 8.2% p.a. shows how composite solutions will be making a significant contribution towards the plastics substitution story. Substitution represents at least 1.0% p.a. per annum of the extra growth in annual production output. This growth is focussed on 6 end use markets, and is highlighted in this next section.

End Use Markets



A summary of where the new volume generated comes from shows food and drink are the main beneficiaries.



Mayr Melnhof

| Estimates & Forecasts of Carton Sales Analysed by Market – Total Europe – 2013, 2018 & 2023 – € Million | | | | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|--------------|------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast cereal products | 485 | 4.7 | 468 | 4.3 | 476 | 3.9 | -0.7 | 0.4 |
| Cakes, biscuits, baked products | 510 | 5.0 | 560 | 5.1 | 637 | 5.2 | 1.9 | 2.6 |
| Chocolate & sugar confectionery | 852 | 8.3 | 885 | 8.1 | 964 | 7.9 | 0.8 | 1.7 |
| Chilled foods | 337 | 3.3 | 402 | 3.7 | 520 | 4.2 | 3.6 | 5.3 |
| Dry beverages | 205 | 2.0 | 228 | 2.1 | 258 | 2.1 | 2.1 | 2.5 |
| Food to go | 300 | 2.9 | 361 | 3.3 | 453 | 3.7 | 3.8 | 4.7 |
| Frozen food | 882 | 8.6 | 983 | 9.0 | 1211 | 9.9 | 2.2 | 4.3 |
| Soft drinks & beer | 510 | 5.0 | 562 | 5.1 | 703 | 5.7 | 2.0 | 4.6 |
| Wines & spirits | 340 | 3.3 | 375 | 3.4 | 437 | 3.6 | 2.0 | 3.1 |
| Other foods | 770 | 7.5 | 861 | 7.9 | 1026 | 8.4 | 2.3 | 3.6 |
| Sub-total Food | 5190 | 50.6 | 5684 | 51.9 | 6684 | 54.5 | 1.8 | 3.3 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | 372 | 3.6 | 293 | 2.7 | 277 | 2.3 | -4.7 | -1.1 |
| Cleaning & laundry products | 348 | 3.4 | 322 | 2.9 | 348 | 2.8 | -1.6 | 1.6 |
| Cosmetics & beauty | 633 | 6.2 | 721 | 6.6 | 833 | 6.8 | 2.7 | 2.9 |
| Misc household products | 399 | 3.9 | 393 | 3.6 | 396 | 3.2 | -0.3 | 0.1 |
| Paper, stationery & related goods | 245 | 2.4 | 249 | 2.3 | 253 | 2.1 | 0.3 | 0.3 |
| Personal care | 336 | 3.3 | 371 | 3.4 | 409 | 3.3 | 2.0 | 2.0 |
| Pharmaceuticals & medical products | 1614 | 15.7 | 1756 | 16.0 | 1898 | 15.5 | 1.7 | 1.6 |
| Other non-foods | 1129 | 11.0 | 1154 | 10.5 | 1176 | 9.6 | 0.4 | 0.4 |
| Sub-total Non-food | 5077 | 49.4 | 5259 | 48.1 | 5590 | 45.5 | 0.7 | 1.2 |
| TOTAL | 10267 | 100.0 | 10944 | 100.0 | 12274 | 100.0 | 1.3 | 2.3 |

NB: 1 Soft drinks & beer includes multipacks

NB: 2 Cigarettes, tobacco & accessories includes vaping & tobacco substitutes

Shows growth by each end use market. Main growth comes from Chilled foods, Food to go, Frozen foods, Soft drinks and beer, Other foods, and Cosmetics and Beauty (N.B. Cleaning and Laundry products has a better growth rate versus Cosmetics and Beauty for the last 5 years and the next 5 years).

Forecasts of Incremental Carton Sales Generated By Each Market Ranked by Size of Increment – 2018 to 2023 – € Million

| Country | € M Incr | % |
|------------------------------------|-----------------|--------------|
| Frozen food | 228.3 | 17.2 |
| Other foods | 164.9 | 12.4 |
| Pharmaceuticals & medical products | 142.1 | 10.7 |
| Soft drinks & beer | 140.6 | 10.6 |
| Chilled foods | 117.6 | 8.8 |
| Cosmetics & beauty | 112.4 | 8.4 |
| Food to go | 92.4 | 6.9 |
| Chocolate & sugar confectionery | 78.7 | 5.9 |
| Cakes, biscuits, baked products | 76.9 | 5.8 |
| Wines & spirits | 62.0 | 4.7 |
| Personal hygiene | 38.0 | 2.9 |
| Dry beverages | 30.1 | 2.3 |
| Cleaning & laundry products | 26.0 | 2.0 |
| Other non-foods | 22.0 | 1.7 |
| Breakfast cereal products | 8.4 | 0.6 |
| Paper, stationery & related goods | 3.4 | 0.3 |
| Misc household products | 2.8 | 0.2 |
| Cigarettes, tobacco, accessories | -16.3 | -1.2 |
| TOTAL | 1330.5 | 100.0 |

NB: 1 Soft drinks & beer includes multipacks

NB: 2 Cigarettes, tobacco & accessories includes vaping & tobacco substitutes

Shows the top End Use Markets for incremental growth; of these, 4 of the top 5 have plastics substitution contributing a large percentage of their growth.

5. CONSUMER AND RETAILING DYNAMICS

5.1 Consumer & retailing trends and their impact on packaging.

Consumer



Consumers are driving change by:

- Being more affluent; money rich, time poor.
- Living in urban areas and adapting their lifestyles to meet this way of living (less space, more frequent shopping trips etc.). According to the UN's Department of Economic & Social Affairs, two-thirds of the world's population is expected to live in urban areas by 2050.
- Being influenced by the media, especially through Key Opinion Leaders (KOLs). Media coverage on packaging waste has influenced the purchasing habits of 74% of Europeans (according to a European Consumer Packaging Perceptions study for Pro-Carton in 2018).
- Caring for the environment. A recent study showed that just over half (52%) of all Europeans say they are seeking out products in environmentally-friendly packaging.
- Demanding brand transparency (e.g. Swedish brand H&M's new label Arket share information on supplier and factory for each product).
- Requesting evidence (e.g. French supermarket chain U used Snapchat Stories -- which disappear after 24 hours -- to demonstrate that its fish is freshly caught).
- Supporting ingredient bans (e.g. palm oil - linked to deforestation).
- Boycotting brands (e.g. German brand Haribo - slave labour accusations).
- Rejecting products (e.g. plastic straws – now replaced by paper straws, costing 5 to 10 times more than the plastic version).

Apart from consumer spending patterns, which other factors might affect European carton demand?

We cannot leave this section without mentioning those prevailing geo-political influences on trade, growth in uncertainty and risk, and as a consequence, having their influence on carton demand. They are as follows:

- **The Trump effect** – especially around global trade wars.
- **Brexit** – a potential detrimental effect on trade, as well as a false demand “blip” due to stockpiling of paper and/or finished goods.
- **Geo-political changes** - anti-Brussels sentiment from other major European countries.
- **Migration** – changes to rules affecting movement of people, leading to a shortage of labour.
- **Volatility regarding board availability and pricing** – short term, due to Brexit (shortages) and over-capacity (converter and mill excesses) across Europe.

According to an industry trade body the three EU countries with the top recovery and recycling rates are Belgium, Finland and Germany.

Retail industry (response to consumer demands)



Retailers are having to react to consumers by:

- Changing their offering (e.g. Aldi and Lidl in Germany are altering store layouts and shelving to focus on customer experience, as well as investing in private brands).
- Being green (e.g. Lidl in Belgium are offering home deliveries by bicycle through a portal called Lidl Simpl and Picnic in the Netherlands offering next day deliveries by electric van. Rewe in Germany is offering cartons - rather than plastic bags - enabling customers to pack their own fruit and vegetables. A number of retailers are also trialling plastic-free aisles. However, the Pro Carton study showed that almost two thirds of Europeans don’t think that retailers and brand owners are doing enough to introduce more environmentally-friendly forms of packaging).

- Consumers are particularly concerned about the future of the planet and are not afraid to vote with their feet. Retailers and brand owners who do not respond (by not listening to consumers) are less likely to be a part of that future.
- By the retailer listening positively to consumer feedback, the relationship between consumer and retailer has reversed with the growth of consumer power.
- Packaging strategies are responding to demands for less waste and more sustainable packaging (most notably at Amazon)



"We get it verbally – we get letters – but it is different when people are in store using their own money. We ask people if they would pay 5 cents extra for a more sustainable pack and people say yes, but if we go ahead and use that pack and up the price by 5 cents we find that sales drop dramatically. So, people say one thing and do another!"

(a European grocery retailer).

Retail industry (response to supply chain)

Retailers are having to react to the retail environment by:

- Adopting multi-channel retailing.
- Redesigning the use of their stores, often using parts of the space to store eCommerce deliveries (e.g. convenience stores).
- Co-ordinating with brand owners to deliver the products the consumers want (e.g. redesigning packaging to meet Aldi's requirements for mixed cases - different flavours or fragrances within one outer case or with Lidl's bellarom cappuccino range designed to accommodate consumers dispensing needs).
- Working with brand owners as they sell through their own eCommerce channels (e.g. Heineken setting up their own eCommerce website, Beerwulf).

What are the different retail channels doing?

Supermarkets/ Hypermarkets

- Hypermarkets and large supermarkets in most countries have lost market share and will continue to do so.
- Consolidating; mergers and acquisitions of retailers are rife as they strive to survive.
- Trying new formats to cream off the most successful ideas from other channels.
- Creating an experience out of a grocery shopping trip by offering more (e.g. pop-up restaurants, leisure activities, etc.)
- Rightsizing their product offering to ensure they offer what the consumer wants, at the same time as offering competitive prices.
- Reacting by shifting their strategic focus from bricks & mortar (B&M) and more towards eCommerce, convenience and limited list discounting (LLD).

eCommerce

- Amazon is pioneering this channel, initially via consumer goods, and more recently with fresh and ambient grocery products.
- Amazon plus many other eCommerce companies growing this channel to 10%+ of all retailing sales.
- Growing either by efficiency or establishing a niche. Biggest winners are those with the most efficient systems (e.g. Amazon, Ocado, Zalando, etc.) or those with more niche/specialised products (e.g. Garçon Wines).
- Trying to overcome the high levels of returns (especially high in clothing at 35%+) which can severely dent e-tailer profits.
- In some cases eCommerce companies are opening up B&M stores to offer a more immediate, cashier-less service (e.g. Amazon Go) or as a physical rendezvous for a click & collect service.
- Major B&M retailers responding to the competitive pressure by opening up their own eCommerce channels (even if a "loss leader") to compete with on-line sellers.

Convenience Stores

- Successfully combining the benefits of locality alongside the benefits of eCommerce by utilising part of their stores as an eCommerce collection area for consumers.
- Selling locally sourced products, appealing to consumers' growing support for locally produced foods.
- Benefitting from consumers' hectic lifestyles and leading to more frequent local shopping trips.
- More and more decanting of product out of their outer or SRP packaging as they extend their product range offering.

Limited list discounters (LLDs)

- Focusing on low prices whilst also offering more well-known brands.
- Offering sufficient products to encourage consumers to do a full weekly shop, rather than just buying a narrow range of staple food goods.
- Looking more like supermarkets (ironically) by increasing the range of stock keeping units (SKUs) often having 2 or 3 SKUs per SRP pack.

Small Supermarkets

- Experiencing some of the issues faced by supermarkets and hypermarkets with losses to eCommerce.
- Rightsizing their product offering to ensure they offer what the consumers want.

Other Retailers

- Struggling to survive against the purchasing power of the larger retailers, or from a trend towards more local, organic and craft retailers.
- Seeing some light at the end of the tunnel in niche areas where consumers are willing to pay a price premium (organic, local, etc.).
- Using subscription membership as a key way to gain loyalty (e.g. Costco, Makro, etc.)

The retail industry in Europe has become highly complex with traditional retailers now competing in 2 or 3 channels simultaneously (e.g. Tesco with hypermarket stores, convenience, and the discounter brand, Jack's, as well as online).

The European retail scene is undergoing constant change. With the dominance of multi-national retailers, this will ensure these trends continue on a pan-European scale. The changes in market shares of retail channels can vastly affect packaging requirements, therefore, it is important to keep abreast of these changes.

A recent European survey concluded that over 75% of those questioned said that they were willing to pay more for packaging which impacts less on the environment. Almost half the respondents said that they would bear an increase in price of 5%, while 5% of those questioned said they would pay up to a 20% premium in the cost (However, retailers contest this)!

"We need protection to get the product to the consumer for the last mile – it has a rough ride" - (a European confectionery brand owner).

"In the 1970s brand owners had more power over availability, price and packaging, but over the years this has been turned upside down. Retailers have taken over control and have a strong say in what is done" - (a European household goods brand owner).

"Due to the shift by retailers/brand owners into board and away from plastic, we have recently had to invest £250k on a new machine to cater for the end of line changes" - (a European healthcare manufacturer and distributor).

5.2 Megatrends and their effect on today's consumers and patterns of expenditure.

Global megatrends are impacting on industries and markets in Europe and around the world. This list is by no means exhaustive. Disruption is continuous and is forcing rapid change. The current key megatrends include:

- Shifting market frontiers:
 - Urbanisation.
 - Changing demographics.
 - Advancement in technology.
- Ethical living - this is largely being driven by millennials (there are estimates that predict this group will make up a third of the global population by 2020.) Consumers are increasingly interested in the ethical and moral values of companies, including:
 - Environment.
 - Sustainability.
 - Plastic - consumers are reviewing their behaviour to prevent plastic pollution and are requiring change from brand owners and retailers.
 - Reduce/Reuse/Recycle.
 - Labour practices.
 - Production methods.
 - Drive for further supply chain efficiencies.
 - Disruptive technologies.
 - Industry 4.0.
 - Corporate social responsibility.
- Digital consumers – there is a significant growth in the number of "connected consumers" within Europe and across the globe.
 - Consumers, brand owners and retailers all have a digital persona, which results in a battle for attention and everything being open to scrutiny.

- Greater level of mobile purchasing.
- Shopping being reinvented – there is little certainty of what will happen in the future of retail, but we are seeing many developments:
 - Smaller bricks and mortar (B&M) stores, e.g. Ikea with very small stores (micro-retailing), B&Q (DIY) very small store in London, Amazon click & collect lockers across many countries in Europe.
 - Online embraced by B&M, e.g. Ahold subsidiary called Bol.com in the Netherlands, ManoMano in France.
 - Completely new products driven by millennials, e.g. MiPow Playbulb, new lightbulb and music player combination device.

These global megatrends are all having an influence on how the European consumer live their lives in today's connected world.



6. ECONOMIC AND BUSINESS PROSPECTS

6.1 Economic forecasts (GDP and consumers' expenditure).

| GDP - Annual % Change | | | | | | | | | | | | | | | |
|---------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------------------|---------------------|------------------------|---------------------|
| Country | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Index 2018: 2013 = 100 | Ave % p.a. 13 to 18 | Index 2023: 2018 = 100 | Ave % p.a. 18 to 23 |
| Austria | 0.0 | 0.7 | 1.1 | 2.0 | 2.6 | 2.7 | 2.0 | 1.7 | 1.6 | 1.5 | 1.5 | 109.4 | 1.8 | 108.4 | 1.6 |
| Belgium | 0.2 | 1.3 | 1.7 | 1.5 | 1.7 | 1.4 | 1.3 | 1.4 | 1.5 | 1.5 | 1.5 | 107.8 | 1.5 | 107.4 | 1.4 |
| France | 0.6 | 1.0 | 1.1 | 1.2 | 2.2 | 1.5 | 1.3 | 1.4 | 1.5 | 1.5 | 1.5 | 107.1 | 1.4 | 107.4 | 1.4 |
| Germany | 0.6 | 2.2 | 1.5 | 2.2 | 2.5 | 1.5 | 0.8 | 1.4 | 1.5 | 1.4 | 1.3 | 110.1 | 1.9 | 106.6 | 1.3 |
| Italy | -1.7 | 0.1 | 0.9 | 1.1 | 1.6 | 0.9 | 0.1 | 0.9 | 0.7 | 0.6 | 0.6 | 104.7 | 0.9 | 102.9 | 0.6 |
| Netherlands | -0.1 | 1.4 | 2.0 | 2.2 | 2.9 | 2.5 | 1.8 | 1.7 | 1.5 | 1.5 | 1.5 | 111.5 | 2.2 | 108.2 | 1.6 |
| Spain | -1.7 | 1.4 | 3.7 | 3.2 | 3.0 | 2.5 | 2.1 | 1.9 | 1.7 | 1.7 | 1.7 | 114.5 | 2.7 | 109.5 | 1.8 |
| Switzerland | 1.9 | 2.5 | 1.3 | 1.6 | 1.7 | 2.5 | 1.1 | 1.5 | 1.6 | 1.6 | 1.6 | 109.9 | 1.9 | 107.6 | 1.5 |
| Turkey | 8.5 | 5.2 | 6.1 | 3.2 | 7.4 | 2.6 | -2.5 | 2.5 | 3.0 | 3.0 | 3.5 | 126.9 | 4.9 | 109.7 | 1.9 |
| UK | 2.0 | 2.9 | 2.3 | 1.8 | 1.8 | 1.4 | 1.2 | 1.4 | 1.5 | 1.6 | 1.6 | 110.7 | 2.1 | 107.5 | 1.5 |
| Other Western Europe | -2.2 | 0.8 | 0.7 | 0.9 | 2.2 | 2.1 | 2.0 | 1.8 | 1.5 | 1.3 | 1.3 | 106.8 | 1.3 | 108.3 | 1.6 |
| Sub-total Western Europe | 1.0 | 2.0 | 2.2 | 2.0 | 2.8 | 1.7 | 0.7 | 1.6 | 1.6 | 1.6 | 1.6 | 111.1 | 2.1 | 107.3 | 1.4 |
| Nordic Region | 0.8 | 1.7 | 2.6 | 2.2 | 2.2 | 1.9 | 1.6 | 1.8 | 1.7 | 1.7 | 1.7 | 111.1 | 2.1 | 108.9 | 1.7 |
| Poland | 1.4 | 3.3 | 3.8 | 3.1 | 4.8 | 5.1 | 3.8 | 3.1 | 2.8 | 2.8 | 2.8 | 121.8 | 4.0 | 116.3 | 3.1 |
| Other Central Europe | 1.5 | 2.9 | 3.8 | 3.3 | 4.8 | 3.8 | 3.2 | 2.9 | 2.7 | 2.7 | 2.6 | 120.1 | 3.7 | 114.9 | 2.8 |
| Sub-total Central Europe | 1.5 | 3.1 | 3.8 | 3.2 | 4.8 | 4.3 | 3.4 | 3.0 | 2.8 | 2.7 | 2.7 | 120.8 | 3.8 | 115.5 | 2.9 |
| Total Europe | 1.0 | 2.1 | 2.4 | 2.1 | 3.0 | 2.1 | 1.1 | 1.8 | 1.8 | 1.7 | 1.8 | 112.3 | 2.3 | 108.4 | 1.6 |

Source IMF WEO

GDP growth rates over the 10 year tend to be slightly ahead of past folding carton production growth

| Retail Sales Growth by Country - Annual % Change | | | | | | | | | | | |
|--|-------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Country/Region | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Austria | -0.3 | -0.8 | 0.8 | 1.6 | 1.1 | 1.5 | 0.9 | 1.1 | 0.8 | 0.8 | 0.4 |
| Belgium | 0.0 | 0.8 | 1.2 | 0.8 | 1.3 | 1.0 | 0.8 | 1.1 | 1.0 | 1.0 | 1.0 |
| France | -0.3 | -1.0 | 0.6 | 0.9 | 1.3 | 0.8 | 0.6 | 0.6 | 0.5 | 0.4 | 0.5 |
| Germany | -0.4 | 1.0 | 3.1 | 2.6 | 1.3 | 0.8 | 0.9 | 0.8 | 0.8 | 0.9 | 0.9 |
| Italy | -3.3 | -0.2 | 0.8 | 0.7 | 1.3 | 0.3 | 0.2 | 0.4 | 0.7 | 0.9 | 0.9 |
| Netherlands | -0.8 | 0.7 | 1.7 | 1.8 | 2.7 | 2.6 | 0.9 | 1.1 | 1.2 | 1.3 | 1.2 |
| Spain | -6.9 | 0.7 | 2.1 | 2.8 | 2.4 | 2.4 | 3.1 | 2.4 | 2.3 | 2.1 | 1.9 |
| Switzerland | 1.3 | 0.3 | 0.9 | 1.1 | 0.0 | 0.6 | 1.0 | 1.3 | 0.4 | 0.9 | 0.8 |
| Turkey | 2.5 | -1.3 | 1.9 | 1.3 | 2.5 | -1.2 | -2.4 | 4.0 | 3.9 | 3.9 | 4.0 |
| United Kingdom | 0.4 | 4.2 | 1.8 | 2.0 | 1.5 | 1.8 | 1.6 | 1.6 | 1.6 | 1.7 | 1.7 |
| Other Western Europe | -1.9 | 0.5 | 0.7 | 1.1 | 0.9 | 1.3 | 1.0 | 1.3 | 0.8 | 1.1 | 1.2 |
| Sub-total West Europe | -0.9 | 0.7 | 1.7 | 1.7 | 1.6 | 0.9 | 0.7 | 1.4 | 1.4 | 1.4 | 1.4 |
| Nordic | 1.1 | 2.3 | 2.1 | 1.4 | 1.9 | 1.6 | 1.4 | 1.6 | 1.6 | 2.1 | 2.1 |
| Poland | -0.2 | 2.1 | 2.7 | 3.8 | 4.1 | 2.4 | 5.1 | 2.9 | 2.4 | 2.3 | 3.0 |
| Other Central Europe | -0.3 | 3.0 | 4.3 | 5.4 | 5.7 | 3.1 | 2.8 | 2.2 | 2.6 | 2.3 | 2.6 |
| Sub-total Central Europe | -0.3 | 2.7 | 3.7 | 4.8 | 5.1 | 2.9 | 3.7 | 2.5 | 2.5 | 2.3 | 2.7 |
| Total Europe | -0.7 | 1.0 | 2.0 | 2.1 | 2.0 | 1.2 | 1.1 | 1.6 | 1.5 | 1.6 | 1.6 |

Source: EIU/Planet Retail

Retail sales showing a lower growth rate than GDP and predicted production growth.

6.2 Relationship between folding carton demand and a composite index of GDP and consumers' expenditure.

We continue to note a close relationship between folding carton demand and our composite index (now being used as part of the ECMA quarterly bulletin report). The composite index consists of a formula using GDP (80%) and Retail price index data (20%).

Carton demand is often closely linked, as our composite index (below) illustrates

"There is an increasing optimism for cartons as we see more and more initiatives to find alternatives to plastics, and for more environmentally recyclable solutions, which cartons are well equipped to provide. It is taking a bit of time to hit big volumes as users have to look at their operations and make the necessary changes, especially where lines are currently automated, but it is happening" –
(MD, Independent carton converter)

| Comparison of Carton Output Index & GDP/Retail Sales Composite Index - 2013 to 2018 - 2013=100 | | |
|--|---------------------|-------------------------------|
| Country | Carton Output Index | Comp. GDP/ Retail Sales Index |
| Austria | 109 | 108 |
| Belgium | 94 | 107 |
| France | 103 | 106 |
| Germany | 102 | 110 |
| Italy | 113 | 104 |
| Netherlands | 99 | 111 |
| Spain | 113 | 114 |
| Switzerland | 86 | 108 |
| Turkey | 137 | 122 |
| U.K. | 106 | 111 |
| Other Western Europe | 105 | 106 |
| Sub total West Europe | 108 | 110 |
| Nordic Region | 107 | 111 |
| Poland | 133 | 121 |
| Other Central Europe | 121 | 121 |
| Central Europe | 128 | 121 |
| Total Europe | 111 | 112 |

NB: The composite index comprises 80% GDP & 20% Retail Sales

NOA includes this composite index each quarter as part of the ECMA quarterly bulletin and would recommend its ongoing use for forecasting future output demand.

| Currency Movements - Average Exchange Rates for Selected Currencies versus the Euro - 2009 to 2019 | | | | | | | | | | | |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Country/Region | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019* |
| Nordic Average | 8.937 | 8.197 | 8.093 | 7.877 | 7.973 | 8.304 | 8.588 | 8.736 | 8.802 | 9.108 | 9.252 |
| Swiss Franc | 1.510 | 1.383 | 1.233 | 1.205 | 1.231 | 1.215 | 1.068 | 1.090 | 1.112 | 1.155 | 1.123 |
| Turkish Lira | 2.162 | 1.999 | 2.335 | 2.315 | 2.531 | 2.905 | 3.022 | 3.342 | 4.118 | 5.697 | 6.347 |
| UK £Sterling | 0.891 | 0.859 | 0.868 | 0.811 | 0.849 | 0.806 | 0.727 | 0.819 | 0.876 | 0.885 | 0.881 |
| Polish Zloty | 4.326 | 3.994 | 4.117 | 4.182 | 4.196 | 4.185 | 4.183 | 4.364 | 4.257 | 4.262 | 4.292 |
| Other Central Europe Average | 25.554 | 25.111 | 25.091 | 25.680 | 25.911 | 26.437 | 26.404 | 26.428 | 26.359 | 26.476 | 26.603 |

Source: www.oanda.com, www.ofx.com. * indicates incomplete year.

Nordic average comprises average for Danish Krone, Norwegian Kroner & Swedish Krona

Other Central Europe average exchange comprises weighted average exchange for Euro & non-Euro Zone countries

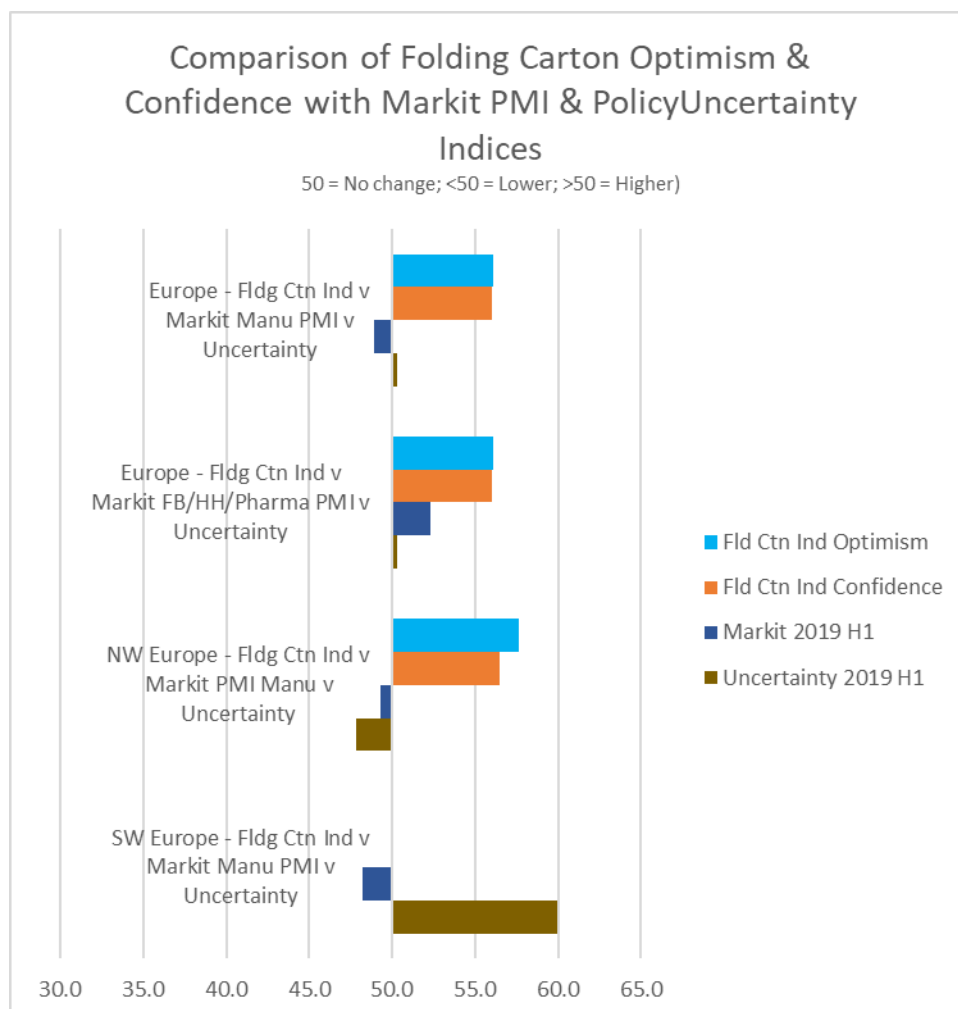
There are significant differences to the index, most notably Switzerland and Turkey, where currency differences have a marked impact on demand. Currency fluctuations have a significant effect on carton demand; Turkey, Poland and the UK carton output has benefitted, whereas Switzerland's carton production has suffered as a result of reduced competitiveness.

6.3 Relationship between folding carton demand and ECMA optimism and confidence index

NOA has also been using the globally recognised business confidence measure of Purchasing Managers Index (Markit PMI) in the ECMA quarterly bulletin for the last 2 to 3 years. The Markit PMI data is a generic index covering a wide range of manufacturing businesses.

In this report we have undertaken our own, in-depth confidence and optimism survey. This has been done specifically with folding carton converters, board mills and allied industries. A question referring to optimism and confidence was included in the ECMA fieldwork interviews exploring the subject of risk and uncertainty within the folding carton industry.

In the first chart below the comparison is with ECMA respondents, Market PMI and one other Index; in the second chart below the comparison of opinion is from different sub-groups within the ECMA set of interviews and offers an insight into how those different sub-groups regard current and future prospects for folding cartons:



NB: Folding carton indices based on average of associations, board suppliers & converters.

NB: Markit FB/HH/Pharma is based on an average of Europe Sector PMIs for Food & Beverage, Household & Personal Use Products & Pharmaceuticals & Biotech.

NB: Country coverage for different data sets may vary.

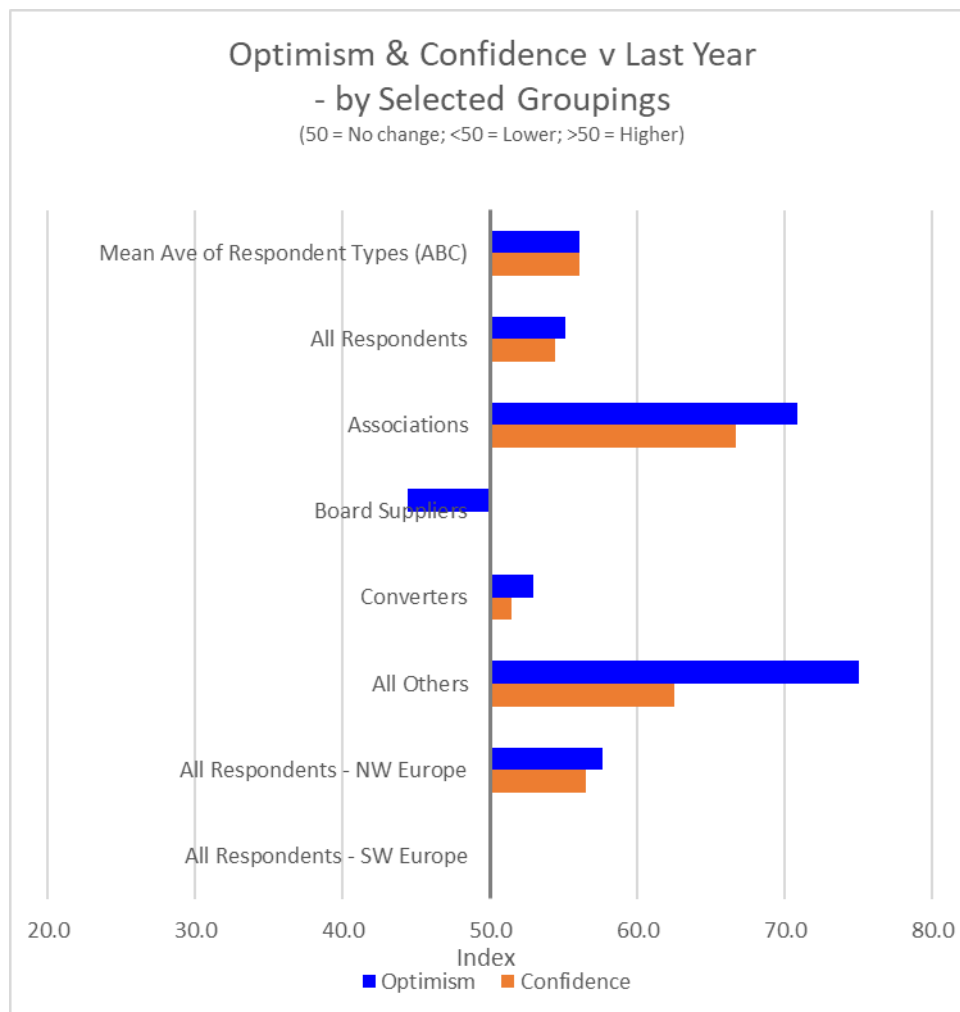
NB: PolicyUncertainty index assumes average of all months Jan 2017 to June 2019 = 50.

NB: External sources: Markit & www.policyncertainty.com

The folding carton industry’s optimism and confidence compared to last year is buoyant but restrained and compares well with Markit PMI for selected consumer goods sectors; folding carton interviewees are suggesting that confidence is holding up better than when compared to the Markit index for total manufacturing.

Rising uncertainty during 2019 compared to 2018 does not yet appear to have impacted on folding carton industry optimism and confidence, though lower ratings identified from the sub-group representing board suppliers does indicate concerns over wider economic and political factors.

North west Europe has a much more buoyant set of ratings for all measures compared to south west Europe, a theme picked up at other points within this report.



NB: Respondent Types ABC refers to Associations, Board Suppliers & Converters.

The chart above shows ratings for various sub-groups of ECMA respondents. 50 equals no change from last year, above 50 is higher than last year and below 50 lower than last year. Note that where no reading is visible then the result is on or very near to 50.

The inclusion of this new data has been provided as an extension to the numerical set usually provided for the European Carton Prospects report. We hope that subscribers will enjoy reading the findings in

this report and agree that it adds to the breadth of supporting data available for subscribers. We would be happy to provide this data as part of the regular ECMA quarterly bulletin report.

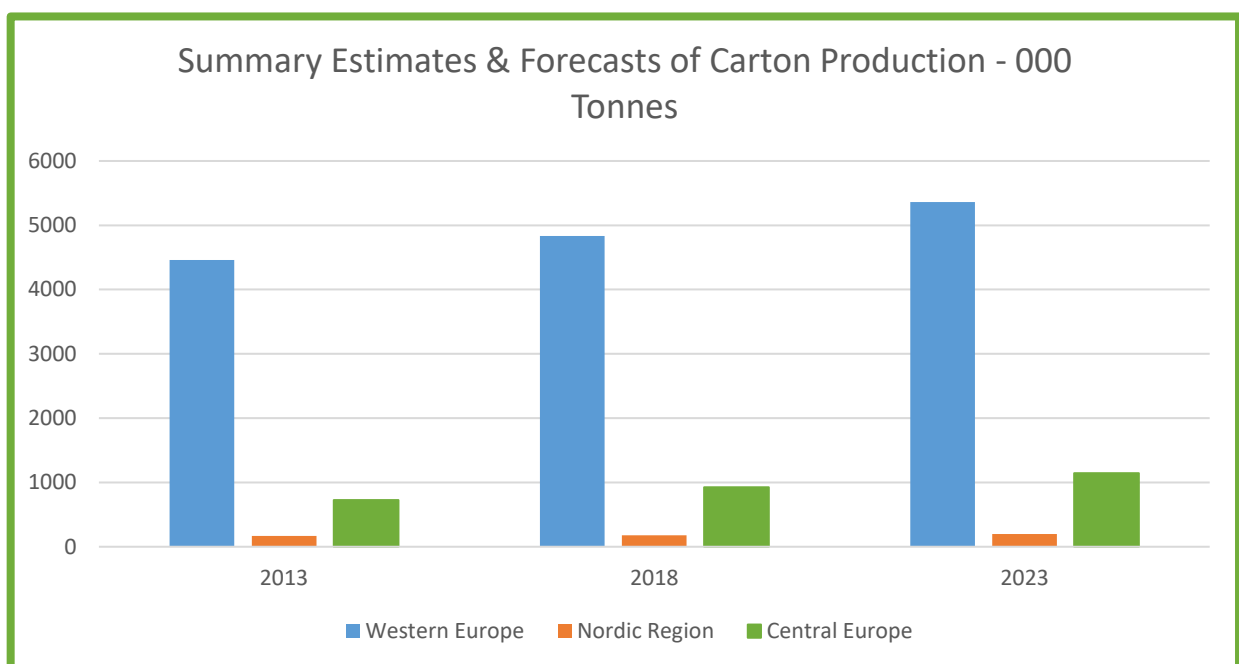
For more in-depth information of this survey, see full details on Page 120.



Colpac Ltd

7. KEY EUROPEAN AND GLOBAL FACTORS INFLUENCING CARTON DEMAND

7.1 Supply dynamics within the European market, and the dynamics between West, Central and East Europe, including a short commentary on business migration.



Political and economic factors

- After a slowdown in growth rates for carton demand in 2016 and 2017, European carton demand has had a boost over the last 12 to 18 months with demand much improved. The impact of political and economic change continues to make predictions of future growth very difficult.
- Global trade wars between China and the United States, and the implications that this might have with trade for Europe. Tension in the Middle East is adding to nervousness around the world (e.g. with oil tankers impounded or highjacked). These proxy wars may spin into increased oil prices or energy cost rises.
- Signs that indicate an overall slowing down of trade. Europe is close to recession, especially in industries such as automotive. Growth is barely at +1% p.a. following a notable economic slowdown in Europe (which became apparent in mid-2018).
- BREXIT and its impact politically and economically affecting the output of cartons for several European countries; impact not just restricted to the UK (see details later on in this chapter).

- Politics and the economic situation in Southern Europe (e.g. Italy and Greece) versus Northern Europe, where interest rates are especially high, seen as disadvantaging business, especially versus Northern European economies.
- The recent political situation in Turkey has had a significant impact on that economy, and in turn shown a notable slowdown in growth rates for Turkey throughout 2017/2018. Turkey has been the growth hub for carton volumes for the last 5+ years and the powerhouse for overall growth for cartons in Europe.
- With China now rumoured to only accept 0.5% of contamination of fibre-based waste, a changing scene on waste recovery happening both outside of Europe as well as within.

Legislation and the environment

- The impact of single use plastic legislation, the European plastics directive is poised to have a positive impact on carton demand (this has been the single most discussed topic from all of the interviews undertaken by NOA). The latest European directive over Single Use Plastics https://europa.eu/rapid/press-release_STATEMENT-19-1873_en.htm and the banning of certain packaging products will have a major impact on demand for folding cartons. This subject is likely to signify the most important change for carton demand for the last 10 to 15 years.
- Continued consumer pressure being exerted by individuals and consumer groups:
 - The impact that Greta Thunberg, the 16 year old environmentalist from Sweden has had over the last 12 months in Europe (and beyond).
 - The effect that television programmes such “Blue Planet 2” presented by Sir David Attenborough have been having on people’s awareness and opinion.
 - The impact of campaigns like the “plastic soup surfer” on the lobbying for change.
 - A growth in environmental awareness and the power of the consumer to influence huge change for demand of goods (e.g. effect on demand of plastic straws and paper cups).
 - Fears amongst brand owners and retailers that consumers may blacklist products for environmental reasons.
- Away from the environmental debate, legislation and tighter regulations in some market sectors have had a significant effect on trading conditions; this has been especially so in highly regulated markets such as Pharmaceutical and Healthcare, particularly on topics such as tamper evidence, serialisation, etc. Such regulations have played a significant part in repelling new players from coming into those markets.
- Debate (and some confusion) over the 95:5 material content proposition; this is a key factor for the industry. The debate is whether a product is 95% or more of one base material, and if agreed, means that product would be deemed as a single material and be passed “OK” to go into the recycling stream. The key issue is the level of waste that board mills will accept. Minimising mixed waste is a key issue and leading motivation for these important stakeholders.

Retailing scene

A highly competitive market, with retailers and branded goods companies jostling for position. Bricks and mortar retailers trying to stop losing share to internet retailers and to eCommerce sales; while branded goods companies strive to be seen in both these different sides of the retailing market place:

- Aggressive purchasing strategies by major retailers have been keeping a squeeze on brand owners. In turn, brand owners have been seeking every opportunity to make savings wherever

possible. A reduction in number of colours (i.e. reduced down to 4 colours) may not result in big cost savings, but they are looking for every cent they can save.

- Branded goods volumes have been adversely affected due to the growth of limited list discounters, who favour private label and own label products traditionally over branded goods. This favouring of private label leads to no brand loyalty and product being moved from one folding carton supplier to another supplier very easily.
- Private label is growing well, at all levels of the retailer continuum: Lidl, Carrefour or M&S. Estimates suggest private label maybe as large as 35% of the overall retail market in Europe. Consumers don't see much difference between private label and branded goods today; the quality of the products is comparable and even their imagery is very similar!
- An increased pressure on retailers and branded goods companies to make changes to designs and use more fibre-based solutions. This particularly for private label ranges; outcome is likely to be more fibre-based products being delivered more swiftly via supermarket's own ranges.



“Don't underestimate the power of the retailers. It is proving very difficult for brand owners to be listed in retailers. Pricing and merchandising are determined by the retailers; they are very powerful and own the channel, both online and in the high street” – (SD, European carton converter)

The change in society and how we live. Urbanisation is one of the key mega-trends around the world:

- Social changes due to reduction in family sizes and the growth of single-parent families and of people living on their own; means carton pack sizes are reducing. Smaller households mean smaller portions and therefore smaller cartons and smaller volumes of cartons. However, an overall increase in the total numbers of ready packed foods.
- Growth of convenience shopping trend in Northern Europe (much less so in Southern Europe) leading to a subtle difference appearing with some pack types between North and South.
- A growth in more urban living too. This has a similar effect as the point above, leading to smaller packs and more frequent shopping visits (no longer a shopping trip once a week, now invariably once a day, if not more frequently). Also leads to move away from home cooking to more ready to cook meals and more prepared, convenience foods.

The rise in importance of environmental matters, sustainability and a healthier way of living:

- Consumer trends with lifestyle and healthy living are impacting on new carton opportunities. Consumers are demanding innovative, new packs for products such as protein bars, health drinks and protein supplements.

- A growth in “vegan” plus “organic” plus “natural” plus “locally sourced” as key trends. Impact has been for packaging to reflect these popular trends (e.g. use of more brown substrates for packs).
- A move towards greater use of brown outers to reflect a more “natural” finish and embrace a more environmental “look and feel”. Move driven by an increased awareness for sustainability and consideration of how best to appeal to consumer demand and demonstrate that brand owners are making a change. A move away from “shiny and glossy” is being swapped for an increase in “beige, brown and natural colours”.
- Noted that a large German retailer now has a large recycling division in their structure, heralding that recycling will be an increasing topic of interest in retailing.

Supply Chain trends



Over the last 5 years since the publication of European Carton Prospects 2014 (ECP’14) we have seen even more complexity brought into the supply chain and an ongoing reduction in pack and order sizes:

- Increasing number, frequency and volume of print runs:
 - Retailers have wanted to provide more variety in their own portfolio of private label/own label and their offering to consumers (i.e. from “Value” up to “Premium”).
 - Brand owners have sought to offer increased numbers of variants of product types in order to guarantee listings with major European retailers.
 - Smaller pack formats in greater numbers due to a combination of
 - Consumers’ changing living habits and,
 - Retailers desire to offer a more customised and personalised appeal to consumers, leading to even more fragmented portfolio of SKUs for brand owners to provide.

- An increased demand for regional packs where packs are required to offer explanation via labelling in local languages, and has increased SKUs numbers even further, adding ever more numbers of prints to folding carton converters portfolio of SKUs.

“There is a significant increase in the number of jobs and decrease in run length. This is driving a growth in automation in pre-press, digitisation and a growth in CAD for carton design. Factories are now running at 500 jobs per days whereas it was just tens of orders in the past” – (SD, European Graphics Company)

- Shorter run lengths due to reduced stock holding and JIT supply chain demands
 - In niche markets, such as pharmaceutical or medical devices, orders can be for just a single pallet today, whereas in food it is often 3 or 4 times higher.
 - This trend has driven down converting and printing line utilisation (OEE now below 30% for many converters and levels of converting waste rising towards 20% in feedback from several of our interviews).
 - The effect of this change has driven increased investment in automation. This in addition to a rise in the adoption of new or different manufacturing methods (e.g. using pre-printed liners to improve the throughput of converting plant), and embracing new pre-press solutions (e.g. digital pre-press production of artwork and plates).
- Greater variety in packaging formats
 - More use of design to attract the eye leads to an increased number of different types of pack formats or shapes in brand owner portfolios, and having to be supplied by carton converters.
 - Large focus on new product development means an increasing number of SKUs.
 - Increase in number of finishes being required (e.g. embossing, blocking, etc.) to ensure the pack has a greater “stand out” feature to attract the eye of consumers as well as making packs much more tactile.
 - More complexity being seen in packaging construction and design to guarantee that packs “stand out from the crowd” on shelves of B&M retail outlets.
 - Microflute - eCommerce encouraging development of new distribution pack formats, some using folding carton packs but many using microflute as a viable board option. Similar interest in microflute is happening for fast food or food2go applications.

The impact for converters has been reduced efficiencies, increased wastage and attempts to work in new ways within the supply chain:

- Carton converters have been seeing lower and lower average order sizes/run lengths. OEE at converters has been dropping (going below 30% OEE).

- In 2018 the average order size dropped significantly; factors for this include greater customisation, an increase in localisation and more personalisation of products for different markets.
- Improved stock holding, despite the increased variety and numbers of SKUs, is happening due to the advances in product planning and material flow systems through better integration with client's own systems. Board producers, board converters and brand owners now consider more closely where and how much stock they each hold – a move to integrate systems and reduce stock in the overall supply chain and replicate good practice of other industries (e.g. Automotive industry).



“More smaller volume orders, with increasing number of changes in pack and design. Brand Owners and Retailers are aiming for more market share by making the product and the pack more attractive. They are offering a lot of promotions” – (Owner, European Carton Converter)

One short to medium-term problem has been the impact of Brexit on Pan-European supply. Two political deadlines have led to companies having to change how they manage stocks:

- The UK saw a notable build-up of stocks in 2018, and then with the delay in Brexit through 2019, a big downturn in demand (as much as -10% month on month for converters) as brand owners and retailers destocked. This caused major fluctuations in volumes over recent months. A roller coaster of demand; with boosts in volume then followed by unpredictable plunges in volumes.
- Volume swings were experienced both in the UK and across other neighbouring countries in Western Europe with finished product stocks increasing and then reducing once again.
- Other Western European countries saw a similar see-saw in demand as the UK over the last 12 months as brand owners decided what they needed to do in this scenario of logistical mystery and uncertainty within the supply chain.



“For some UK converters it gave major swings and falls in volumes. We didn't see any impact of stockpiling for Brexit, our customers took a wait and see approach to the situation in the UK” – (MD, Western European Converter)

- Pan-European brand owner companies demanded that notable volumes of cartons be moved away from production in the UK as they pressed for assurances with continuity of supply. This volume, once gone from those manufacturing sites in the UK, may never return.
- This bringing forward of orders to enable building up of stocks added uncertainty and additional pressure to the supply chain. At a key time in the summer of 2019, available freezer storage space for food products was at an all-time low of less than 5% (where normal capacity would have been more like 15% to 20% “head room” at that stage of the year in previous years).
- A constant theme from respondents in the UK and neighbouring countries was the inability to give solid growth or decline predictions for future volume trends. This period of uncertainty is likely to continue to impact on both UK and neighbouring carton converters used to exporting product to the UK.



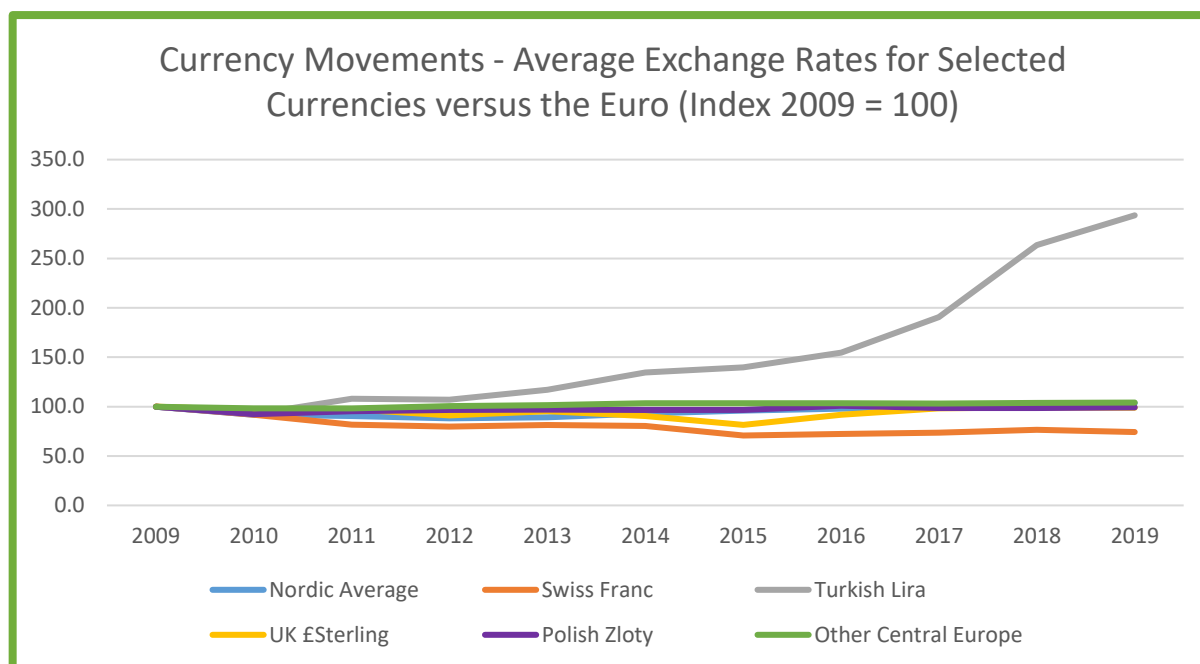
- Exchange rate fluctuations have had a significant impact on Turkish, Swiss and UK converters in particular, with huge changes in raw material costs, when trying to keep input costs under control. Prices rose significantly at the end of 2017 and into 2018.

| Currency Movements - Average Exchange Rates for Selected Currencies versus the Euro - 2009 to 2019 - % Change on Previous Year | | | | | | | | | | | |
|--|------|------|-------|------|------|------|-------|------|------|------|-------|
| Country/Region | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019* |
| Nordic Average | 5.9 | -8.3 | -1.3 | -2.7 | 1.2 | 4.2 | 3.4 | 1.7 | 0.8 | 3.5 | 1.6 |
| Swiss Franc | -4.9 | -8.4 | -10.8 | -2.3 | 2.1 | -1.3 | -12.0 | 2.0 | 2.0 | 3.9 | -2.8 |
| Turkish Lira | 13.4 | -7.6 | 16.9 | -0.9 | 9.3 | 14.8 | 4.0 | 10.6 | 23.2 | 38.3 | 11.4 |
| UK £Sterling | 12.0 | -3.7 | 1.1 | -6.5 | 4.7 | -5.0 | -9.9 | 12.7 | 7.0 | 1.0 | -0.4 |
| Polish Zloty | 23.1 | -7.7 | 3.1 | 1.6 | 0.3 | -0.3 | -0.1 | 4.3 | -2.4 | 0.1 | 0.7 |
| Other Central Europe | 7.2 | -1.7 | -0.1 | 2.3 | 0.9 | 2.0 | -0.1 | 0.1 | -0.3 | 0.4 | 0.5 |

Source: www.oanda.com, www.ofx.com. * indicates incomplete year.

Nordic average comprises average for Danish Krone, Norwegian Kroner & Swedish Krona

Other Central Europe average exchange comprises weighted average exchange for Euro & non-Euro Zone countries



Business Migration


| Summary Estimates & Forecasts of Carton Production, Cartonboard Purchases, & Carton Sales - Main European Regions - 2013, 2018 & 2023 - 000 Tonnes, € Million | | | | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|--------------|------------|------------|
| | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | Vol/Val | % | Vol/Val | % | Vol/Val | % | 13 to 18 | 18 to 23 |
| Cartonboard Purchases - 000 Tonnes | | | | | | | | |
| Western Europe | 4460 | 83.4 | 4831 | 81.4 | 5363 | 80.0 | 1.6 | 2.1 |
| Nordic Region | 166 | 3.1 | 178 | 3.0 | 196 | 2.9 | 1.4 | 1.9 |
| Central Europe | 725 | 13.5 | 925 | 15.6 | 1143 | 17.1 | 5.0 | 4.3 |
| TOTAL | 5351 | 100.0 | 5934 | 100.0 | 6702 | 100.0 | 2.1 | 2.5 |
| Carton Production - 000 Tonnes | | | | | | | | |
| Western Europe | 4241 | 84.0 | 4577 | 82.0 | 5103 | 80.6 | 1.5 | 2.2 |
| Nordic Region | 154 | 3.1 | 165 | 3.0 | 182 | 2.9 | 1.4 | 1.9 |
| Central Europe | 656 | 13.0 | 840 | 15.0 | 1044 | 16.5 | 5.1 | 4.4 |
| TOTAL | 5051 | 100.0 | 5583 | 100.0 | 6329 | 100.0 | 2.0 | 2.5 |
| Carton Sales - € Million | | | | | | | | |
| Western Europe | 8895 | 86.6 | 9311 | 85.1 | 10261 | 83.6 | 0.9 | 2.0 |
| Nordic Region | 344 | 3.4 | 321 | 2.9 | 359 | 2.9 | -1.4 | 2.3 |
| Central Europe | 1028 | 10.0 | 1312 | 12.0 | 1654 | 13.5 | 5.0 | 4.7 |
| TOTAL | 10267 | 100.0 | 10944 | 100.0 | 12274 | 100.0 | 1.3 | 2.3 |

This sub-section contains a summary of business migration from Western to Eastern and Central Europe over the last 5 to 10 years:

- Western Europe has seen growth rates of 1.5% p.a. for output while Central Europe has enjoyed a much more buoyant 5.1% p.a. over the last 5-year period.
- Turkey and Poland's production output have both risen significantly over the last 5 to 10 years.
- Estimates for migration have been as high as 10% of total volumes for the last 5 to 10 years, although much reduced over the last 2 to 3 years.
- Migration has been affecting certain regions more than others (e.g. Switzerland's output has declined heavily, Germany's growth has come to a halt, while Turkey's and Poland's have risen significantly).
- Germany has been the largest affected region by total volume over the 5 to 10-year period, seeing little or no growth in output over the last 5 years, while other countries in Central Europe (e.g. Poland, Hungary, Romania, etc.) have enjoyed significant carton production growth.
- A significant driver for this has been brand owners who have relocated manufacturing sites to locations in the east who want carton production closer to their own manufacturing sites. Around 10 years ago P&G, GSK and Nestlé all moved to the east of Europe but that trend has now all but stopped.
- Business migration was mainly affecting business in the context of price discussions. Eastern European sites were often quoted as part of a commercial negotiation (and less on value of the product and its specifications).
- More capacity has been laid down in Central and Eastern Europe compared to Western Europe, factories are being decommissioned in Western Europe over the last few years (e.g. Netherlands and Germany) as the balance is adjusted.
- With a key focus on speed of supply and JIT deliveries, the trend of shifting volumes to the east from the west has slowed down significantly (2.2% p.a. for Western Europe for output over the next 5 years versus 4.4% p.a. for Central Europe over the same time period).
- Poland has seen significant growth over the last 5 to 8 years; this has slowed down a little. There aren't the huge shifts of volumes anymore. Board Mills note however that growth in Central Europe still remains greater than that of Western Europe, even in the last 12 months.
- Certain end use markets moving production away from Western Europe with new machinery investments in Eastern Europe, Middle East and parts of Africa. In some instances, product moving completely away from any European markets (e.g. certain electronics products, such as some vaping facilities, have now moved to China).

Industry trends

A squeeze on margins, especially over the last 12 to 18 months with raw material cost hikes and only modest success in recovering these increases from customers is increasing business pressure on carton converters.



“Raw material prices have risen steeply over the last 12 to 18 months, and it is very difficult to pass these price increases on to our customers. With multi-national suppliers and pan-European brand owners, converters have to fight hard not to get squeezed in the middle” – (MD, regional carton converter)

Overcapacity in Western Europe has not helped the situation either. The outcome has been:

- More consolidation within the carton converter industry with a list of converter companies up for sale across Western Europe.
- Smaller companies being swallowed up by larger groups.
- A number of bankruptcies expected across several regions of Western Europe.
- Mills approximately 98% full, with converters in several countries experiencing utilisation well below this level.
- Wastage levels rising from 16.5% in 2013 to an average of 17.8% in 2018, despite significant efforts to achieve manufacturing efficiencies through newly introduced continuous improvement and lean techniques.
- Despite volume growing well in 2018, overall margins were eroded.
- Big push to reduce labour costs by increasing automation at carton making factories.
- Deskilling of workforce, mainly due to a switch to more automation (skilled workers retiring).

To mitigate against cost pressures many companies have focussed their efforts on improving their manufacturing processes. In many instances, if investment in new machinery is not an option, a strong focus on continual improvement projects have been undertaken by converters to improve efficiencies and increase line speeds.

| Estimates of Waste % - Analysed by Country - 2018 | |
|---|-------------|
| Country | % |
| Austria | 18.5 |
| Belgium | 18.2 |
| France | 17.1 |
| Germany | 17.1 |
| Italy | 17.4 |
| Netherlands | 17.3 |
| Spain | 17.3 |
| Switzerland | 17.3 |
| Turkey | 21.0 |
| U.K. | 16.8 |
| Other Western Europe | 17.3 |
| Sub-total West Europe | 17.7 |
| Nordic Region | 16.7 |
| Poland | 18.3 |
| Other Central Europe | 18.3 |
| Sub-total Central Europe | 18.3 |
| Total Europe | 17.8 |

Despite efforts to reduce production waste levels, the average across Europe has risen to 17.8%; some converters are achieving levels as low as 10% where run lengths are longer, with others exceeding levels of 20%. The effect of smaller run lengths and increased print numbers has had a negative effect on waste levels over the last 5 years, while continuous improvement projects have helped to counter this trend and bring waste levels down.

Pressure to reduce costs have continued the drive for lightweighting and the reduction in board weights. In addition, more costs saving initiatives have included getting rid of outers where secondary packaging is strong enough to do the job alone. In other instances, then cartons are being replaced with sleeve formats to save more monies on pack costs.

“Brand owners and retailers continue to press for savings, either by traditional commercial measures or by a focus on pack savings through grammage reduction; this is across the whole range of fibreboard packaging from solidboard through cartons to microflute and corrugated” – (MD, Independent regional carton converter)

Where companies have invested in new equipment, it has caused an increased interest by brand owners in those companies. The obvious expectation that new capacity leads to improved efficiencies and therefore to lower prices, is one conclusion; however, feedback also suggests that new investment implies a fresh potential for offering new innovations for customers to try out. This has proven beneficial for some carton converters who have been able to get into new and rewarding new markets.

Some more creative solutions have included former competitors joining forces and forming alliances, a move undertaken as a positive step to gain economies of scale, as well as enabling offering of a wider range of converting finishes, drawing on the collective skills and expertise of the joint ventures.



8. PACK STYLE CHANGE AND INFLUENCES ON PACK SPECIFYING

8.1 Changing carton constructions.

Trend has been for a polarisation in demand; on the one hand an increase in more elaborate carton finishes, designs and increased complexity of print; while on the other hand there has been a focus on simplicity and a more natural look to packs in the wake of a more environmental trend with packaging.

| Prospects for the Main Carton Constructions – Total Europe – 2013, 2018 & 2023 – 000 Tonnes | | | | | | | | |
|---|-------------|--------------|-------------|--------------|-------------|--------------|------------|------------|
| Carton Construction | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | 000 Tonnes | % | 000 Tonnes | % | 000 Tonnes | % | 13 to 18 | 18 to 23 |
| Consumer primary packs | 3127 | 61.9 | 3442 | 61.7 | 3927 | 62.0 | 1.9 | 2.7 |
| Display outers / multi packs | 722 | 14.3 | 816 | 14.6 | 969 | 15.3 | 2.5 | 3.5 |
| Sub-total Cartonboard Packs | 3850 | 76.2 | 4258 | 76.3 | 4896 | 77.4 | 2.0 | 2.8 |
| Litho printed corrugated containers | 1201 | 23.8 | 1324 | 23.7 | 1433 | 22.6 | 2.0 | 1.6 |
| TOTAL | 5051 | 100.0 | 5583 | 100.0 | 6329 | 100.0 | 2.0 | 2.5 |

Primary packs represent the vast majority of pack formats at just under 62%, and along with display outer/multipacks collectively representing over 76% of all pack types.

Carton finishes

- Increase in number of colours for some markets, especially for branded goods owners (rather than for retailers and private label). The need to differentiate brands or products still continues to dominate in all regional markets. Standing out on the shelf and attracting the eye of the consumer, still remains a key role for folding cartons.
- An increase in embellishments such as embossing, cold foiling, hot foil stamping and special varnish effects (and all ideally using recyclable materials and more environmentally friendly applications, where possible). A continued demand for higher gloss effects and a trend for more double coating, especially when competing with plastic applications.
- Innovation in shape and structure is an important part of the appeal offered by folding cartons.

- Innovation in functionality through intelligent or smart packaging (e.g. RFID to communicate with consumers) or barcodes that you can scan and then partake in a competition, packaging that can be turned into a virtual reality game (e.g. on packets of cereals, offering augmented reality games), etc.
- At the same time that more added value finishes are being requested, so too a drive to remove some converting processes or finishes due to cost saving reasons or environmental concerns:
 - Reduction in number of packs with metalised finishes, put under the microscope due to recycling concerns or environmental reasons (e.g. MetPol). Alternative finishes being used (e.g. using Silver-effect inks) to achieve the same look, but offer cost savings, reduced complexity or help towards reducing lead-times.
 - Removal of some finishes (e.g. foil layering inside packs) because no longer needed, due to the possible danger now having gone away (e.g. oil migration concerns).
- Growth of limited list discounters and the general rise in popularity of private label has shown an increased demand for the simplification of carton finishes and an increased pressure on the cost of cartons from this important part of the market.

Trends in print


- With continuous improvements in traditional printing, and a significant improvement in printing capabilities, so lithographic print continues to compete well with other print processes.
- Conventional printing has improved in leaps and bounds due to industry developments in artwork through to plate technology (CTP), enabling converters to compete strongly with digital print processes.
- High printing standards still being demanded in high value-added markets (e.g. premium drinks, pharmaceutical, etc.). General trend for more increased resolution, higher quality print packs, and with an increased number of images contained within them.
- There has been an increased demand for print to offer an even more standout quality on a carton. It is rare to find simple, basic packs in today's market.
- Examples of high definition flexographic reel-fed printing becoming available and adopted for certain market sectors as print quality can reach folding carton market standards and because of its competitive cost effectiveness, reflecting the polarisation of printing on primary packs.
- Requirement for low migration inks has seen regulations increasing and in turn ensured that less regulated converters are unable to compete, especially for food contact applications.
- Increased use of QR codes to help accommodate more and more information.
- Printing of microprocessors onto the cartons as integrated units rather than as separate components (e.g. RFID tags). 2D or 3D barcodes are also growing in popularity as consumers increase their interest in engaging with the packs that they are buying.

- A cost saving drive for using more CMYK rather than specific ink formulations in order to improve efficiencies (less wash down and reduced change over times) due to running with less custom colours - known as GAMIT printing.



Digital print

- Offering opportunities in niche markets like pharmaceuticals with the introduction of sequential numbering, especially for purposes of traceability using unique code on each product (a benefit that digital print has offered) and tamper evidence. Digital print has helped support these important requirements for pack safety.
- Examples of small runs of promotions for as few as 300 packs (e.g. small editions of canned foods, coffee packs, etc.).
- Personalisation is offering an opportunity for printed cartons to be used to connect more intimately with consumers, much as it did for labels a few years back (e.g. Coca-Cola bottle labels with individuals’ names and Absolute Vodka for a similar campaign). Examples with printed cartons have included seasonal events (e.g. festivals or sporting events) but in the main have been more of a gimmick than a real volume opportunity to use print in a new way.
- Good for prototyping and testing concepts before committing to larger production runs.
- Digital print still seems to remain a niche process, with the impact being felt only in a few end use markets (e.g. vaping, chocolate bars, medicines, etc.).
- Breakeven point has not yet been achieved for digital printing however, with a continued reduction in order sizes, digital could well compete as a mainstream print process versus offset litho.



“In some cases, it will not be that easy to transfer from plastics to folding cartons due to inadequate barrier properties, but there is an increasing pressure to find technical solutions to this problem, driven by very high consumer demand”

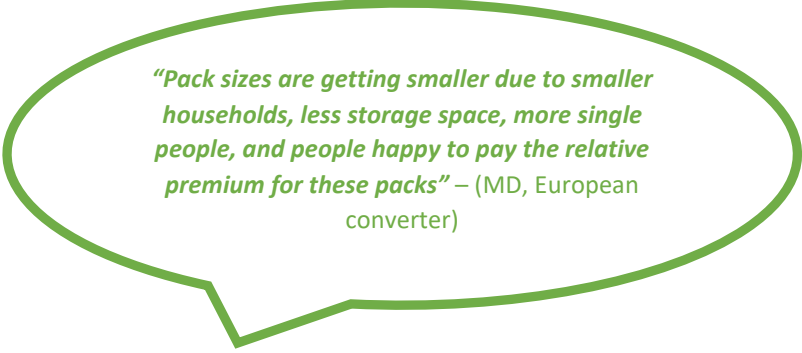
– (MD, European Carton Group)

Barriers and coatings

- Growth in interest in barriers and coatings for food use. Grease and aqueous barriers for liquid and the avoidance of using any form of plastic liner on the inside of the board wherever possible.
- Growth in interest of PLA as a means of enabling folding cartons to offer a solution versus plastics.
- Growth in popularity for dual ovenable trays for ready meals rather than with C-PET trays necessitates good barrier solutions.
- Bio-dispersion for applications is in high demand at present (although this is not necessarily the ideal solution – see section on substitution).
- Board mills have invested in PE coating equipment in the past, but with the plastics directive, this is less likely to happen. Board mills are now actively investigating water-based solutions that can be recycled, composted, etc. Investigations are ongoing, including developments in “Grease”, “Moisture” and “Oxygen” applications, and with a breakthrough using environmentally acceptable solutions expected soon.
- Subject to board mills accepting PE into the waste recycling system then barrier coated options like this could grow.

Pack format and sizes

- “Shrinkflation” has been happening over the last few years – both the pack format and the pack sizes are reducing, driven by consumer lifestyle changes. Smaller packs, smaller volume content, and more of them!
- Retailer’s desire to not increase prices, but to enable increased returns from products that they sell.
- Some instances where secondary packaging is being removed and primary pack bolstered in strength to be both display and shipper.




“Pack sizes are getting smaller due to smaller households, less storage space, more single people, and people happy to pay the relative premium for these packs” – (MD, European converter)

Premiumisation

A recent trend in certain end use markets (includes Drinks, Cosmetics, Beauty and Personal Care) for an upgrading or “Premiumisation” of packs to differentiate brands. This has always been present in traditional markets such as for whisky or champagne, but is now evolving into other end use markets.

Cartons are well regarded at the luxury end of the market (along with tubes and rigid boxes) to raise the profile of premium products. This trend continues to grow despite pervading environmental and sustainability demands from certain consumers, and therefore brand owners are happy to offer mixed materials as they position these premium products to appeal to these discerning consumers in those markets.

A particular cache recently for French products going to the Far Eastern market – anything with “Made in France” attached to it means the Chinese love it and want it!



“Consumers are not entirely consistent with their views or demands. They are really focussed on the environment, but are also asking for new devices on packs to aid convenience; those requests seem to counter each other” – (MD, board mill)

The premium markets include cosmetics (especially perfumes), toiletries, tobacco, electronics, IT components, confectionery, wines and spirits (including whisky, cognac, champagne, etc.), gift packs and a few food products (e.g. exotic fruits or vegetables).



Mayr-Melnhof Karton

8.2 Changing cartonboard yields.

Board grades

- Recent trend showing a move away from recycled board towards virgin board options, despite longer term trend; WLC estimated to have reduced by -11% in 2018 and FBB increased by +8.5% over last 12 to 18 months. Change to virgin boards happening for several reasons:
 - Demand for improved print quality.
 - Better runnability on automated packing equipment.
 - Increased use with food products.
 - Availability of new capacity for virgin board production.
 - Demand for lower basis weights of board.
- Increased demand (initially in German market, but spreading around many other European countries) for more virgin due to the oil migration issue. An increased usage of virgin has occurred over the last few years for this predominantly recycled market.

“Trend has favoured virgin over recycled recently; however, both types are needed and there are no big changes being seen in the relative shares of each, just some small gains” – (MD, European mill group)

A move towards a more natural feel by using more brown material, and offering a more artisan finish that appeals to environmental requests by consumers. This has been happening in various traditional markets (e.g. beverages, dairy, etc.) as well as in the more ethical or aspirational ones too (e.g. health and lifestyle).

- Paper mills offering several choices within virgin board range (e.g. “Kraftback” or “CKB”) to offer more variety and therefore encourage more take up of virgin carton boards.
- Availability of sufficient raw materials is the key issue as demand increases. Forests need to be farmed, and by farming them effectively, this will then provide enough wood to support the growth of virgin raw material for packaging. Scandinavian forests are growing faster than they can be harvested, so the supply of raw pulp is available to meet the growing demand for virgin boards.



“We have seen very nice growth of around +2.5% for virgin and +1.5% for recycled over the last 12 to 18 months. Increased demand for virgin plus higher demand due to price rises has boosted demand” – (MD, European paper mill)

Board availability

- Recycled and Virgin grades have been in short supply over last 18 to 24 months and hence several price increases.
- Recycled materials such as GD2 have been in short supply in 2017 and 2018. There have been no new investments in GD machines for over 20 years.
- Virgin capacity for GC grades came on stream from Finland and Sweden (former fine and graphic paper mills have been converted/upgraded/adapted for supply of carton board materials) giving between 800kt to 950kt of new capacity to the European market, which came on-stream throughout 2018 and into 2019. The GC sector is doing well and growing steadily due to the food-to-go and fast food market, especially the cup stock market.
- Mills went for Price Increases in Germany in 2018. Contrary to efforts, prices remained stable – in some part achieved because both retailers and brand owners got involved in negotiations direct with the board mills.
- GD mills are full and have been for the last 2 to 3 years.
- GC mills have only recently come on stream with new capacity; however, demand is already very strong for this newly available virgin material. Demand for virgin carton board has been boosted due to the recent trend to replace plastic packs with fibre-based solutions.
- China’s “green ban” in 2016 and 2017 had a major impact on world demand for paper. Rather than easing the supply of board, it made things tighter (as the demand for virgin increased).


Other trends around board

- A trend to an increased white look. Demand is for a more expensive, more luxury look that uses more colour and is glossier.
- Demand for even whiter grades than GD2 has seen a rise in demand for GZ board – customers want “perfect looking products”.



“Product managers at brand owners want virgin board as it is whiter. The consumer is demanding this whiter image too” – (SD, Regional converter)

- Growth in demand for FBB (Fully Bleached Board) or other GC grades which offers a greater printing surface. This has been particularly so in markets for luxury goods where the visual impact of a virgin white board is so important.
- Recycled more acceptable for high volume food application, and for where a more rustic appearance might be preferred.
- Virgin is seen as more appealing as less chemicals used in the process of converting trees to board, than the recycling process to turn recovered fibres back into usable board once more.
- Management of the waste stream has become a much more important issue, especially with the restriction of any newspaper waste for making recycled carton board materials, has seen a much tighter focus on recycled waste inputs.



“There is a split in the market for either high quality white board for excellent decorative presentation, or for natural board that emphasises the environmental and natural attributes of carton board” – (SD, Scandinavian Board Mill)


- The importance of ethical sourcing illustrated by demand for FSC and PEFC certification, continues to grow. Both systems are recognised and so too the importance of using board from these certificated sources.
- Mills are very actively investing in new technologies and developing new boards to sell to end users, especially against the backdrop of plastic substitution.



“The efforts by Mills to find viable, new board solutions for producing alternatives to plastic packaging is helping move this opportunity forward at a great pace” – (MD, European converter)


Lightweighting

- Although lightweighting has been actively pursued for nearly 20 years, potentially having run its course, there remains an ongoing drop in basis weights in recent years. Lightweighting continues due to brand owner demands for a drop in material content and lighter weight materials.
- The trend for using lighter grammage boards for litho laminating has also ensured a continued reduction in basis weights too.



“Over the last 10 to 15 years we have seen a reduction in weights of board as stability has increased. A move from 300g to 270g has been typical” – (MD, European converter)

- Trend to going lighter in substance weights, especially for the growing market of fast food containers.
- Switch from recycled to virgin has offered the opportunity to reduce weights relative to performance.



“Trend is for more Msm in the market for less tonnage. Estimated lightweighting runs at overall -3% to -4% over the last 5 years” – (MD, mill group)

- Introduction of new mill capacity for virgin materials over the last 5 years has offered further opportunities for reducing basis weight with the same performance. Further developments are in the pipeline, so more opportunities remain available.



MetsaBoard

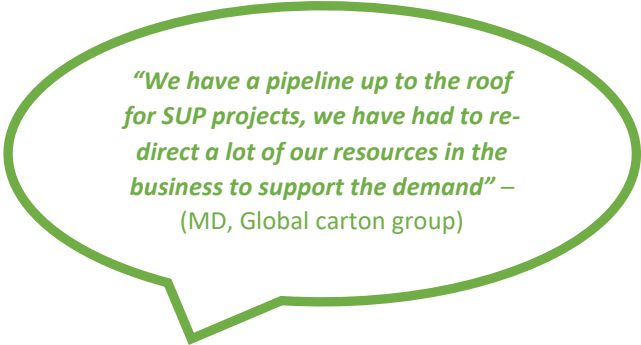
9. THE OPPORTUNITY FOR CARTONS TO REPLACE PLASTIC PACKAGING

9.1 Summary of potential “quick wins” for Cartons.

The thrust of this chapter is to explore the biggest substitution opportunity for folding cartons, namely the replacement of plastics by fibre-based alternatives. The picture had been a very different one in this last report 5 years ago; flexible plastics were on the up and folding cartons had largely been the loser at that time.

What are the opportunities?

- **Low hanging fruit**
 - Where changing from a plastic format to a paper-based format is easy and where such a change has little impact on the operational side of a business such as on existing packing lines, necessitating little or no investment. This is most typically when the product has been hand-packed, and where automation is still relatively low, such as with produce (i.e. Fruit and Vegetables).
 - Pack combinations – where packs can combine board and plastics (if unable to remove all the plastic elements, then striving to minimise the plastic content as much as possible).
 - Where the environmental impact is proving a cause for concern, a change in specifications has to be made – as it is for hot foil applications. Innovative new ideas are having to be found that offer the same premium feel but moves away from environmentally unfriendly processes.
- **On the cusp of changing**
 - New barrier coatings are in development. Many converters are subject to NDAs, but there is significant evidence that a lot of projects are happening in this area and likely to be coming to fruition very soon. Barriers or coatings are being developed for (1) Oxygen, (2) Moisture, or (3) Grease. One solution using Polylactic Acid (PLA) has already been oversubscribed and this product is in short supply.



*“We have a pipeline up to the roof for SUP projects, we have had to re-direct a lot of our resources in the business to support the demand” –
(MD, Global carton group)*

- **Harder ones to crack**

- Ready meals are a “slow burn”; the cost of a plastic tray is approximately half that of a converted carton. This is a significant barrier for a paper-based solution to be able to replace plastic trays. Ready meals, both microwaveable and dual ovenable, represents an attractive option in the medium term but substitution will be influenced by the low cost of existing plastic trays (current cost is approximately 50% of fibre).

“It is a complex decision regarding making changes in the production process. The key factors to consider, especially in the high-volume sectors, are the investment and applications for filling lines required to make the change. High automation at large producers are a barrier to change because of the number of filling lines operated by pan-European brand owners” – (MD, European converter)

Examples of recent changes

- **Beer and soft drinks**

- The Damm Brewery (Spanish Estrella brand) - 6 can die-cut pad for holding 6 bottles or cans of Premium Beers.
- The Rothaus Brewery (German Radler Zäpfle brand) - 6 packs for beer to hold 6 bottles together.
- Diageo - Guinness are substituting current Hi-Cone packs by using multipack for 4 can display.



- **Frozen Foods**

- Solero – compartmentalised Ice Lollies pack that substitutes the plastic wrappers around each of the 5 individual lollies and replaces them with a PE (polyethylene) coated cartonboard material.



- **Chilled Foods**

- M&S Meats – New Halopack board-based MAP capable food tray for chicken.

- **Other Foods**

- Tomato trays - printed Black Ink on inside and then coated twice to be food safe.
- Fruit punnets – part of a range of carton solutions to contain ambient produce, mainly tomatoes, apples and other more exotic fruit and vegetables (e.g. Kiwi Fruit).

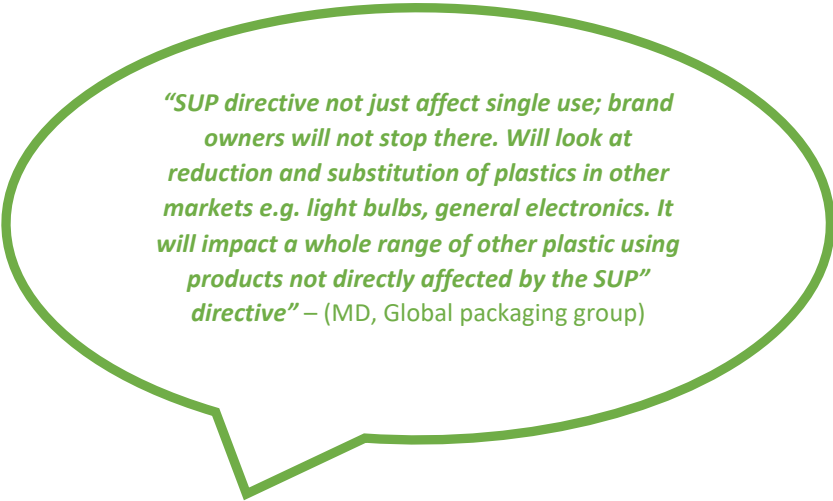


9.2 Commentary on the trends and key drivers that influence this opportunity.

Folding cartons are now poised to benefit from a very different European and global scene, where sustainability now dominates as a mega-trend. The following is our summary of how this opportunity is being perceived and how this trend might benefit folding carton demand against the backdrop of the European plastic directive, consumers wishes for a more circular economy and the drive for substitution:

Legal framework

- SUP directive – new rules from Brussels put into EU law in 2019 abolishing certain single use plastics by 2022/2023.
- A lot of activity around changing pack material composition to enable removal of some (or all) plastic elements. Coatings are being used to enable better presentation or improved product protection to try to match the qualities of plastics.



“SUP directive not just affect single use; brand owners will not stop there. Will look at reduction and substitution of plastics in other markets e.g. light bulbs, general electronics. It will impact a whole range of other plastic using products not directly affected by the SUP” – (MD, Global packaging group)

- An increased focus on plastic to board, or board to plastic and an overall drive for mono-materials.
- A strong drive for removing shrink wrap wherever possible, and a much-reduced confidence by brand owners to use it.
- Plastic tax, recycling regulations, labelling regulations and the latest version of European packaging recycling notes (EPRNs) are all adding to the legal activity around packaging.

Some specifiers are advocating that mono-plastic is a better proposition than a composite carton. The argument for mono-plastic is a dubious one as markets may not accept any plastic solutions at all. The real argument is whether board mills will accept plastic coated fibreboard in the recycled waste stream.

The drivers for change

- The evidence is that there is an overwhelming intention to shift away from plastics and towards fibre-based solutions. The reference to vast numbers of projects with non-disclosure agreements (NDAs) is testimony to the commitment to make changes.
- Speed of change is heavily influenced by cost however, both investment costs and packaging cost, and how fast the key stakeholders can make those changes.
- Producers of cartons, mill owners, brand owners and retailers are all now having to take brave decisions and show boldness on how these additional costs can be allocated or absorbed. A coordinated effort to work together to create viable solutions is most likely to effect the swiftest change.
- Major brand owners like Unilever, Proctor & Gamble, Johnson and Johnson, L’Oreal, etc. and key retailers like Aldi, Carrefour, Boots Alliance, etc. are all searching for ways to make a packaging shift from plastic to fibreboard, and combining this with a more natural look for the packaging as well.



“A lot of the brand owners have aligned goals with the single use plastic directive published by the EU. They are committed to change. Brand equity is being hit by the impact on turtles in the oceans by current systems” – (MD, Global packaging group)



“What is socially acceptable in terms of sustainability is becoming very important. Plastics is starting to become socially unacceptable, a bit like smoking and drink driving became a decade or more ago” – (MD, Independent carton converter)

- Overall, innovative solutions are being actively sought; however, this entails significant investment, commitment to company resources and a lot of development activity.

Barriers and coatings

In order to compete, folding cartons need to be able to tackle and supply solutions that address moisture, grease, oxygen and aqueous needs of the food industry; barrier coatings are required to tackle moisture vapour transmission (MVT).

| Estimates & Forecasts of Folding Carton Primary Pack Output – Total Europe Analysed by Barrier & Non-barrier Applications – 2013, 2018 & 2023 – 000 Tonnes | | | | | | | | |
|--|-------------|--------------|-------------|--------------|-------------|--------------|------------|------------|
| | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| Sector | 000 Tonnes | % | 000 Tonnes | % | 000 Tonnes | % | 13 to 18 | 18 to 23 |
| Barrier | 276 | 5.5 | 439 | 7.9 | 649 | 10.3 | 9.7 | 8.2 |
| Non barrier | 4775 | 94.5 | 5144 | 92.1 | 5680 | 89.7 | 1.5 | 2.0 |
| TOTAL | 5051 | 100.0 | 5583 | 100.0 | 6329 | 100.0 | 2.0 | 2.5 |

NB: Barrier cartons includes cartons produced from coated and laminated cartonboard grades

- Designed to offer solutions for extended shelf life, or for handling wet product such as ready meals or sauces. Replacing the thermoformed plastic tray is a key goal for retailers, brand owners and carton converters alike. Virgin producers are able to offer several innovative options using multi-layer plastic barriers already.
- Likely to see a gradual move away from the fossil fuel-based barriers (e.g. PP, PE, PET, etc.) to more “green” barriers (e.g. using crop based raw materials). Aim is to use new barriers to avoid the need for polycoating.
- Some barriers being offered right now as the ultimate solution which do still use polymers, but at microscopic levels; these use dispersion methods to biodegrade the liners and simply means that microscopic particulates of plastic then end up back in the ecosystem (and gets into our water table and food chain!).

9.3 Market opportunities

There is a growing list of products that could and should benefit from substitution and move away from current plastics-based packaging solutions. The key growth markets are indicated below.

| Estimates & Forecasts of Carton Sales Analysed by Market – Total Europe – 2013, 2018 & 2023 – € Million | | | | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|--------------|------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast cereal products | 485 | 4.7 | 468 | 4.3 | 476 | 3.9 | -0.7 | 0.4 |
| Cakes, biscuits, baked products | 510 | 5.0 | 560 | 5.1 | 637 | 5.2 | 1.9 | 2.6 |
| Chocolate & sugar confectionery | 852 | 8.3 | 885 | 8.1 | 964 | 7.9 | 0.8 | 1.7 |
| Chilled foods | 337 | 3.3 | 402 | 3.7 | 520 | 4.2 | 3.6 | 5.3 |
| Dry beverages | 205 | 2.0 | 228 | 2.1 | 258 | 2.1 | 2.1 | 2.5 |
| Food to go | 300 | 2.9 | 361 | 3.3 | 453 | 3.7 | 3.8 | 4.7 |
| Frozen food | 882 | 8.6 | 983 | 9.0 | 1211 | 9.9 | 2.2 | 4.3 |
| Soft drinks & beer | 510 | 5.0 | 562 | 5.1 | 703 | 5.7 | 2.0 | 4.6 |
| Wines & spirits | 340 | 3.3 | 375 | 3.4 | 437 | 3.6 | 2.0 | 3.1 |
| Other foods | 770 | 7.5 | 861 | 7.9 | 1026 | 8.4 | 2.3 | 3.6 |
| Sub-total Food | 5190 | 50.6 | 5684 | 51.9 | 6684 | 54.5 | 1.8 | 3.3 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | 372 | 3.6 | 293 | 2.7 | 277 | 2.3 | -4.7 | -1.1 |
| Cleaning & laundry products | 348 | 3.4 | 322 | 2.9 | 348 | 2.8 | -1.6 | 1.6 |
| Cosmetics & beauty | 633 | 6.2 | 721 | 6.6 | 833 | 6.8 | 2.7 | 2.9 |
| Misc household products | 399 | 3.9 | 393 | 3.6 | 396 | 3.2 | -0.3 | 0.1 |
| Paper, stationery & related goods | 245 | 2.4 | 249 | 2.3 | 253 | 2.1 | 0.3 | 0.3 |
| Personal care | 336 | 3.3 | 371 | 3.4 | 409 | 3.3 | 2.0 | 2.0 |
| Pharmaceuticals & medical products | 1614 | 15.7 | 1756 | 16.0 | 1898 | 15.5 | 1.7 | 1.6 |
| Other non-foods | 1129 | 11.0 | 1154 | 10.5 | 1176 | 9.6 | 0.4 | 0.4 |
| Sub-total Non-food | 5077 | 49.4 | 5259 | 48.1 | 5590 | 45.5 | 0.7 | 1.2 |
| TOTAL | 10267 | 100.0 | 10944 | 100.0 | 12274 | 100.0 | 1.3 | 2.3 |

NB: 1 Soft drinks & beer includes multipacks

NB: 2 Cigarettes, tobacco & accessories includes vaping & tobacco substitutes

Markets showing strong opportunities – short-term

The key attributes for these short-term changes from single use plastic items to fibre solutions are for products that can be easily switched. They are often for products with a method of packing that is less automated or subject to very lower investment costs to switch to a new packaging format. These 6 end use markets are the ones we believe will develop fastest in the drive to replace plastic packaging:

- **Beer and Soft Drinks**
 - Seen as a significant opportunity for growth of folding carton volumes and the switch out of plastics, due to recent design changes and investment in automation e.g. replacing Hi-Cone with new carton layer pads.
 - Opportunities lie with the 6-pack and 4-pack multi-pack formats too.
- **Frozen Foods**
 - Many, many projects with NDAs here.
 - Innovation and invention of new product are a lifeblood of this market, so new opportunities always happening, and seen as a strong candidate for new pack specifications using less plastics.
 - Already seeing packs that are substituting what were once 100% plastic formats with a carton and plastic combination. This “combination pack format” is proving popular as a compromise while further research is carried out to find a 100% plastic-free solution.
 - Ready meals (see comments in chilled foods, below).
 - Pack changes happening with replacement of lolly wrappers, and with the possible replacement of ice cream tubs.
- **Other Foods**
 - Ambient or fresh fruit and vegetables are seen as a certainty for SUP replacement because they are often hand packed and so enables changes to be made relatively swiftly.
 - Retailers are also removing the loose plastic produce bags that were offered for consumers to use in store and offering paper bags or fibre boxes.
 - Pack changes have already been made with tomatoes. Other pack changes are being seen in more exotic fruits (e.g. Pink Lady Apples and Kiwi fruit).
- **Chilled Foods**
 - In the same light as with “other foods”, so too for chilled foods and especially fruit and vegetables as SUP replacements.
 - Ready meals (both chilled foods and frozen food formats)
 - i. Need a liquid barrier solution for C-Pet trays.
 - ii. Lots of R&D work but not many viable solutions yet (as this report goes to press).
 - iii. Some examples of folding carton trays combined with a thin PE plastic layer, offered as an interim solution to a complete plastic-free pack solution.
 - Change has been happening in both folding carton material and with microflute.

- **Food to go (Fast food or food on the move)**
 - Well developed as a user of fibre solutions and the market is growing well in several regions of Europe (e.g. UK, Netherlands, Germany, etc.).
 - The “fast food” market is already well developed as a substitute for plastics and innovative packs using fibre-board are already well established in this market. This market includes burger boxes, fish & chip boxes, etc.



- Party cutlery is already making the change from plastic to wood-based packaging. This market is one where producers can easily switch back to an old, established format already because manufacturing equipment still in place in many instances.
- The other sub-market of “food-on-the-move” (rather than fast food), where consumers have a more healthier eating approach, is also seeing significant growth (e.g. sandwiches, wraps and pasta meals).
- Pack changes have already happened. Sandwich packs are seeing removal of “window boxes” or acetate windows in food packs as an immediate response to the SUP directive.
- **Cleaning and laundry products**
 - Some markets reverting back to cartons for powder, tablet and sachet versions. Equipment previously used to pack powder has simply been re-instated and production switched back to these production systems.
 - Unlikely to revert to powder in its entirety, and therefore new solutions using cartons (and less plastics) being researched.
 - Examples of bag-in-box packs seen from major brand owners. These packs using a combination of microflute with high quality litho lam graphics are being used to send product direct to the consumer via internet delivery systems.



Forecasts of Incremental Carton Sales Generated By Each Market Ranked by Size of Increment – 2018 to 2023 – € Million

| Country | € M Incr | % |
|------------------------------------|---------------|--------------|
| Frozen food | 228.3 | 17.2 |
| Other foods | 164.9 | 12.4 |
| Pharmaceuticals & medical products | 142.1 | 10.7 |
| Soft drinks & beer | 140.6 | 10.6 |
| Chilled foods | 117.6 | 8.8 |
| Cosmetics & beauty | 112.4 | 8.4 |
| Food to go | 92.4 | 6.9 |
| Chocolate & sugar confectionery | 78.7 | 5.9 |
| Cakes, biscuits, baked products | 76.9 | 5.8 |
| Wines & spirits | 62.0 | 4.7 |
| Personal hygiene | 38.0 | 2.9 |
| Dry beverages | 30.1 | 2.3 |
| Cleaning & laundry products | 26.0 | 2.0 |
| Other non- foods | 22.0 | 1.7 |
| Breakfast cereal products | 8.4 | 0.6 |
| Paper, stationery & related goods | 3.4 | 0.3 |
| Misc household products | 2.8 | 0.2 |
| Cigarettes, tobacco, accessories | -16.3 | -1.2 |
| TOTAL | 1330.5 | 100.0 |

NB: 1 Soft drinks & beer includes multipacks

NB: 2 Cigarettes, tobacco & accessories includes vaping & tobacco substitutes

The above table indicates where a significant part of the growth in substitution will be coming from.

Markets showing good opportunities – medium to longer-term

Other markets have their opportunities to move away from plastics too, however these may prove harder to transfer where plastics is already an established cost leader or because the volumes involved are smaller. For these reasons we feel these EUM opportunities may prove slower to come to fruition:

- **Dry goods**
 - Tea could potentially be taken out of the flexible plastic outer wrap for larger carton designs. Cartons offers greater protection versus plastics, while shape and print can be changed to attract the eye of the consumers.
 - Coatings also being used on these products (e.g. combination packs) as a means to reduce the amount of plastics being used.
- **Other Foods**
 - Dehydrated goods – Soups, Desserts, etc.
 - Dry goods – Pasta, Rice, etc.
- **Cakes, Biscuits & Baked products**
 - Crackers
 - Cookies/Biscuits
 - Doughnuts
- **Breakfast cereals**
- **Chocolate and sugar confectionery**

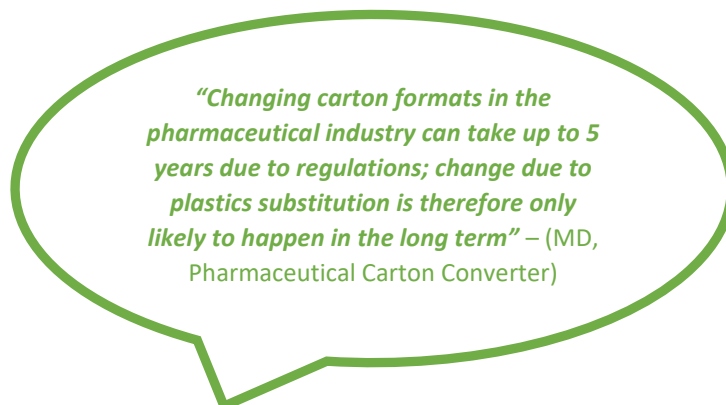
- Premium end
- Switch out of plastic tubs and into folding cartons, maybe?

These are important folding carton markets already. The presence of cartons as an existing solution in these markets means that opportunities will arise here.



Markets showing potential opportunities – the much longer term

- Pharmaceutical
 - Pack formats are fixed so changing formats or specifications is quite hard to achieve due to the approval and certification process that all pack changes have to go through.
 - In some instances, experiments and projects are happening where re-usable plastic solutions are preferred rather than opting for a carton solution.
- Beer & Soft Drinks
 - Substituting PET bottles.
- Cosmetics
 - This market is a luxury market, and (as mentioned in previous comments) unlikely to be pressing for pack changes on environmental grounds.



- Other Foods
 - Snacks – Crisps and Nuts. Very cheap products, and cartons likely to only ever be used for premium priced products in this EUM (e.g. Graze).

Opportunities do exist elsewhere but would need further, in-depth research in order to assess the viability of these products due to the cost differential versus plastics.

9.4 The plastics industry response and developments elsewhere

Response to plastic replacement by other companies or organisations?

- In Germany moves are in place to get a better recycling scheme for plastics.
- In Austria and Germany there are experiments with grass fibres as a folding carton base material. It would be ok for food contact, so could have applications for food service. Trials are at an advanced stage and we may soon see examples in the burger market from several well-known burger makers in Europe. Currently grass is a more expensive material, but does have the benefit that it is seen as trendy by young adult consumers.



Baden Board

- Alternatives to conventional plastics has led to experimentation into materials other than grass; these include bamboo as well as seaweed-based plastics. The increase in experimentation shows the demand that brand owners and retailers are putting on material suppliers, and by the variety of materials being experimented with, that nothing is off the table as a potential new material to be used.
- Increasingly likely that separation will be required by the end consumer, meaning greater hassle in handling packaging waste. May mean an increase in knowledge of different packaging materials required by the end consumer. Likely that this will lead to an increased demand for more mono-material solutions to be made available even more quickly.
- Plastics industry unlikely to simply sit still and do nothing. They will focus their attention on improving the current recycling rates for plastics (very poor at approximately 15% recovery at present). Downstream recycling capabilities will inevitably have to be improved to cope with ever more complex recovery, reuse and recycling needs.
- The guideline of 95:5 is encouraging a drive for more mono material solutions, to help the recycling chain to process more packaging materials. This may end up favouring 100% plastics solutions as a preferred packaging format.

- There is a prevailing consumer trend that portrays plastics as the villains. There is also a lobby saying that “too much forest is being destroyed” and the consumer is now pressing for “less packaging” whatever the base substrate.
- There is an increased dialogue by retailers and brand owners directly with the board mills. This has developed due to the increased focus on SUP and the need to find environmentally friendly and consumer acceptable solutions.

*“The hype around switching away from plastics is ahead of what is actually happening on the ground” –
(MD, European Converter)*

- Despite the SUP directive it is evident that plastics will still have their place. Flexible plastics are still replacing other packaging products due to their cost advantage. Plastics, especially flexible plastics will still be a preferred option versus folding cartons on those lower cost items (e.g. snacks).
- 100% fibre is the ideal solution but not yet practicable. The key question is “can the combination pack be viable”?



10. COUNTRY PROSPECTS

10.1 Relationship between GDP/consumers' expenditure indices and carton production in each country.

In chapter 6 we have referred to this subject in some detail, including our ongoing provision of data for the ECMA quarterly bulletin. The following table shows carton output for Europe as a total and compares this with the numerical trends indicated in our composite index. Note the correlation with carton output for the last 5 years (at 2.0% p.a.) tracks closely with the composite index (at 2.2% p.a.).

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - All Countries – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|--|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 5351 | 0.3 | 100 | 5051 | 0.5 | 100 | 100.0 | 10267 | 0.8 | 100 |
| 2014 | 5472 | 2.3 | 102 | 5155 | 2.1 | 102 | 101.9 | 10285 | 0.2 | 100 |
| 2015 | 5593 | 2.2 | 105 | 5292 | 2.7 | 105 | 104.2 | 10722 | 4.2 | 104 |
| 2016 | 5616 | 0.4 | 105 | 5321 | 0.5 | 105 | 106.4 | 10545 | -1.7 | 103 |
| 2017 | 5846 | 4.1 | 109 | 5518 | 3.7 | 109 | 109.4 | 10877 | 3.2 | 106 |
| 2018 | 5934 | 1.5 | 111 | 5583 | 1.2 | 111 | 111.5 | 10944 | 0.6 | 107 |
| 2019 | 6053 | 2.0 | 113 | 5699 | 2.1 | 113 | 112.8 | 11136 | 1.8 | 108 |
| 2020 | 6215 | 2.7 | 116 | 5855 | 2.7 | 116 | 114.7 | 11404 | 2.4 | 111 |
| 2021 | 6370 | 2.5 | 119 | 6007 | 2.6 | 119 | 116.7 | 11682 | 2.4 | 114 |
| 2022 | 6530 | 2.5 | 122 | 6162 | 2.6 | 122 | 118.7 | 11968 | 2.4 | 117 |
| 2023 | 6702 | 2.6 | 125 | 6329 | 2.7 | 125 | 120.8 | 12274 | 2.6 | 120 |
| Average % p.a.13 to 18 | 2.1 | | | 2.0 | | | 2.2 | 1.3 | | |
| Average % p.a. 18 to 23 | 2.5 | | | 2.5 | | | 1.6 | 2.3 | | |

The overall growth for carton output for Europe over the next 5 years diverges from the composite index, with carton output growing at 2.5% p.a. versus the composite index at 1.6% p.a., reflecting the situation that cartons find as folding cartons progressively substitute plastic packs.

The composite index therefore remains a great “bellwether” (or predictor of trends) to track the effect of substitution away from plastics and into carton output over the next 5 years.

10.2 Forecasts of carton production by country.

The following tables have the same layout as above, with our composite index included in each table to enable easy comparisons at country level. This detail should help track carton output at a country level as well.

Germany

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Germany – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|--|-----------------------|--------|--------------|---------------|--------|--------------|-----------------|--------------|--------|--------------|
| Year | Cartonboard Purchases | | | Carton Output | | | Composite Index | Carton Sales | | |
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | | €M | % p.a. | Index 13=100 |
| 2013 | 1118 | -1.0 | 100.0 | 1035 | -0.9 | 100.0 | 100.0 | 2111 | -0.6 | 100.0 |
| 2014 | 1103 | -1.4 | 98.6 | 1021 | -1.3 | 98.7 | 101.9 | 2111 | 0.0 | 100.0 |
| 2015 | 1127 | 2.2 | 100.8 | 1045 | 2.3 | 101.0 | 103.8 | 2096 | -0.7 | 99.3 |
| 2016 | 1104 | -2.0 | 98.8 | 1025 | -1.9 | 99.1 | 106.1 | 2048 | -2.3 | 97.0 |
| 2017 | 1122 | 1.6 | 100.3 | 1042 | 1.7 | 100.7 | 108.5 | 2091 | 2.1 | 99.1 |
| 2018 | 1148 | 2.3 | 102.6 | 1059 | 1.6 | 102.3 | 109.9 | 2100 | 0.4 | 99.4 |
| 2019 | 1152 | 0.3 | 103.0 | 1064 | 0.4 | 102.8 | 110.7 | 2083 | -0.8 | 98.7 |
| 2020 | 1165 | 1.1 | 104.1 | 1077 | 1.2 | 104.0 | 112.2 | 2088 | 0.2 | 98.9 |
| 2021 | 1181 | 1.4 | 105.6 | 1093 | 1.5 | 105.6 | 113.7 | 2115 | 1.3 | 100.2 |
| 2022 | 1197 | 1.3 | 107.0 | 1108 | 1.4 | 107.1 | 115.2 | 2141 | 1.2 | 101.4 |
| 2023 | 1215 | 1.5 | 108.7 | 1127 | 1.6 | 108.9 | 116.7 | 2172 | 1.4 | 102.9 |
| Average % p.a. 13 to 18 | 0.5 | | | 0.5 | | | 1.9 | -0.1 | | |
| Average % p.a. 18 to 23 | 1.1 | | | 1.2 | | | 1.2 | 0.7 | | |

NB: Forecast downgraded due to relocation of business to Poland and general downturn

The main market to suffer as a result of business migration. The last 5 years have seen virtually no growth (0.5% p.a.) for folding carton output for this regional market. This low growth rate is largely down to the proximity of low-cost producer countries such as Poland (and other central European countries - see "Poland" for commentary on growth rates over this same period).

New laws being introduced regarding waste disposal legislation for Germany, favouring mono-materials over multi-material will have an impact on this market. Increased disposal costs will also be introduced to encourage the use of mono-materials and may favour cartons.

Growth rates are predicted to improve at 1.2% p.a. for the next 5 years with West to East migration slowing and the beneficial effect of plastics substitution taking an increasing effect on carton output.

Italy

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Italy – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|--|-----------------------|--------|-----------------|---------------|--------|-----------------|------------------------|--------------|--------|-----------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 578 | -0.9 | 100.0 | 589 | -0.8 | 100.0 | 100.0 | 1163 | -0.3 | 100.0 |
| 2014 | 606 | 4.9 | 104.9 | 618 | 4.9 | 104.9 | 100.1 | 1198 | 3.0 | 103.0 |
| 2015 | 633 | 4.5 | 109.6 | 646 | 4.5 | 109.6 | 101.0 | 1240 | 3.5 | 106.6 |
| 2016 | 637 | 0.7 | 110.4 | 650 | 0.7 | 110.3 | 102.0 | 1245 | 0.4 | 107.1 |
| 2017 | 649 | 1.9 | 112.4 | 662 | 1.9 | 112.4 | 103.6 | 1282 | 3.0 | 110.3 |
| 2018 | 655 | 0.9 | 113.4 | 668 | 0.9 | 113.4 | 104.4 | 1327 | 3.5 | 114.1 |
| 2019 | 660 | 0.7 | 114.2 | 674 | 0.8 | 114.4 | 104.5 | 1338 | 0.8 | 115.1 |
| 2020 | 668 | 1.3 | 115.7 | 683 | 1.4 | 116.0 | 105.3 | 1357 | 1.4 | 116.7 |
| 2021 | 677 | 1.2 | 117.2 | 692 | 1.3 | 117.5 | 106.0 | 1375 | 1.3 | 118.2 |
| 2022 | 685 | 1.3 | 118.7 | 702 | 1.4 | 119.2 | 106.7 | 1394 | 1.4 | 119.9 |
| 2023 | 694 | 1.3 | 120.2 | 712 | 1.4 | 120.8 | 107.4 | 1413 | 1.4 | 121.5 |
| Average % p.a. 13 to 18 | 2.5 | | | 2.6 | | | 0.9 | 2.7 | | |
| Average % p.a. 18 to 23 | 1.2 | | | 1.3 | | | 0.6 | 1.3 | | |

Very different market to the others making up the “Top 5”. Growth rates have been above the average for Europe at 2.6% p.a. for the last 5 years (and well above the composite index for the same period).

Future prospects are looking slightly less positive, for the following reasons:

- Political and economic situation in Italy quite changeable especially with the introduction of a new government. High interest rates putting a hold on investments and affecting growth.
- EU policy seen as causing trading problems for Italy, leading to high unemployment and very little investment in recent years.
- Market is characterised by SMEs and family businesses. Not much “Food-on-the-Go” as consumers like to cook their own meals more than in other European countries. A small trend to a more convenience style of living is being seen with young Italian city workers.
- Brand owners are suffering losses to the growth of private label.

Prospects suggest a much lower growth rate of 1.3% p.a. for the next 5 years (but still above the composite index).

UK

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - UK – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 605 | -1.5 | 100.0 | 586 | -1.1 | 100.0 | 100.0 | 1279 | 6.5 | 100.0 |
| 2014 | 607 | 0.2 | 100.2 | 587 | 0.2 | 100.2 | 103.2 | 1240 | -3.0 | 97.0 |
| 2015 | 607 | 0.0 | 100.2 | 593 | 1.0 | 101.3 | 105.5 | 1521 | 22.7 | 119.0 |
| 2016 | 605 | -0.3 | 100.0 | 582 | -1.9 | 99.4 | 107.4 | 1313 | -13.7 | 102.7 |
| 2017 | 654 | 8.1 | 108.1 | 606 | 4.1 | 103.5 | 109.3 | 1317 | 0.4 | 103.0 |
| 2018 | 670 | 2.5 | 110.8 | 621 | 2.5 | 106.0 | 110.9 | 1322 | 0.3 | 103.4 |
| 2019 | 682 | 1.8 | 112.8 | 633 | 1.9 | 108.0 | 112.3 | 1351 | 2.2 | 105.7 |
| 2020 | 696 | 2.0 | 115.0 | 646 | 2.1 | 110.3 | 114.0 | 1383 | 2.4 | 108.1 |
| 2021 | 710 | 2.1 | 117.4 | 660 | 2.2 | 112.7 | 115.7 | 1417 | 2.5 | 110.8 |
| 2022 | 725 | 2.1 | 119.8 | 675 | 2.2 | 115.2 | 117.6 | 1453 | 2.5 | 113.6 |
| 2023 | 741 | 2.1 | 122.4 | 690 | 2.2 | 117.7 | 119.5 | 1489 | 2.5 | 116.5 |
| Average % p.a. 13 to 18 | 2.1 | | | 1.2 | | | 2.1 | 0.7 | | |
| Average % p.a. 18 to 23 | 2.0 | | | 2.1 | | | 1.5 | 2.4 | | |

Prospects have been dominated by Brexit for the last 12 to 18 months; monthly output numbers have been very unpredictable during this period. Production output dropped in 2016 reflecting brand owner volumes dropping and a subsequent carton factory closure in south wales. Average growth rate at 1.2% p.a. for the last 5 years has been below the European average (and behind the composite index for the same period).

A lower sales value growth versus output. Reasons include:

- Recent price increases for virgin paper stock (average of +5%) saw a move over to recycled to mitigate cost increases.
- More recycled vs virgin in last 12 months due to oil migration legislation not happening now.
- Move away from Metallised Polyester (MetPol) for environmental reasons has also contributed to a reduced sales value.
- Parity differences in exchange rates have affected sales value, pricing and purchasing costs.

Growth is looking slightly better at 2.1% p.a. for the next 5 years; the prospects for the next 12 to 18 months are looking very unpredictable for the same political and economic reasons as for the last 12 to 18 months, namely Brexit.

France

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - France – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|-----------------|---------------|--------|-----------------|------------------------|--------------|--------|-----------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 542 | 1.9 | 100.0 | 520 | 2.0 | 100.0 | 100.0 | 1237 | 2.5 | 100.0 |
| 2014 | 539 | -0.5 | 99.5 | 517 | -0.5 | 99.5 | 100.6 | 1237 | 0.0 | 100.0 |
| 2015 | 544 | 1.0 | 100.5 | 522 | 1.0 | 100.5 | 101.6 | 1243 | 0.5 | 100.5 |
| 2016 | 550 | 1.0 | 101.5 | 528 | 1.0 | 101.5 | 102.7 | 1256 | 1.0 | 101.5 |
| 2017 | 556 | 1.1 | 102.6 | 533 | 1.1 | 102.6 | 104.8 | 1275 | 1.5 | 103.1 |
| 2018 | 558 | 0.4 | 103.0 | 536 | 0.5 | 103.1 | 106.2 | 1281 | 0.5 | 103.6 |
| 2019 | 565 | 1.3 | 104.3 | 543 | 1.4 | 104.5 | 107.4 | 1300 | 1.4 | 105.1 |
| 2020 | 578 | 2.3 | 106.8 | 557 | 2.4 | 107.1 | 108.8 | 1331 | 2.4 | 107.6 |
| 2021 | 589 | 1.8 | 108.7 | 567 | 1.9 | 109.1 | 110.2 | 1357 | 1.9 | 109.7 |
| 2022 | 600 | 1.8 | 110.7 | 578 | 1.9 | 111.2 | 111.6 | 1383 | 1.9 | 111.8 |
| 2023 | 610 | 1.8 | 112.7 | 589 | 1.9 | 113.4 | 113.1 | 1409 | 1.9 | 113.9 |
| Average % p.a. 13 to 18 | 0.6 | | | 0.6 | | | 1.2 | 0.7 | | |
| Average % p.a. 18 to 23 | 1.8 | | | 1.9 | | | 1.3 | 1.9 | | |

Market growth has been very low at only 0.6% p.a. for the last 5 years (and well behind the composite index at 1.2% p.a.).

It is hard to predict what the next 5 years might bring, largely because the country has been in a state of flux in key markets. The trend suggests a more optimistic 1.9% p.a. with the expectation that substitution of plastics will have the same positive effect for this country's carton output over the next 5 years.

Turkey

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Turkey – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|-----------------|---------------|--------|-----------------|------------------------|--------------|--------|-----------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 408 | 8.9 | 100.0 | 382 | 8.9 | 100.0 | 100.0 | 650 | 4.8 | 100.0 |
| 2014 | 500 | 22.4 | 122.4 | 450 | 17.7 | 117.7 | 103.9 | 675 | 3.8 | 103.8 |
| 2015 | 512 | 2.4 | 125.4 | 473 | 5.1 | 123.7 | 109.3 | 696 | 3.1 | 107.1 |
| 2016 | 515 | 0.6 | 126.1 | 490 | 3.6 | 128.2 | 112.4 | 735 | 5.6 | 113.1 |
| 2017 | 599 | 16.3 | 146.7 | 573 | 16.9 | 149.9 | 119.6 | 859 | 16.9 | 132.2 |
| 2018 | 561 | -6.3 | 137.4 | 525 | -8.4 | 137.3 | 121.8 | 761 | -11.4 | 117.1 |
| 2019 | 575 | 2.4 | 140.7 | 538 | 2.5 | 140.7 | 118.8 | 783 | 2.9 | 120.5 |
| 2020 | 619 | 7.6 | 151.5 | 580 | 7.7 | 151.6 | 122.1 | 847 | 8.1 | 130.3 |
| 2021 | 659 | 6.5 | 161.3 | 618 | 6.6 | 161.6 | 126.0 | 906 | 7.0 | 139.4 |
| 2022 | 702 | 6.5 | 171.8 | 659 | 6.6 | 172.3 | 130.0 | 969 | 7.0 | 149.1 |
| 2023 | 750 | 6.9 | 183.7 | 705 | 7.0 | 184.4 | 134.7 | 1041 | 7.4 | 160.2 |
| Average % p.a. 13 to 18 | 6.6 | | | 6.5 | | | 4.0 | 3.2 | | |
| Average % p.a. 18 to 23 | 6.0 | | | 6.1 | | | 2.0 | 6.5 | | |

Growth rates have been significantly above those of Western European carton producing countries at 6.5% p.a. over the last 5 years. Significant investments in both carton converting and paper making equipment have been happening over the last 2 or 3 years to increase production capacity.

The Turkish carton market has been affected by rampant inflation and currency parity changes; as a result, there was a heavy fall back in output in late 2017 and through 2018. Growth is predicted to spring back over 2019 and consequently prospects look much better than they did in 2018. Forecasters suggest recovery may take until 2021 to return to the growth levels of pre-2017. We predict overall growth will still remain strong at 6.1% p.a. for the next 5 years.

Litho Lam is a very important sector of the folding carton market for this country, especially for exports. Lamination with liner board on microflute corrugated is developing well. Initially success has been driven by consumer trends with food products, but also now developing due to the growth of eCommerce and internet packaging requirements.

Poland

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Poland – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|-----------------|---------------|--------|-----------------|------------------------|--------------|--------|-----------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 415 | 1.6 | 100.0 | 375 | 1.7 | 100.0 | 100.0 | 588 | 1.7 | 100.0 |
| 2014 | 434 | 4.7 | 104.7 | 393 | 4.8 | 104.8 | 103.1 | 619 | 5.3 | 105.3 |
| 2015 | 458 | 5.5 | 110.4 | 415 | 5.6 | 110.6 | 106.8 | 656 | 5.9 | 111.6 |
| 2016 | 480 | 4.9 | 115.8 | 436 | 5.0 | 116.1 | 110.2 | 662 | 0.9 | 112.6 |
| 2017 | 514 | 7.1 | 124.1 | 467 | 7.2 | 124.5 | 115.4 | 730 | 10.2 | 124.1 |
| 2018 | 550 | 7.0 | 132.7 | 500 | 7.1 | 133.3 | 120.6 | 783 | 7.2 | 133.1 |
| 2019 | 587 | 6.6 | 141.4 | 533 | 6.7 | 142.2 | 125.5 | 837 | 7.0 | 142.4 |
| 2020 | 617 | 5.1 | 148.7 | 561 | 5.2 | 149.7 | 129.4 | 883 | 5.5 | 150.2 |
| 2021 | 645 | 4.6 | 155.5 | 587 | 4.7 | 156.7 | 132.9 | 927 | 5.0 | 157.7 |
| 2022 | 674 | 4.5 | 162.5 | 615 | 4.6 | 163.9 | 136.5 | 973 | 4.9 | 165.5 |
| 2023 | 706 | 4.7 | 170.1 | 644 | 4.8 | 171.7 | 140.4 | 1023 | 5.1 | 173.9 |
| Average % p.a. 13 to 18 | 5.8 | | | 5.9 | | | 3.8 | 5.9 | | |
| Average % p.a. 18 to 23 | 5.1 | | | 5.2 | | | 3.1 | 5.5 | | |

A significant beneficiary of the migration of production from west to east. Growth rates have been very high in recent years; carton output has grown on average by 5.9% p.a. over the last 5 years. At the same time, its close neighbour Germany has suffered with little or no growth in carton output.

500kt is our best estimate for the size of the Polish market in the absence of records for this significant and growing market. At 500kt, this country represents the 6th largest producer of cartons of those countries monitored in this report.

Growth rates for the next 5 years look buoyant, albeit a slightly slower 5.2% p.a., however at a rate that exceeds that of the country composite index, reflecting the ongoing effect of carton migration plus some plastics substitution within this market.

Spain & Portugal

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Spain – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|--|-----------------------|--------|-----------------|---------------|--------|-----------------|------------------------|--------------|--------|-----------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 340 | -1.3 | 100.0 | 320 | -1.2 | 100.0 | 100.0 | 670 | -0.9 | 100.0 |
| 2014 | 344 | 1.3 | 101.3 | 325 | 1.4 | 101.4 | 101.3 | 665 | -0.7 | 99.3 |
| 2015 | 356 | 3.5 | 104.8 | 336 | 3.5 | 104.9 | 104.6 | 677 | 1.8 | 101.1 |
| 2016 | 363 | 2.0 | 106.9 | 342 | 1.9 | 107.0 | 107.9 | 695 | 2.7 | 103.8 |
| 2017 | 375 | 3.3 | 110.4 | 352 | 2.8 | 110.0 | 111.0 | 715 | 2.9 | 106.7 |
| 2018 | 386 | 2.9 | 113.7 | 362 | 2.8 | 113.1 | 113.7 | 737 | 3.1 | 110.1 |
| 2019 | 399 | 3.3 | 117.4 | 374 | 3.4 | 117.0 | 116.4 | 765 | 3.7 | 114.2 |
| 2020 | 408 | 2.3 | 120.2 | 383 | 2.4 | 119.8 | 118.7 | 786 | 2.7 | 117.3 |
| 2021 | 417 | 2.2 | 122.8 | 392 | 2.3 | 122.5 | 120.9 | 806 | 2.6 | 120.3 |
| 2022 | 426 | 2.1 | 125.3 | 401 | 2.2 | 125.2 | 123.0 | 826 | 2.5 | 123.3 |
| 2023 | 434 | 2.1 | 127.9 | 409 | 2.2 | 127.9 | 125.2 | 846 | 2.5 | 126.3 |
| Average % p.a. 13 to 18 | 2.6 | | | 2.5 | | | 2.6 | 1.9 | | |
| Average % p.a. 18 to 23 | 2.4 | | | 2.5 | | | 1.9 | 2.8 | | |

Buoyant prospects for the Spanish and Portuguese markets, with 10 years of investment since the crash of 2009 and a developing export market. Growth rates at 2.5% p.a. are well above overall growth rates for all the other western European economies at 1.5% p.a. for the last 5 years.

Future growth prospect continues at a healthy level of 2.5% p.a. and above the overall average for Western Europe of 2.2% p.a. This growth rate is exactly in line with the total average for all countries covered in this report.

Netherlands

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Netherlands – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|--|-----------------------|--------|-----------------|---------------|--------|-----------------|------------------------|--------------|--------|-----------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 283 | 0.2 | 100.0 | 263 | 0.3 | 100.0 | 100.0 | 536 | 0.0 | 100.0 |
| 2014 | 285 | 0.8 | 100.8 | 265 | 0.8 | 100.8 | 101.3 | 542 | 1.1 | 101.1 |
| 2015 | 288 | 1.1 | 101.9 | 270 | 1.9 | 102.7 | 103.2 | 553 | 2.0 | 103.2 |
| 2016 | 288 | -0.1 | 101.7 | 270 | 0.0 | 102.7 | 105.4 | 554 | 0.1 | 103.3 |
| 2017 | 270 | -6.1 | 95.5 | 254 | -5.9 | 96.6 | 108.4 | 526 | -5.0 | 98.1 |
| 2018 | 277 | 2.4 | 97.8 | 260 | 2.4 | 98.9 | 111.1 | 553 | 5.1 | 103.2 |
| 2019 | 284 | 2.8 | 100.6 | 268 | 2.9 | 101.8 | 112.9 | 570 | 3.0 | 106.3 |
| 2020 | 294 | 3.2 | 103.8 | 277 | 3.3 | 105.2 | 114.7 | 589 | 3.4 | 109.9 |
| 2021 | 300 | 2.3 | 106.2 | 283 | 2.4 | 107.7 | 116.4 | 604 | 2.5 | 112.6 |
| 2022 | 307 | 2.3 | 108.6 | 290 | 2.4 | 110.3 | 118.1 | 619 | 2.5 | 115.5 |
| 2023 | 314 | 2.2 | 111.0 | 297 | 2.3 | 112.8 | 119.8 | 634 | 2.4 | 118.3 |
| Average % p.a. 13 to 18 | -0.4 | | | -0.2 | | | 2.1 | 0.6 | | |
| Average % p.a. 18 to 23 | 2.6 | | | 2.7 | | | 1.5 | 2.8 | | |

NB: For 2016 to 2018 adjustments were made to data to allow for the closure if a plant in Eindhoven reduced output to another plant in Bergen op Zoom

One of the countries that has also suffered volume losses due to the migration of production from West to East; a major factory closure in Eindhoven, and the loss of tobacco end use market in Europe has seen the remaining tobacco specialist reduce their output significantly. This showed in the newly revised output figure for the last 5 years of -0.2% p.a.

Prospects look more optimistic for the next 5 years at 2.7% p.a., above the average for Western Europe at 2.2% p.a.

Western vs Central Europe

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Total Western Europe – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 4460 | 0.2 | 100.0 | 4241 | 0.4 | 100.0 | 100.0 | 8895 | 0.9 | 100.0 |
| 2014 | 4551 | 2.0 | 102.0 | 4317 | 1.8 | 101.8 | 101.7 | 8882 | -0.1 | 99.9 |
| 2015 | 4632 | 1.8 | 103.9 | 4418 | 2.3 | 104.2 | 103.8 | 9273 | 4.4 | 104.3 |
| 2016 | 4619 | -0.3 | 103.6 | 4413 | -0.1 | 104.0 | 105.8 | 9074 | -2.2 | 102.0 |
| 2017 | 4795 | 3.8 | 107.5 | 4561 | 3.3 | 107.5 | 108.5 | 9307 | 2.6 | 104.6 |
| 2018 | 4831 | 0.8 | 108.3 | 4577 | 0.4 | 107.9 | 110.2 | 9311 | 0.0 | 104.7 |
| 2019 | 4899 | 1.4 | 109.8 | 4645 | 1.5 | 109.5 | 111.0 | 9422 | 1.2 | 105.9 |
| 2020 | 5015 | 2.4 | 112.4 | 4760 | 2.5 | 112.2 | 112.7 | 9617 | 2.1 | 108.1 |
| 2021 | 5126 | 2.2 | 114.9 | 4869 | 2.3 | 114.8 | 114.5 | 9823 | 2.1 | 110.4 |
| 2022 | 5240 | 2.2 | 117.5 | 4982 | 2.3 | 117.5 | 116.2 | 10034 | 2.2 | 112.8 |
| 2023 | 5363 | 2.4 | 120.2 | 5103 | 2.4 | 120.3 | 118.1 | 10261 | 2.3 | 115.4 |
| Average % p.a. 13 to 18 | 1.6 | | | 1.5 | | | 2.0 | 0.9 | | |
| Average % p.a. 18 to 23 | 2.1 | | | 2.2 | | | 1.4 | 2.0 | | |



| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Total Central Europe – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 725 | 1.2 | 100.0 | 656 | 1.3 | 100.0 | 100.0 | 1028 | 0.8 | 100.0 |
| 2014 | 754 | 4.0 | 104.0 | 682 | 4.1 | 104.1 | 103.0 | 1065 | 3.6 | 103.6 |
| 2015 | 790 | 4.8 | 109.0 | 716 | 4.9 | 109.2 | 106.9 | 1121 | 5.3 | 109.1 |
| 2016 | 824 | 4.4 | 113.7 | 747 | 4.5 | 114.0 | 110.7 | 1146 | 2.2 | 111.5 |
| 2017 | 875 | 6.2 | 120.8 | 795 | 6.3 | 121.2 | 116.1 | 1241 | 8.3 | 120.7 |
| 2018 | 925 | 5.6 | 127.5 | 840 | 5.7 | 128.2 | 120.8 | 1312 | 5.8 | 127.6 |
| 2019 | 974 | 5.3 | 134.4 | 886 | 5.4 | 135.1 | 124.9 | 1387 | 5.7 | 135.0 |
| 2020 | 1016 | 4.3 | 140.2 | 925 | 4.4 | 141.1 | 128.5 | 1453 | 4.7 | 141.4 |
| 2021 | 1057 | 4.0 | 145.8 | 963 | 4.1 | 146.9 | 132.0 | 1518 | 4.4 | 147.6 |
| 2022 | 1099 | 3.9 | 151.6 | 1002 | 4.0 | 152.9 | 135.5 | 1583 | 4.3 | 154.0 |
| 2023 | 1143 | 4.1 | 157.7 | 1044 | 4.2 | 159.2 | 139.2 | 1654 | 4.5 | 160.9 |
| Average % p.a. 13 to 18 | 5.0 | | | 5.1 | | | 3.8 | 5.0 | | |
| Average % p.a. 18 to 23 | 4.3 | | | 4.4 | | | 2.9 | 4.7 | | |

Overall production growth for Western Europe has been 1.5% p.a. for the last 5 years. This compared to Central European countries as a whole at 5.1% p.a.

The next 5 years suggest Western Europe will increase production output to 2.2% p.a., while Central Europe will still be well ahead at 4.4% p.a.

Central Europe now experiencing significant wage growth, eroding some of the competitive edge enjoyed by these economies. A switch to greater automation now being seen as major brand owners and packaging companies invest in equipment in the region.

11. END USE MARKET PROSPECTS

11.1 Commentary on end use trends and developments

The table below indicates carton output, sales value and value per tonnes of each of the 18 end use markets under review in this report:

| Estimates of Carton Sales Analysed by Market – Total Europe – 2018 – 000 Tonnes, € Million, € per Tonne | | | | | |
|---|-------------|--------------|--------------|--------------|-------------|
| Sector | 000 Tonnes | % | € M | % | € per Tonne |
| Food | | | | | |
| Breakfast cereal products | 276 | 4.9 | 468 | 4.3 | 1696 |
| Cakes, biscuits, baked products | 382 | 6.8 | 560 | 5.1 | 1468 |
| Chocolate & sugar confectionery | 454 | 8.1 | 885 | 8.1 | 1947 |
| Chilled foods | 256 | 4.6 | 402 | 3.7 | 1573 |
| Dry beverages | 145 | 2.6 | 228 | 2.1 | 1572 |
| Food to go | 214 | 3.8 | 361 | 3.3 | 1686 |
| Frozen food | 637 | 11.4 | 983 | 9.0 | 1543 |
| Soft drinks & beer | 292 | 5.2 | 562 | 5.1 | 1928 |
| Wines & spirits | 191 | 3.4 | 375 | 3.4 | 1966 |
| Other foods | 511 | 9.2 | 861 | 7.9 | 1686 |
| Sub-total Food | 3356 | 60.1 | 5684 | 51.9 | 1694 |
| Non-Food | | | | | |
| Cigarettes, tobacco, accessories | 181 | 3.2 | 293 | 2.7 | 1623 |
| Cleaning & laundry products | 219 | 3.9 | 322 | 2.9 | 1472 |
| Cosmetics & beauty | 235 | 4.2 | 721 | 6.6 | 3068 |
| Misc household products | 212 | 3.8 | 393 | 3.6 | 1854 |
| Paper, stationery & related goods | 122 | 2.2 | 249 | 2.3 | 2040 |
| Personal care | 166 | 3.0 | 371 | 3.4 | 2238 |
| Pharmaceuticals & medical products | 589 | 10.6 | 1756 | 16.0 | 2980 |
| Other non-foods | 503 | 9.0 | 1154 | 10.5 | 2295 |
| Sub-total Non-food | 2226 | 39.9 | 5259 | 48.1 | 2362 |
| TOTAL | 5583 | 100.0 | 10944 | 100.0 | 1960 |

NB: 1 Soft drinks & beer includes multipacks

NB: 2 Cigarettes, tobacco & accessories includes vaping & tobacco substitutes

The end use markets differ from previous ECP reports. We have available a table using the original end use market data set should readers wish to compare “like with like” for past reports. For more information, please make contact with the team at NOA using the address at the end of this report.

The table below indicates trends in these 18 end use markets:

| Estimates & Forecasts of Carton Sales Analysed by Market – Total Europe – 2013, 2018 & 2023 – € Million | | | | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|--------------|------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast cereal products | 485 | 4.7 | 468 | 4.3 | 476 | 3.9 | -0.7 | 0.4 |
| Cakes, biscuits, baked products | 510 | 5.0 | 560 | 5.1 | 637 | 5.2 | 1.9 | 2.6 |
| Chocolate & sugar confectionery | 852 | 8.3 | 885 | 8.1 | 964 | 7.9 | 0.8 | 1.7 |
| Chilled foods | 337 | 3.3 | 402 | 3.7 | 520 | 4.2 | 3.6 | 5.3 |
| Dry beverages | 205 | 2.0 | 228 | 2.1 | 258 | 2.1 | 2.1 | 2.5 |
| Food to go | 300 | 2.9 | 361 | 3.3 | 453 | 3.7 | 3.8 | 4.7 |
| Frozen food | 882 | 8.6 | 983 | 9.0 | 1211 | 9.9 | 2.2 | 4.3 |
| Soft drinks & beer | 510 | 5.0 | 562 | 5.1 | 703 | 5.7 | 2.0 | 4.6 |
| Wines & spirits | 340 | 3.3 | 375 | 3.4 | 437 | 3.6 | 2.0 | 3.1 |
| Other foods | 770 | 7.5 | 861 | 7.9 | 1026 | 8.4 | 2.3 | 3.6 |
| Sub-total Food | 5190 | 50.6 | 5684 | 51.9 | 6684 | 54.5 | 1.8 | 3.3 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | 372 | 3.6 | 293 | 2.7 | 277 | 2.3 | -4.7 | -1.1 |
| Cleaning & laundry products | 348 | 3.4 | 322 | 2.9 | 348 | 2.8 | -1.6 | 1.6 |
| Cosmetics & beauty | 633 | 6.2 | 721 | 6.6 | 833 | 6.8 | 2.7 | 2.9 |
| Misc. household products | 399 | 3.9 | 393 | 3.6 | 396 | 3.2 | -0.3 | 0.1 |
| Paper, stationery & related goods | 245 | 2.4 | 249 | 2.3 | 253 | 2.1 | 0.3 | 0.3 |
| Personal care | 336 | 3.3 | 371 | 3.4 | 409 | 3.3 | 2.0 | 2.0 |
| Pharmaceuticals & medical products | 1614 | 15.7 | 1756 | 16.0 | 1898 | 15.5 | 1.7 | 1.6 |
| Other non-foods | 1129 | 11.0 | 1154 | 10.5 | 1176 | 9.6 | 0.4 | 0.4 |
| Sub-total Non-food | 5077 | 49.4 | 5259 | 48.1 | 5590 | 45.5 | 0.7 | 1.2 |
| TOTAL | 10267 | 100.0 | 10944 | 100.0 | 12274 | 100.0 | 1.3 | 2.3 |

NB: 1 Soft drinks & beer includes multipacks

NB: 2 Cigarettes, tobacco & accessories includes vaping & tobacco substitutes

The following details are a summary of the main end use markets for folding cartons, categorised into high growth, low growth or static/decline.

Much of the factors contributing to the future growth prospects for each end use market are connected to the substitution of plastics and, as well as in the summary below, have been covered in some detail in chapter 9 already.

High growth prospects for the next 5 years

The following EUM's are predicted to be the 6 fastest growing markets over the next 5 years.

Chilled Foods (5.3% p.a.)

- Growing well with the growth in convenience foods.
- Sandwich packs growing in volumes as more and more people opt for convenience.
- Most northern European countries have a well-developed market for chilled foods.

Food-to-Go (Fast Food & Food-on-the-Go) (4.7% p.a.)

- Sandwich packs changing formats to remove plastics.
- Rise of “cook for yourself” packs for the convenience market growing in popularity with the rise of single person households (e.g. small pizza plus all the ingredients, which you can prepare at home); new sub-market of “food-in-the-home” is another sector within this end use market.
- Market is having to adapt to the demand for more healthier options. These include vegan burgers; an example of how new choices are being added to a growing range of products offered within this market. New product variants are being constantly demanded for this growing market.
- One concern for this market is a focus on coffee cups and how they are recycled (or not, as the case maybe). Likely that this will adversely affect volumes for carton converters with these “one use cups” in their portfolio.

Soft Drinks and Beer (4.6% p.a.)

- Beer showing a spring back (Spain, Germany, etc.) with introduction of new 6 pack layer pad.
- Increase in use of 6-pack and 4-pack multipacks in cartonboard.

Frozen Food (4.3% p.a.)

- Frozen food is a huge market for folding cartons across Europe, representing the No.1 usage in the “food” category. This is a significant market in most countries.
- Growing very well in most European countries with many new products being created or invented over the last 2 or 3 years.

Other Food (3.6% p.a.)

- Fruit & vegetables doing well due to SUP directive (especially in Italy, Netherlands and Spain).
- Growing use of barriers for fruit & vegetables (including combination pack using PE overwrap).
- Increased use of colour, especially black, to show off the colour of the fruit (e.g. tomatoes).
- Rice and pasta grown well over last few years, boosted by healthier eating.

Cleaning & laundry products (1.6% p.a.)

- Been declining over last 5 years.
- Experiencing a spring back due to the single use plastics trend, with increased use of folding cartons for powder, tablets and sachets.

We have included this last end use market (cleaning & laundry products) into the “high growth” category due to the significant reversal of fortunes predicted for the next 5 years. Originally showing a decline of -1.6% p.a. for the last 5 years, it is now destined to see 1.6% p.a. growth for the next 5-year period, a swing of +3.2% p.a. for this 10-year period.

Lower growth over next 5 years

We have included wines and spirits in this “lower growth” category as this end use market heralds a group of sub-markets that arguably will see less of an impact of the substitution of plastics by folding cartons. Each of these 7 end use markets are already significant volume markets for folding cartons:

Wines and Spirits (3.1% p.a.)

- Whisky, cognac and champagne using high added value embossing.
- Rum also using high end finishes such as UV or foil/print on foil with this luxury product.
- High value luxury goods have been fast growing over last 12 to 18 months.

Cosmetics and Beauty (2.9% p.a.)

- Cosmetics growing well due to selfie trend; people want to look good for their selfie picture!
- Growing well in most European countries. Skincare is a very important topic.
- Move to higher quality of smaller packs and away from larger packs.
- High value luxury goods have seen fast growth over last 12 to 18 months.



Cakes, biscuits and bakery (2.6% p.a.)

- Energy bars growing in popularity as health and nutrition grow in importance for consumers.
- Growing steadily for last 5 years at 1.9% p.a. as peoples eating habits, especially for breakfast, have been changing. This end use market is destined to increase in growth rates over the next 5 years.

Dry beverages (2.5% p.a.)

- Hot drinks doing well (e.g. Tea and Coffee)
- Nespresso capsules been a great boost for carton sales over the last 10 years, and now that the patent has lapsed there are many variants of the same concept available. Big growth figures for this market (which was a new market only 10 or 15 years ago).
- Health foods and health drinks all doing well due to young consumers and millennial market.

Personal care (2.0% p.a.)

- Ladies hair care is growing well across much of Europe.
- Men's personal care growing well too, especially around men's grooming of beards.



Chocolate & sugar confectionery (1.7% p.a.)

- Growing steadily.
- Benefitting from new pack formats (often for the gifting market).
- Focus on reducing sugar intake for more healthier diets will limit growth for this end use market.
- Gifting of confectionery has provided modest growth over last few years, but likely to offer improved growth for the next 5 years.

Pharmaceutical and medical products (1.6% p.a.)

- This is the biggest sub-market for folding cartons across Europe, representing the No.1 usage within the “food” or “non-food” categories. This is a significant market in most countries.
- An ageing population in Europe leads to an increasing focus on health issues. Development of improved nutrition as well as new drugs being developed to cope with the needs of an ageing, health conscious population.
- Batch size reduction continues.
- Increase in use of “smart” packaging (e.g. pack “tells you” when to take your pills).
- A lot more medicines for specific treatments. Personalised medicines growing as a trend within this market sector.
- Brand protection is growing, with the growth in copying made more prolific with the arrival of internet sales, so businesses need packaging to give assurances that the contents are original and not an imitation.

Static or declining volumes

These are details of the slowest growing markets:

Breakfast cereal products (0.4% p.a.)

- Slowly been declining in popularity due to changes in lifestyle and consumer eating habits in the morning.

Other non-foods (0.4% p.a.)

- Sales of a variety of different non-food products representing the No.2 by volume for folding cartons in Europe.

Paper, stationery and related goods (0.3% p.a.)

- Mainly covering nappies, feminine and incontinence products, sales remain slow but steady.

Misc. household goods (0.1% p.a.)

- Sales of products are flat (e.g. Germany) or only growing very marginally (e.g. UK). A picture repeated across Europe.

Tobacco (-1.1% p.a.)

- Significant losses of volume for folding cartons with the decline of smoking in Western Europe.
- Volume growing well in Central Europe due to production destined for non-European markets.
- Cigarette production largely gone from Western Europe.
- A small boost for this end use market through the development of vaping, which needs many designs and short runs of cartons; however, once good volumes are achieved then manufacturing is likely to move to Central Europe or outside of Europe altogether.

A commentary on eCommerce

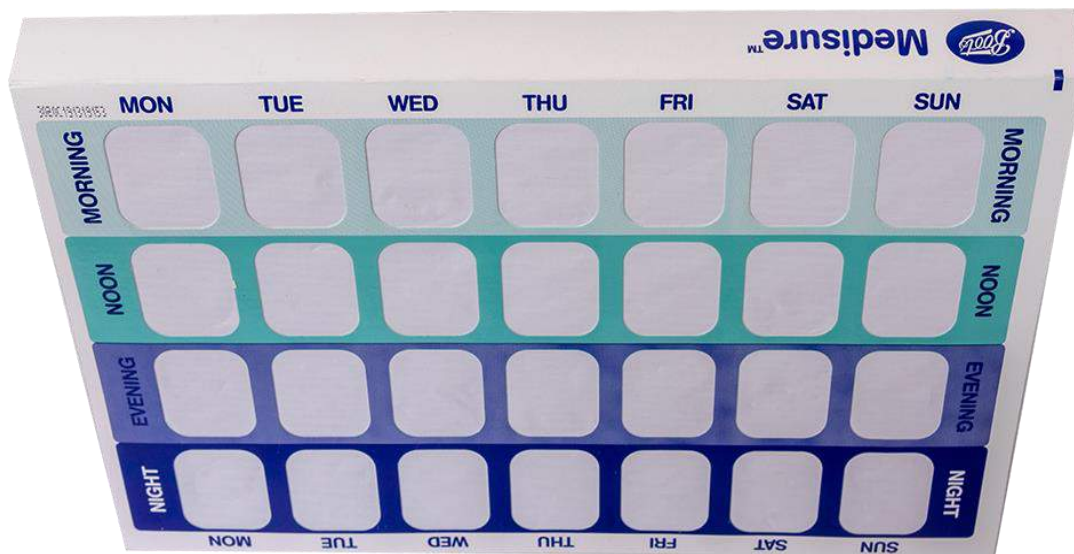
During our interviews for this report the topic of eCommerce has arisen, many respondents indicating that folding carton designs are needing to be designed to suit this distribution channel. Interviewees from many countries have noted that this channel is now affecting folding carton designs and its impact is having a positive effect on carton demand.

We have chosen to write a small piece on this channel in this chapter, but could easily have done so under chapter 8 where we discuss pack style and pack specifying. These are some of the trends with eCommerce impacting on demand:

- A new growth area for cartons due to the need for smaller packs (e.g. coolblue <https://www.coolblue.be/en> in Netherlands, hepsiburada <http://www.hepsiburada.com> in Turkey, etc.)
- This channel has increased the use of microflute (and benefitting those who have microflute as part of their carton converting portfolio).
- New designs being produced, not just with visuals but also with haptics (touch and feel of the internet pack). The “unboxing” experience is boosting the use of cartons; it is very important that the look and the feel of the pack when it first arrives through the post is a great experience for the consumer. Augmented reality is now being built into these packs to enhance the “unboxing” experience even more.
- Europe as a whole is seeing growth from this sector, especially with microflute solutions.

- Growing in Italy, but not anything like that of other European countries. Postal system in Italy doesn't yet facilitate or enable the growth of eCommerce currently.
- A new type of pack phenomena called social media ready packaging or "Selfie Ready Packaging" is coming to the market. Consumers take a picture of their newly arrived product and then post the image online.
- Demand for larger packs growing due to this market.

The impact of this channel is being felt across all categories, but mainly for "non-food" end use markets.



12. STATISTICAL APPENDIX

Numbers may not appear to add up due to rounding

12.1 Europe Overview

| GDP Growth by Country - Annual % Change | | | | | | | | | | | |
|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Country/Region | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Austria | 0.0 | 0.7 | 1.1 | 2.0 | 2.6 | 2.7 | 2.0 | 1.7 | 1.6 | 1.5 | 1.5 |
| Belgium | 0.2 | 1.3 | 1.7 | 1.5 | 1.7 | 1.4 | 1.3 | 1.4 | 1.5 | 1.5 | 1.5 |
| France | 0.6 | 1.0 | 1.1 | 1.2 | 2.2 | 1.5 | 1.3 | 1.4 | 1.5 | 1.5 | 1.5 |
| Germany | 0.6 | 2.2 | 1.5 | 2.2 | 2.5 | 1.5 | 0.8 | 1.4 | 1.5 | 1.4 | 1.3 |
| Italy | -1.7 | 0.1 | 0.9 | 1.1 | 1.6 | 0.9 | 0.1 | 0.9 | 0.7 | 0.6 | 0.6 |
| Netherlands | -0.1 | 1.4 | 2.0 | 2.2 | 2.9 | 2.5 | 1.8 | 1.7 | 1.5 | 1.5 | 1.5 |
| Spain | -1.7 | 1.4 | 3.7 | 3.2 | 3.0 | 2.5 | 2.1 | 1.9 | 1.7 | 1.7 | 1.7 |
| Switzerland | 1.9 | 2.5 | 1.3 | 1.6 | 1.7 | 2.5 | 1.1 | 1.5 | 1.6 | 1.6 | 1.6 |
| Turkey | 8.5 | 5.2 | 6.1 | 3.2 | 7.4 | 2.6 | -2.5 | 2.5 | 3.0 | 3.0 | 3.5 |
| United Kingdom | 2.0 | 2.9 | 2.3 | 1.8 | 1.8 | 1.4 | 1.2 | 1.4 | 1.5 | 1.6 | 1.6 |
| Other Western Europe | -2.2 | 0.8 | 0.7 | 0.9 | 2.2 | 2.1 | 2.0 | 1.8 | 1.5 | 1.3 | 1.3 |
| Sub-total West Europe | 1.0 | 2.0 | 2.2 | 2.0 | 2.8 | 1.7 | 0.7 | 1.6 | 1.6 | 1.6 | 1.6 |
| Nordic | 0.8 | 1.7 | 2.6 | 2.2 | 2.2 | 1.9 | 1.6 | 1.8 | 1.7 | 1.7 | 1.7 |
| Poland | 1.4 | 3.3 | 3.8 | 3.1 | 4.8 | 5.1 | 3.8 | 3.1 | 2.8 | 2.8 | 2.8 |
| Other Central Europe | 1.5 | 2.9 | 3.8 | 3.3 | 4.8 | 3.8 | 3.2 | 2.9 | 2.7 | 2.7 | 2.6 |
| Sub-total Central Europe | 1.5 | 3.1 | 3.8 | 3.2 | 4.8 | 4.3 | 3.4 | 3.0 | 2.8 | 2.7 | 2.7 |
| Total Europe | 1.0 | 2.1 | 2.4 | 2.1 | 3.0 | 2.1 | 1.1 | 1.8 | 1.8 | 1.7 | 1.8 |

Source: IMF WEO

| GDP Growth by Country - Index 2013 = 100 | | | | | | | | | | | |
|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Country/Region | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Austria | 100.0 | 100.7 | 101.8 | 103.9 | 106.5 | 109.4 | 111.6 | 113.5 | 115.2 | 116.9 | 118.6 |
| Belgium | 100.0 | 101.3 | 103.0 | 104.5 | 106.3 | 107.8 | 109.2 | 110.7 | 112.4 | 114.1 | 115.8 |
| France | 100.0 | 101.0 | 102.1 | 103.3 | 105.5 | 107.1 | 108.5 | 110.0 | 111.6 | 113.3 | 115.1 |
| Germany | 100.0 | 102.2 | 103.7 | 105.9 | 108.5 | 110.1 | 110.9 | 112.5 | 114.2 | 115.9 | 117.4 |
| Italy | 100.0 | 100.1 | 101.0 | 102.2 | 103.8 | 104.7 | 104.8 | 105.8 | 106.5 | 107.1 | 107.7 |
| Netherlands | 100.0 | 101.4 | 103.4 | 105.7 | 108.7 | 111.5 | 113.5 | 115.4 | 117.1 | 118.9 | 120.7 |
| Spain | 100.0 | 101.4 | 105.1 | 108.4 | 111.6 | 114.5 | 116.9 | 119.1 | 121.2 | 123.2 | 125.3 |
| Switzerland | 100.0 | 102.5 | 103.8 | 105.4 | 107.2 | 109.9 | 111.1 | 112.8 | 114.6 | 116.4 | 118.3 |
| Turkey | 100.0 | 105.2 | 111.6 | 115.1 | 123.7 | 126.9 | 123.6 | 126.8 | 130.5 | 134.5 | 139.2 |
| United Kingdom | 100.0 | 102.9 | 105.4 | 107.3 | 109.2 | 110.7 | 112.0 | 113.6 | 115.4 | 117.2 | 119.0 |
| Other Western Europe | 100.0 | 100.8 | 101.5 | 102.4 | 104.6 | 106.8 | 109.0 | 111.0 | 112.7 | 114.1 | 115.7 |
| Sub-total West Europe | 100.0 | 102.0 | 104.2 | 106.2 | 109.2 | 111.1 | 111.9 | 113.6 | 115.5 | 117.3 | 119.2 |
| Nordic | 100.0 | 101.7 | 104.3 | 106.6 | 109.0 | 111.1 | 112.9 | 114.9 | 116.9 | 118.9 | 120.9 |
| Poland | 100.0 | 103.3 | 107.3 | 110.6 | 115.9 | 121.8 | 126.4 | 130.3 | 134.0 | 137.8 | 141.6 |
| Other Central Europe | 100.0 | 102.9 | 106.8 | 110.4 | 115.7 | 120.1 | 124.0 | 127.6 | 131.1 | 134.5 | 138.1 |
| Sub-total Central Europe | 100.0 | 103.1 | 107.0 | 110.5 | 115.8 | 120.8 | 124.9 | 128.6 | 132.2 | 135.8 | 139.4 |
| Total Europe | 100.0 | 102.1 | 104.5 | 106.7 | 110.0 | 112.3 | 113.5 | 115.5 | 117.6 | 119.6 | 121.7 |

Source: IMF WEO

| Retail Sales Growth by Country - Annual % Change | | | | | | | | | | | |
|--|-------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Country/Region | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Austria | -0.3 | -0.8 | 0.8 | 1.6 | 1.1 | 1.5 | 0.9 | 1.1 | 0.8 | 0.8 | 0.4 |
| Belgium | 0.0 | 0.8 | 1.2 | 0.8 | 1.3 | 1.0 | 0.8 | 1.1 | 1.0 | 1.0 | 1.0 |
| France | -0.3 | -1.0 | 0.6 | 0.9 | 1.3 | 0.8 | 0.6 | 0.6 | 0.5 | 0.4 | 0.5 |
| Germany | -0.4 | 1.0 | 3.1 | 2.6 | 1.3 | 0.8 | 0.9 | 0.8 | 0.8 | 0.9 | 0.9 |
| Italy | -3.3 | -0.2 | 0.8 | 0.7 | 1.3 | 0.3 | 0.2 | 0.4 | 0.7 | 0.9 | 0.9 |
| Netherlands | -0.8 | 0.7 | 1.7 | 1.8 | 2.7 | 2.6 | 0.9 | 1.1 | 1.2 | 1.3 | 1.2 |
| Spain | -6.9 | 0.7 | 2.1 | 2.8 | 2.4 | 2.4 | 3.1 | 2.4 | 2.3 | 2.1 | 1.9 |
| Switzerland | 1.3 | 0.3 | 0.9 | 1.1 | 0.0 | 0.6 | 1.0 | 1.3 | 0.4 | 0.9 | 0.8 |
| Turkey | 2.5 | -1.3 | 1.9 | 1.3 | 2.5 | -1.2 | -2.4 | 4.0 | 3.9 | 3.9 | 4.0 |
| United Kingdom | 0.4 | 4.2 | 1.8 | 2.0 | 1.5 | 1.8 | 1.6 | 1.6 | 1.6 | 1.7 | 1.7 |
| Other Western Europe | -1.9 | 0.5 | 0.7 | 1.1 | 0.9 | 1.3 | 1.0 | 1.3 | 0.8 | 1.1 | 1.2 |
| Sub-total West Europe | -0.9 | 0.7 | 1.7 | 1.7 | 1.6 | 0.9 | 0.7 | 1.4 | 1.4 | 1.4 | 1.4 |
| Nordic | 1.1 | 2.3 | 2.1 | 1.4 | 1.9 | 1.6 | 1.4 | 1.6 | 1.6 | 2.1 | 2.1 |
| Poland | -0.2 | 2.1 | 2.7 | 3.8 | 4.1 | 2.4 | 5.1 | 2.9 | 2.4 | 2.3 | 3.0 |
| Other Central Europe | -0.3 | 3.0 | 4.3 | 5.4 | 5.7 | 3.1 | 2.8 | 2.2 | 2.6 | 2.3 | 2.6 |
| Sub-total Central Europe | -0.3 | 2.7 | 3.7 | 4.8 | 5.1 | 2.9 | 3.7 | 2.5 | 2.5 | 2.3 | 2.7 |
| Total Europe | -0.7 | 1.0 | 2.0 | 2.1 | 2.0 | 1.2 | 1.1 | 1.6 | 1.5 | 1.6 | 1.6 |

Source: EIU/Planet Retail

| Retail Sales Growth by Country - Index 2013 = 100 | | | | | | | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Country/Region | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Austria | 100.0 | 99.2 | 99.9 | 101.5 | 102.5 | 104.1 | 105.0 | 106.2 | 107.0 | 107.9 | 108.3 |
| Belgium | 100.0 | 100.8 | 101.9 | 102.8 | 104.1 | 105.1 | 106.0 | 107.1 | 108.2 | 109.3 | 110.4 |
| France | 100.0 | 99.0 | 99.6 | 100.5 | 101.9 | 102.7 | 103.3 | 103.9 | 104.5 | 104.9 | 105.4 |
| Germany | 100.0 | 101.0 | 104.1 | 106.8 | 108.1 | 109.0 | 110.0 | 110.9 | 111.7 | 112.7 | 113.8 |
| Italy | 100.0 | 99.8 | 100.6 | 101.3 | 102.7 | 103.0 | 103.2 | 103.6 | 104.3 | 105.2 | 106.2 |
| Netherlands | 100.0 | 100.7 | 102.4 | 104.2 | 107.0 | 109.8 | 110.8 | 112.0 | 113.4 | 114.9 | 116.2 |
| Spain | 100.0 | 100.7 | 102.9 | 105.8 | 108.3 | 110.9 | 114.3 | 117.1 | 119.8 | 122.3 | 124.6 |
| Switzerland | 100.0 | 100.3 | 101.2 | 102.2 | 102.2 | 102.9 | 103.9 | 105.2 | 105.7 | 106.6 | 107.5 |
| Turkey | 100.0 | 98.7 | 100.6 | 101.9 | 104.4 | 103.2 | 100.7 | 104.7 | 108.8 | 113.0 | 117.6 |
| United Kingdom | 100.0 | 104.2 | 106.1 | 108.1 | 109.8 | 111.7 | 113.5 | 115.3 | 117.2 | 119.2 | 121.2 |
| Other Western Europe | 100.0 | 100.5 | 101.2 | 102.3 | 103.2 | 104.6 | 105.6 | 106.9 | 107.8 | 108.9 | 110.2 |
| Sub-total West Europe | 100.0 | 100.7 | 102.4 | 104.1 | 105.8 | 106.8 | 107.5 | 109.1 | 110.5 | 112.1 | 113.7 |
| Nordic | 100.0 | 102.3 | 104.4 | 105.8 | 107.8 | 109.5 | 111.0 | 112.8 | 114.6 | 117.0 | 119.5 |
| Poland | 100.0 | 102.1 | 104.8 | 108.9 | 113.3 | 116.0 | 121.9 | 125.5 | 128.5 | 131.5 | 135.4 |
| Other Central Europe | 100.0 | 103.0 | 107.5 | 113.3 | 119.8 | 123.6 | 127.0 | 129.8 | 133.2 | 136.3 | 139.8 |
| Sub-total Central Europe | 100.0 | 102.7 | 106.5 | 111.6 | 117.3 | 120.7 | 125.1 | 128.2 | 131.4 | 134.5 | 138.1 |
| Total Europe | 100.0 | 101.0 | 103.0 | 105.1 | 107.3 | 108.6 | 109.8 | 111.5 | 113.3 | 115.1 | 117.0 |

Source: EIU/Planet Retail

| Currency Movements - Average Exchange Rates for Selected Currencies versus the Euro - 2009 to 2019 | | | | | | | | | | | |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Country/Region | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019* |
| Nordic Average | 8.937 | 8.197 | 8.093 | 7.877 | 7.973 | 8.304 | 8.588 | 8.736 | 8.802 | 9.108 | 9.252 |
| Swiss Franc | 1.510 | 1.383 | 1.233 | 1.205 | 1.231 | 1.215 | 1.068 | 1.090 | 1.112 | 1.155 | 1.123 |
| Turkish Lira | 2.162 | 1.999 | 2.335 | 2.315 | 2.531 | 2.905 | 3.022 | 3.342 | 4.118 | 5.697 | 6.347 |
| UK £Sterling | 0.891 | 0.859 | 0.868 | 0.811 | 0.849 | 0.806 | 0.727 | 0.819 | 0.876 | 0.885 | 0.881 |
| Polish Zloty | 4.326 | 3.994 | 4.117 | 4.182 | 4.196 | 4.185 | 4.183 | 4.364 | 4.257 | 4.262 | 4.292 |
| Other Central Europe Average | 25.554 | 25.111 | 25.091 | 25.680 | 25.911 | 26.437 | 26.404 | 26.428 | 26.359 | 26.476 | 26.603 |

Source: www.oanda.com, www.ofx.com. * indicates incomplete year.

Nordic average comprises average for Danish Krone, Norwegian Kroner & Swedish Krona

Other Central Europe average exchange comprises weighted average exchange for Euro & non-Euro Zone countries

| Currency Movements - Average Exchange Rates for Selected Currencies versus the Euro - 2009 to 2019 - % Change on Previous Year | | | | | | | | | | | |
|--|------|------|-------|------|------|------|-------|------|------|------|-------|
| Country/Region | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019* |
| Nordic Average | 5.9 | -8.3 | -1.3 | -2.7 | 1.2 | 4.2 | 3.4 | 1.7 | 0.8 | 3.5 | 1.6 |
| Swiss Franc | -4.9 | -8.4 | -10.8 | -2.3 | 2.1 | -1.3 | -12.0 | 2.0 | 2.0 | 3.9 | -2.8 |
| Turkish Lira | 13.4 | -7.6 | 16.9 | -0.9 | 9.3 | 14.8 | 4.0 | 10.6 | 23.2 | 38.3 | 11.4 |
| UK £Sterling | 12.0 | -3.7 | 1.1 | -6.5 | 4.7 | -5.0 | -9.9 | 12.7 | 7.0 | 1.0 | -0.4 |
| Polish Zloty | 23.1 | -7.7 | 3.1 | 1.6 | 0.3 | -0.3 | -0.1 | 4.3 | -2.4 | 0.1 | 0.7 |
| Other Central Europe | 7.2 | -1.7 | -0.1 | 2.3 | 0.9 | 2.0 | -0.1 | 0.1 | -0.3 | 0.4 | 0.5 |

Source: www.oanda.com, www.ofx.com. * indicates incomplete year.

Nordic average comprises average for Danish Krone, Norwegian Kroner & Swedish Krona

Other Central Europe average exchange comprises weighted average exchange for Euro & non-Euro Zone countries

| Currency Movements - Average Exchange Rates for Selected Currencies versus the Euro - 2009 to 2019 - Index 2009 = 100 | | | | | | | | | | | |
|---|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Country/Region | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019* |
| Nordic Average | 100.0 | 91.7 | 90.6 | 88.1 | 89.2 | 92.9 | 96.1 | 97.8 | 98.5 | 101.9 | 103.5 |
| Swiss Franc | 100.0 | 91.6 | 81.7 | 79.8 | 81.5 | 80.4 | 70.8 | 72.2 | 73.6 | 76.5 | 74.4 |
| Turkish Lira | 100.0 | 92.4 | 108.0 | 107.1 | 117.1 | 134.4 | 139.8 | 154.6 | 190.5 | 263.5 | 293.6 |
| UK £Sterling | 100.0 | 96.3 | 97.4 | 91.0 | 95.3 | 90.5 | 81.5 | 91.9 | 98.3 | 99.3 | 98.8 |
| Polish Zloty | 100.0 | 92.3 | 95.2 | 96.7 | 97.0 | 96.7 | 96.7 | 100.9 | 98.4 | 98.5 | 99.2 |
| Other Central Europe | 100.0 | 98.3 | 98.2 | 100.5 | 101.4 | 103.5 | 103.3 | 103.4 | 103.1 | 103.6 | 104.1 |

Source: www.oanda.com, www.ofx.com. * indicates incomplete year.

Nordic average comprises average for Danish Krone, Norwegian Kroner & Swedish Krona

Other Central Europe average exchange comprises weighted average exchange for Euro & non-Euro Zone countries

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - All Countries – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|--|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 5351 | 0.3 | 100 | 5051 | 0.5 | 100 | 100.0 | 10267 | 0.8 | 100 |
| 2014 | 5472 | 2.3 | 102 | 5155 | 2.1 | 102 | 101.9 | 10285 | 0.2 | 100 |
| 2015 | 5593 | 2.2 | 105 | 5292 | 2.7 | 105 | 104.2 | 10722 | 4.2 | 104 |
| 2016 | 5616 | 0.4 | 105 | 5321 | 0.5 | 105 | 106.4 | 10545 | -1.7 | 103 |
| 2017 | 5846 | 4.1 | 109 | 5518 | 3.7 | 109 | 109.4 | 10877 | 3.2 | 106 |
| 2018 | 5934 | 1.5 | 111 | 5583 | 1.2 | 111 | 111.5 | 10944 | 0.6 | 107 |
| 2019 | 6053 | 2.0 | 113 | 5699 | 2.1 | 113 | 112.8 | 11136 | 1.8 | 108 |
| 2020 | 6215 | 2.7 | 116 | 5855 | 2.7 | 116 | 114.7 | 11404 | 2.4 | 111 |
| 2021 | 6370 | 2.5 | 119 | 6007 | 2.6 | 119 | 116.7 | 11682 | 2.4 | 114 |
| 2022 | 6530 | 2.5 | 122 | 6162 | 2.6 | 122 | 118.7 | 11968 | 2.4 | 117 |
| 2023 | 6702 | 2.6 | 125 | 6329 | 2.7 | 125 | 120.8 | 12274 | 2.6 | 120 |
| Average % p.a.13 to 18 | 2.1 | | | 2.0 | | | 2.2 | 1.3 | | |
| Average % p.a. 18 to 23 | 2.5 | | | 2.5 | | | 1.6 | 2.3 | | |

| Summary Estimates & Forecasts of European Carton Production – 2013, 2018 & 2023 – 000 Tonnes & € Million | | | | | |
|--|-------|-------|-------|----------|----------|
| | 2013 | 2018 | 2023 | 13 to 18 | 18 to 23 |
| | | | | % p.a. | % p.a. |
| Cartonboard Purchases: 000 Tonnes | 5351 | 5934 | 6702 | 2.1 | 2.5 |
| Carton Output: 000 Tonnes | 5051 | 5583 | 6329 | 2.0 | 2.5 |
| Sales by European Cartonmakers: € Million | 10267 | 10944 | 12274 | 1.3 | 2.3 |

| Primary Pack Substitution Trends in Folding Carton Primary Pack Markets in Europe - 2013, 2018 & 2023 - % of Units | | | |
|--|--------------|--------------|--------------|
| Pack Type | 2013 | 2018 | 2023 |
| Folding Cartons | 25.4 | 24.8 | 27.6 |
| Flexible Pack | 57.1 | 57.4 | 56.4 |
| Other Primary Packs | 17.5 | 17.8 | 16.0 |
| TOTAL | 100.0 | 100.0 | 100.0 |

NB: 1 Table refers to folding carton markets, not FMCG markets and excludes canned bottled foods and drinks packaging

NB: 2 Estimates for folding cartons excludes multiple packaging. (i.e. refers to primary packs only)

| Estimates & Forecasts of Folding Carton Primary Pack Output – Total Europe Analysed by Barrier & Non-barrier Applications – 2013, 2018 & 2023 – 000 Tonnes | | | | | | | | |
|--|-------------|--------------|-------------|--------------|-------------|--------------|------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | 000 Tonnes | % | 000 Tonnes | % | 000 Tonnes | % | 13 to 18 | 18 to 23 |
| Barrier | 276 | 5.5 | 439 | 7.9 | 649 | 10.3 | 9.7 | 8.2 |
| Non barrier | 4775 | 94.5 | 5144 | 92.1 | 5680 | 89.7 | 1.5 | 2.0 |
| TOTAL | 5051 | 100.0 | 5583 | 100.0 | 6329 | 100.0 | 2.0 | 2.5 |

NB: Barrier cartons includes cartons produced from coated and laminated cartonboard grades

| Prospects for the Main Carton Constructions – Total Europe – 2013, 2018 & 2023 – 000 Tonnes | | | | | | | | |
|---|-------------|--------------|-------------|--------------|-------------|--------------|------------|------------|
| Carton Construction | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | 000 Tonnes | % | 000 Tonnes | % | 000 Tonnes | % | 13 to 18 | 18 to 23 |
| Consumer primary packs | 3127 | 61.9 | 3442 | 61.7 | 3927 | 62.0 | 1.9 | 2.7 |
| Display outers / multi packs | 722 | 14.3 | 816 | 14.6 | 969 | 15.3 | 2.5 | 3.5 |
| Sub total Cartonboard Packs | 3850 | 76.2 | 4258 | 76.3 | 4896 | 77.4 | 2.0 | 2.8 |
| Litho printed corrugated containers | 1201 | 23.8 | 1324 | 23.7 | 1433 | 22.6 | 2.0 | 1.6 |
| TOTAL | 5051 | 100.0 | 5583 | 100.0 | 6329 | 100.0 | 2.0 | 2.5 |

| Summary Estimates & Forecasts of Carton Production, Cartonboard Purchases, & Carton Sales - Main European Regions - 2013, 2018 & 2023 - 000 Tonnes, € Million | | | | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|--------------|------------|------------|
| | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | Vol/Val | % | Vol/Val | % | Vol/Val | % | 13 to 18 | 18 to 23 |
| Cartonboard Purchases - 000 Tonnes | | | | | | | | |
| Western Europe | 4460 | 83.4 | 4831 | 81.4 | 5363 | 80.0 | 1.6 | 2.1 |
| Nordic Region | 166 | 3.1 | 178 | 3.0 | 196 | 2.9 | 1.4 | 1.9 |
| Central Europe | 725 | 13.5 | 925 | 15.6 | 1143 | 17.1 | 5.0 | 4.3 |
| TOTAL | 5351 | 100.0 | 5934 | 100.0 | 6702 | 100.0 | 2.1 | 2.5 |
| Carton Production - 000 Tonnes | | | | | | | | |
| Western Europe | 4241 | 84.0 | 4577 | 82.0 | 5103 | 80.6 | 1.5 | 2.2 |
| Nordic Region | 154 | 3.1 | 165 | 3.0 | 182 | 2.9 | 1.4 | 1.9 |
| Central Europe | 656 | 13.0 | 840 | 15.0 | 1044 | 16.5 | 5.1 | 4.4 |
| TOTAL | 5051 | 100.0 | 5583 | 100.0 | 6329 | 100.0 | 2.0 | 2.5 |
| Carton Sales - € Million | | | | | | | | |
| Western Europe | 8895 | 86.6 | 9311 | 85.1 | 10261 | 83.6 | 0.9 | 2.0 |
| Nordic Region | 344 | 3.4 | 321 | 2.9 | 359 | 2.9 | -1.4 | 2.3 |
| Central Europe | 1028 | 10.0 | 1312 | 12.0 | 1654 | 13.5 | 5.0 | 4.7 |
| TOTAL | 10267 | 100.0 | 10944 | 100.0 | 12274 | 100.0 | 1.3 | 2.3 |

| Estimates & Forecasts of Cartonboard Purchases – Total Europe Analysed by Country – 2013, 2018 & 2023 – 000 Tonnes | | | | | | | | |
|--|-------------|--------------|-------------|--------------|-------------|--------------|------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | 000 Tonnes | % | 000 Tonnes | % | 000 Tonnes | % | 13 to 18 | 18 to 23 |
| Austria | 145 | 2.7 | 158 | 2.7 | 167 | 2.5 | 1.7 | 1.1 |
| Belgium | 126 | 2.4 | 113 | 1.9 | 119 | 1.8 | -2.2 | 1.2 |
| France | 542 | 10.1 | 558 | 9.4 | 610 | 9.1 | 0.6 | 1.8 |
| Germany | 1118 | 20.9 | 1148 | 19.3 | 1215 | 18.1 | 0.5 | 1.1 |
| Italy | 578 | 10.8 | 655 | 11.0 | 694 | 10.4 | 2.5 | 1.2 |
| Netherlands | 283 | 5.3 | 277 | 4.7 | 314 | 4.7 | -0.4 | 2.6 |
| Spain | 340 | 6.3 | 386 | 6.5 | 434 | 6.5 | 2.6 | 2.4 |
| Switzerland | 118 | 2.2 | 98 | 1.7 | 93 | 1.4 | -3.6 | -1.0 |
| Turkey | 408 | 7.6 | 561 | 9.5 | 750 | 11.2 | 6.6 | 6.0 |
| U.K. | 605 | 11.3 | 670 | 11.3 | 741 | 11.1 | 2.1 | 2.0 |
| Other Western Europe | 198 | 3.7 | 208 | 3.5 | 224 | 3.3 | 1.0 | 1.6 |
| Sub-total West Europe | 4460 | 83.4 | 4831 | 81.4 | 5363 | 80.0 | 1.6 | 2.1 |
| Nordic Region | 166 | 3.1 | 178 | 3.0 | 196 | 2.9 | 1.4 | 1.9 |
| Poland | 415 | 7.7 | 550 | 9.3 | 706 | 10.5 | 5.8 | 5.1 |
| Other Central Europe | 310 | 5.8 | 374 | 6.3 | 438 | 6.5 | 3.8 | 3.2 |
| Sub-total Central Europe | 725 | 13.5 | 925 | 15.6 | 1143 | 17.1 | 5.0 | 4.3 |
| Total Europe | 5351 | 100.0 | 5934 | 100.0 | 6702 | 100.0 | 2.1 | 2.5 |

| Estimates & Forecasts of Carton Output – Total Europe Analysed by Country – 2013, 2018 & 2023 – 000 Tonnes | | | | | | | | |
|--|-------------|--------------|-------------|--------------|-------------|--------------|------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | 000 Tonnes | % | 000 Tonnes | % | 000 Tonnes | % | 13 to 18 | 18 to 23 |
| Austria | 125 | 2.5 | 136 | 2.4 | 144 | 2.3 | 1.7 | 1.2 |
| Belgium | 127 | 2.5 | 119 | 2.1 | 127 | 2.0 | -1.3 | 1.3 |
| France | 520 | 10.3 | 536 | 9.6 | 589 | 9.3 | 0.6 | 1.9 |
| Germany | 1035 | 20.5 | 1059 | 19.0 | 1127 | 17.8 | 0.5 | 1.2 |
| Italy | 589 | 11.7 | 668 | 12.0 | 712 | 11.2 | 2.6 | 1.3 |
| Netherlands | 263 | 5.2 | 260 | 4.7 | 297 | 4.7 | -0.2 | 2.7 |
| Spain | 320 | 6.3 | 362 | 6.5 | 409 | 6.5 | 2.5 | 2.5 |
| Switzerland | 101 | 2.0 | 87 | 1.6 | 83 | 1.3 | -2.9 | -0.9 |
| Turkey | 382 | 7.6 | 525 | 9.4 | 705 | 11.1 | 6.5 | 6.1 |
| U.K. | 586 | 11.6 | 621 | 11.1 | 690 | 10.9 | 1.2 | 2.1 |
| Other Western Europe | 194 | 3.8 | 204 | 3.6 | 221 | 3.5 | 1.0 | 1.6 |
| Sub-total West Europe | 4241 | 84.0 | 4577 | 82.0 | 5103 | 80.6 | 1.5 | 2.2 |
| Nordic | 154 | 3.1 | 165 | 3.0 | 182 | 2.9 | 1.4 | 1.9 |
| Poland | 375 | 7.4 | 500 | 9.0 | 644 | 10.2 | 5.9 | 5.2 |
| Other Central Europe | 281 | 5.6 | 340 | 6.1 | 400 | 6.3 | 3.9 | 3.3 |
| Sub-total Central Europe | 656 | 13.0 | 840 | 15.0 | 1044 | 16.5 | 5.1 | 4.4 |
| Total Europe | 5051 | 100.0 | 5583 | 100.0 | 6329 | 100.0 | 2.0 | 2.5 |

| Estimates & Forecasts of Carton Sales – Total Europe Analysed by Country – 2013, 2018 & 2023 – € Million | | | | | | | | |
|--|--------------|--------------|--------------|--------------|--------------|--------------|-------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Austria | 267 | 2.6 | 294 | 2.7 | 304 | 2.5 | 1.9 | 0.7 |
| Belgium | 246 | 2.4 | 223 | 2.0 | 235 | 1.9 | -1.9 | 1.1 |
| France | 1237 | 12.0 | 1281 | 11.7 | 1409 | 11.5 | 0.7 | 1.9 |
| Germany | 2111 | 20.6 | 2100 | 19.2 | 2172 | 17.7 | -0.1 | 0.7 |
| Italy | 1163 | 11.3 | 1327 | 12.1 | 1413 | 11.5 | 2.7 | 1.3 |
| Netherlands | 536 | 5.2 | 553 | 5.1 | 634 | 5.2 | 0.6 | 2.8 |
| Spain | 670 | 6.5 | 737 | 6.7 | 846 | 6.9 | 1.9 | 2.8 |
| Switzerland | 363 | 3.5 | 319 | 2.9 | 284 | 2.3 | -2.5 | -2.3 |
| Turkey | 650 | 6.3 | 761 | 7.0 | 1041 | 8.5 | 3.2 | 6.5 |
| U.K. | 1279 | 12.5 | 1322 | 12.1 | 1489 | 12.1 | 0.7 | 2.4 |
| Other Western Europe | 373 | 3.6 | 393 | 3.6 | 432 | 3.5 | 1.0 | 1.9 |
| Sub-total West Europe | 8895 | 86.6 | 9311 | 85.1 | 10261 | 83.6 | 0.9 | 2.0 |
| Nordic | 344 | 3.4 | 321 | 2.9 | 359 | 2.9 | -1.4 | 2.3 |
| Poland | 588 | 5.7 | 783 | 7.2 | 1023 | 8.3 | 5.9 | 5.5 |
| Other Central Europe | 440 | 4.3 | 529 | 4.8 | 631 | 5.1 | 3.8 | 3.6 |
| Sub-total Central Europe | 1028 | 10.0 | 1312 | 12.0 | 1654 | 13.5 | 5.0 | 4.7 |
| Total Europe | 10267 | 100.0 | 10944 | 100.0 | 12274 | 100.0 | 1.3 | 2.3 |

Estimates of Carton Sales Analysed by Market – Total Europe – 2018 – 000 Tonnes, € Million, € per Tonne

| Sector | 000 Tonnes | % | € M | % | € per Tonne |
|------------------------------------|-------------|--------------|--------------|--------------|-------------|
| Food | | | | | |
| Breakfast cereal products | 276 | 4.9 | 468 | 4.3 | 1696 |
| Cakes, biscuits, baked products | 382 | 6.8 | 560 | 5.1 | 1468 |
| Chocolate & sugar confectionery | 454 | 8.1 | 885 | 8.1 | 1947 |
| Chilled foods | 256 | 4.6 | 402 | 3.7 | 1573 |
| Dry beverages | 145 | 2.6 | 228 | 2.1 | 1572 |
| Food to go | 214 | 3.8 | 361 | 3.3 | 1686 |
| Frozen food | 637 | 11.4 | 983 | 9.0 | 1543 |
| Soft drinks & beer | 292 | 5.2 | 562 | 5.1 | 1928 |
| Wines & spirits | 191 | 3.4 | 375 | 3.4 | 1966 |
| Other foods | 511 | 9.2 | 861 | 7.9 | 1686 |
| Sub-total Food | 3356 | 60.1 | 5684 | 51.9 | 1694 |
| Non-Food | | | | | |
| Cigarettes, tobacco, accessories | 181 | 3.2 | 293 | 2.7 | 1623 |
| Cleaning & laundry products | 219 | 3.9 | 322 | 2.9 | 1472 |
| Cosmetics & beauty | 235 | 4.2 | 721 | 6.6 | 3068 |
| Misc household products | 212 | 3.8 | 393 | 3.6 | 1854 |
| Paper, stationery & related goods | 122 | 2.2 | 249 | 2.3 | 2040 |
| Personal care | 166 | 3.0 | 371 | 3.4 | 2238 |
| Pharmaceuticals & medical products | 589 | 10.6 | 1756 | 16.0 | 2980 |
| Other non-foods | 503 | 9.0 | 1154 | 10.5 | 2295 |
| Sub-total Non-food | 2226 | 39.9 | 5259 | 48.1 | 2362 |
| TOTAL | 5583 | 100.0 | 10944 | 100.0 | 1960 |

NB: 1 Soft drinks & beer includes multipacks

NB: 2 Cigarettes, tobacco & accessories includes vaping & tobacco substitutes

NB: 3 Food to Go includes Convenience 'On the Move' (including sandwiches, wraps, baguettes, salads, single portion savoury bakery, other savoury & sweet RTE foods.) & Quick Serve Fast food/Takeaways (including French fries/chips burger boxes, other fast food containers)

| Estimates & Forecasts of Carton Sales Analysed by Market – Total Europe – 2013, 2018 & 2023 – € Million | | | | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|--------------|------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast cereal products | 485 | 4.7 | 468 | 4.3 | 476 | 3.9 | -0.7 | 0.4 |
| Cakes, biscuits, baked products | 510 | 5.0 | 560 | 5.1 | 637 | 5.2 | 1.9 | 2.6 |
| Chocolate & sugar confectionery | 852 | 8.3 | 885 | 8.1 | 964 | 7.9 | 0.8 | 1.7 |
| Chilled foods | 337 | 3.3 | 402 | 3.7 | 520 | 4.2 | 3.6 | 5.3 |
| Dry beverages | 205 | 2.0 | 228 | 2.1 | 258 | 2.1 | 2.1 | 2.5 |
| Food to go | 300 | 2.9 | 361 | 3.3 | 453 | 3.7 | 3.8 | 4.7 |
| Frozen food | 882 | 8.6 | 983 | 9.0 | 1211 | 9.9 | 2.2 | 4.3 |
| Soft drinks & beer | 510 | 5.0 | 562 | 5.1 | 703 | 5.7 | 2.0 | 4.6 |
| Wines & spirits | 340 | 3.3 | 375 | 3.4 | 437 | 3.6 | 2.0 | 3.1 |
| Other foods | 770 | 7.5 | 861 | 7.9 | 1026 | 8.4 | 2.3 | 3.6 |
| Sub-total Food | 5190 | 50.6 | 5684 | 51.9 | 6684 | 54.5 | 1.8 | 3.3 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | 372 | 3.6 | 293 | 2.7 | 277 | 2.3 | -4.7 | -1.1 |
| Cleaning & laundry products | 348 | 3.4 | 322 | 2.9 | 348 | 2.8 | -1.6 | 1.6 |
| Cosmetics & beauty | 633 | 6.2 | 721 | 6.6 | 833 | 6.8 | 2.7 | 2.9 |
| Misc household products | 399 | 3.9 | 393 | 3.6 | 396 | 3.2 | -0.3 | 0.1 |
| Paper, stationery & related goods | 245 | 2.4 | 249 | 2.3 | 253 | 2.1 | 0.3 | 0.3 |
| Personal care | 336 | 3.3 | 371 | 3.4 | 409 | 3.3 | 2.0 | 2.0 |
| Pharmaceuticals & medical products | 1614 | 15.7 | 1756 | 16.0 | 1898 | 15.5 | 1.7 | 1.6 |
| Other non-foods | 1129 | 11.0 | 1154 | 10.5 | 1176 | 9.6 | 0.4 | 0.4 |
| Sub-total Non-food | 5077 | 49.4 | 5259 | 48.1 | 5590 | 45.5 | 0.7 | 1.2 |
| TOTAL | 10267 | 100.0 | 10944 | 100.0 | 12274 | 100.0 | 1.3 | 2.3 |

NB: 1 Soft drinks & beer includes multipacks

NB: 2 Cigarettes, tobacco & accessories includes vaping & tobacco substitutes

| Estimates & Forecasts of Litho Laminated Container Sales Analysed by Market – 2018 – € Million | | |
|--|---------------|--------------|
| | € M | % Share |
| Food | | |
| Confectionery | 187.4 | 10.8 |
| Frozen Foods | 34.1 | 2.0 |
| Drinks | 311.7 | 17.9 |
| Other Foods | 187.4 | 10.8 |
| Sub Total Food | 720.4 | 41.3 |
| Other Non-Foods | | |
| Cleaning & Laundry | 136.3 | 7.8 |
| Misc. Household | 306.6 | 17.6 |
| Other non-Foods | 306.6 | 17.6 |
| Sub Total Non-Foods | 749.4 | 43.0 |
| Others | | |
| Gifts & Presentation Packaging | 128.1 | 7.4 |
| POS & Display | 144.4 | 8.3 |
| Sub Total Others | 272.5 | 15.6 |
| TOTAL | 1742.3 | 100.0 |

| Folding Carton Sales Value per Tonne Analysed by Market Sector - 2018 € per Tonne | |
|---|-------------|
| | € per Tonne |
| Food | |
| Breakfast cereal products | 1696 |
| Cakes, biscuits, baked products | 1468 |
| Chocolate & sugar confectionery | 1947 |
| Chilled foods | 1573 |
| Dry beverages | 1572 |
| Food to go | 1686 |
| Frozen food | 1543 |
| Soft drinks & beer | 1928 |
| Wines & spirits | 1966 |
| Other foods | 1686 |
| Sub-total Food | 1694 |
| Non-Food | |
| Cigarettes, tobacco, accessories | 1623 |
| Cleaning & laundry products | 1472 |
| Cosmetics & beauty | 3068 |
| Misc household products | 1854 |
| Paper, stationery & related goods | 2040 |
| Personal care | 2238 |
| Pharmaceuticals & medical products | 2980 |
| Other non-foods | 2295 |
| Sub-total Non-food | 2362 |
| TOTAL | 1960 |

NB: 1 Soft drinks & beer includes multipacks

NB: 2 Cigarettes, tobacco & accessories includes vaping & tobacco substitutes

| Trends in Average Value per Tonne - Total Europe - 2013 to 2018 - € per Tonne | | | |
|---|-------------|--------|--------------|
| Year | € per Tonne | % p.a. | Index 13=100 |
| 2013 | 2033 | na | 100 |
| 2014 | 1995 | -1.9 | 98 |
| 2015 | 2026 | 1.6 | 100 |
| 2016 | 1982 | -2.2 | 97 |
| 2017 | 1971 | -0.5 | 97 |
| 2018 | 1960 | -0.5 | 96 |
| Average % p.a. 13 to 18 | | -0.7 | |

| Estimates of Waste % - Analysed by Market - Total Europe - 2018 | |
|---|-------------|
| | % |
| Food | |
| Breakfast cereal products | 9.9 |
| Cakes, biscuits, baked products | 14.2 |
| Chocolate & sugar confectionery | 15.2 |
| Chilled foods | 15.2 |
| Dry beverages | 12.0 |
| Food to go | 15.2 |
| Frozen food | 15.2 |
| Soft drinks & beer | 14.2 |
| Wines & spirits | 14.2 |
| Other foods | 14.2 |
| Sub-total Food | 14.2 |
| Non-Food | |
| Cigarettes, tobacco, accessories | 11.0 |
| Cleaning & laundry products | 20.5 |
| Cosmetics & beauty | 22.6 |
| Misc household products | 22.6 |
| Paper, stationery & related goods | 14.2 |
| Personal hygiene | 22.6 |
| Pharmaceuticals & medical products | 28.9 |
| Other non-foods | 20.5 |
| Sub-total Non-food | 22.5 |
| TOTAL | 17.8 |

NB: 1 Soft drinks & beer includes multipacks

NB: 2 Cigarettes, tobacco & accessories includes vaping & tobacco substitutes

| Estimates of Waste % - Analysed by Country - 2018 | |
|---|-------------|
| Country | % |
| Austria | 18.5 |
| Belgium | 18.2 |
| France | 17.1 |
| Germany | 17.1 |
| Italy | 17.4 |
| Netherlands | 17.3 |
| Spain | 17.3 |
| Switzerland | 17.3 |
| Turkey | 21.0 |
| U.K. | 16.8 |
| Other Western Europe | 17.3 |
| Sub-total West Europe | 17.7 |
| Nordic Region | 16.7 |
| Poland | 18.3 |
| Other Central Europe | 18.3 |
| Sub-total Central Europe | 18.3 |
| Total Europe | 17.8 |

Average Sales Price per Tonne of Carton Output - Analysed by Country - 2018 - €

| Country | € per Tonne |
|---------------------------------|-------------|
| Austria | 2161 |
| Belgium | 1873 |
| France | 2392 |
| Germany | 1982 |
| Italy | 1986 |
| Netherlands | 2126 |
| Spain | 2037 |
| Switzerland | 3658 |
| Turkey | 1450 |
| U.K. | 2128 |
| Other Western Europe | 1929 |
| Sub-total West Europe | 2034 |
| Nordic Region | 1942 |
| Poland | 1565 |
| Other Central Europe | 1557 |
| Sub-total Central Europe | 1562 |
| Total Europe | 1960 |

Comparison of Forecast Growth in Carton Output & Carton Sales by Country - Average % p.a 2018 to 2023

| Country | Carton Output | Carton Sales | Difference |
|---------------------------------|---------------|--------------|-------------|
| Austria | 1.2 | 0.7 | -0.5 |
| Belgium | 1.3 | 1.1 | -0.2 |
| France | 1.9 | 1.9 | 0.0 |
| Germany | 1.2 | 0.7 | -0.6 |
| Italy | 1.3 | 1.3 | 0.0 |
| Netherlands | 2.7 | 2.8 | 0.1 |
| Spain | 2.5 | 2.8 | 0.3 |
| Switzerland | -0.9 | -2.3 | -1.4 |
| Turkey | 6.1 | 6.5 | 0.4 |
| U.K. | 2.1 | 2.4 | 0.3 |
| Other Western Europe | 1.6 | 1.9 | 0.3 |
| Sub-total West Europe | 2.2 | 2.0 | -0.2 |
| Nordic Region | 1.9 | 2.3 | 0.4 |
| Poland | 5.2 | 5.5 | 0.3 |
| Other Central Europe | 3.3 | 3.6 | 0.3 |
| Sub-total Central Europe | 4.4 | 4.7 | 0.3 |
| Total Europe | 2.5 | 2.3 | -0.2 |

| Forecasts of Carton Output Analysed by Country – 2018 & 2023 – 000 Tonnes - % p.a. & Incremental Business Forecasts | | | | | | |
|---|-------------|--------------|-------------|--------------|------------|------------------|
| Country | 2018 | | 2023 | | 18 to 23 | |
| | 000 Tonnes | % | 000 Tonnes | % | % p.a. | Incr. 000 Tonnes |
| Austria | 136 | 2.4 | 144 | 2.3 | 1.2 | 8.3 |
| Belgium | 119 | 2.1 | 127 | 2.0 | 1.3 | 7.7 |
| France | 536 | 9.6 | 589 | 9.3 | 1.9 | 53.5 |
| Germany | 1059 | 19.0 | 1127 | 17.8 | 1.2 | 67.7 |
| Italy | 668 | 12.0 | 712 | 11.2 | 1.3 | 43.4 |
| Netherlands | 260 | 4.7 | 297 | 4.7 | 2.7 | 36.6 |
| Spain | 362 | 6.5 | 409 | 6.5 | 2.5 | 47.4 |
| Switzerland | 87 | 1.6 | 83 | 1.3 | -0.9 | -4.0 |
| Turkey | 525 | 9.4 | 705 | 11.1 | 6.1 | 180.0 |
| U.K. | 621 | 11.1 | 690 | 10.9 | 2.1 | 68.5 |
| Other Western Europe | 204 | 3.6 | 221 | 3.5 | 1.6 | 17.2 |
| Sub-total West Europe | 4577 | 82.0 | 5103 | 80.6 | 2.2 | 526.2 |
| Nordic Region | 165 | 3.0 | 182 | 2.9 | 1.9 | 16.6 |
| Poland | 500 | 9.0 | 644 | 10.2 | 5.2 | 144.0 |
| Other Central Europe | 340 | 6.1 | 400 | 6.3 | 3.3 | 59.7 |
| Central Europe | 840 | 15.0 | 1044 | 16.5 | 4.4 | 203.7 |
| Total Europe | 5583 | 100.0 | 6329 | 100.0 | 2.5 | 746.4 |

| Forecasts of Incremental Carton Output Generated by Each Country Ranked by Size of Increment - 2018 to 2023 - 000 Tonnes | | |
|--|--------------|--------------|
| Country | 000 Tonnes | % |
| Turkey | 180.0 | 24.1 |
| Poland | 144.0 | 19.3 |
| U.K. | 68.5 | 9.2 |
| Germany | 67.7 | 9.1 |
| Other Central Europe | 59.7 | 8.0 |
| France | 53.5 | 7.2 |
| Spain | 47.4 | 6.3 |
| Italy | 43.4 | 5.8 |
| Netherlands | 36.6 | 4.9 |
| Other Western Europe | 17.2 | 2.3 |
| Nordic Region | 16.6 | 2.2 |
| Austria | 8.3 | 1.1 |
| Belgium | 7.7 | 1.0 |
| Switzerland | -4.0 | -0.5 |
| Total Europe | 746.4 | 100.0 |

| Forecasts of Carton Sales Analysed by Country – 2018 & 2023 – € Million - % p.a. & Incremental Business Forecasts | | | | | | |
|---|--------------|--------------|--------------|--------------|------------|---------------|
| Country | 2018 | | 2023 | | 18 to 23 | |
| | €M | % | €M | % | % p.a. | Incr. €M |
| Austria | 294 | 2.7 | 304 | 2.5 | 0.7 | 10.4 |
| Belgium | 223 | 2.0 | 235 | 1.9 | 1.1 | 12.1 |
| France | 1281 | 11.7 | 1409 | 11.5 | 1.9 | 128.0 |
| Germany | 2100 | 19.2 | 2172 | 17.7 | 0.7 | 72.3 |
| Italy | 1327 | 12.1 | 1413 | 11.5 | 1.3 | 86.1 |
| Netherlands | 553 | 5.1 | 634 | 5.2 | 2.8 | 80.9 |
| Spain | 737 | 6.7 | 846 | 6.9 | 2.8 | 108.8 |
| Switzerland | 319 | 2.9 | 284 | 2.3 | -2.3 | -35.5 |
| Turkey | 761 | 7.0 | 1041 | 8.5 | 6.5 | 280.3 |
| U.K. | 1322 | 12.1 | 1489 | 12.1 | 2.4 | 167.4 |
| Other Western Europe | 393 | 3.6 | 432 | 3.5 | 1.9 | 39.4 |
| Sub-total West Europe | 9311 | 85.1 | 10261 | 83.6 | 2.0 | 950.3 |
| Nordic Region | 321 | 2.9 | 359 | 2.9 | 2.3 | 38.3 |
| Poland | 783 | 7.2 | 1023 | 8.3 | 5.5 | 239.9 |
| Other Central Europe | 529 | 4.8 | 631 | 5.1 | 3.6 | 102.0 |
| Central Europe | 1312 | 12.0 | 1654 | 13.5 | 4.7 | 341.9 |
| Total Europe | 10944 | 100.0 | 12274 | 100.0 | 2.3 | 1330.5 |

| Forecasts of Incremental Value Of Carton Sales Generated By Each Country Ranked by Size of Increment – 2018 to 2023 – € Million | | |
|---|---------------|--------------|
| Country | 2018 to 2023 | |
| | € M Incr | % |
| Turkey | 280.3 | 21.1 |
| Poland | 239.9 | 18.0 |
| U.K. | 167.4 | 12.6 |
| France | 128.0 | 9.6 |
| Spain | 108.8 | 8.2 |
| Other Central Europe | 102.0 | 7.7 |
| Italy | 86.1 | 6.5 |
| Netherlands | 80.9 | 6.1 |
| Germany | 72.3 | 5.4 |
| Other Western Europe | 39.4 | 3.0 |
| Nordic Region | 38.3 | 2.9 |
| Belgium | 12.1 | 0.9 |
| Austria | 10.4 | 0.8 |
| Switzerland | -35.5 | -2.7 |
| Total Europe | 1330.5 | 100.0 |

Forecasts of Carton Sales Analysed by Generic Market – Total Europe – 2018 & 2023 – € Million - % Change & Incremental Business Forecasts

| Sector | 2018 | | 2023 | | 18 to 23 | |
|-----------------------|--------------|--------------|--------------|--------------|------------|---------------|
| | €M | % | €M | % | % p.a. | Incr. €M |
| Food | 4747 | 43.4 | 5545 | 45.2 | 3.2 | 797.5 |
| Drinks | 937 | 8.6 | 1139 | 9.3 | 4.0 | 202.6 |
| Non-Food Consumables | 4173 | 38.1 | 4514 | 36.8 | 1.6 | 340.5 |
| Sub-total FMCG | 9857 | 90.1 | 11198 | 91.2 | 2.6 | 1340.5 |
| Durables & Household | 1086 | 9.9 | 1076 | 8.8 | -0.2 | -10.0 |
| TOTAL | 10944 | 100.0 | 12274 | 100.0 | 2.3 | 1330.5 |

NB: Fast food now included with food, previously included with durables & household under other non-food.

Forecasts of Incremental Carton Sales Generated by Each Market – 2018 to 2023 – € Million

| Sector | € M Incr | % |
|-----------------------|---------------|--------------|
| Food | 797.5 | 59.9 |
| Drinks | 202.6 | 15.2 |
| Non-Food Consumables | 340.5 | 25.6 |
| Sub-total FMCG | 1340.5 | 100.8 |
| Durables & Household | -10.0 | -0.8 |
| TOTAL | 1330.5 | 100.0 |

| Estimates & Forecasts of Carton Sales Analysed by Market – Total Europe – 2018 & 2023 – € Million - % Change & Incremental Business Forecasts | | | | | | |
|---|--------------|--------------|--------------|--------------|------------|---------------|
| Sector | 2018 | | 2023 | | 18 to 23 | |
| | €M | % | €M | % | % p.a. | Incr. €M |
| Food | | | | | | |
| Breakfast cereal products | 468 | 4.3 | 476 | 3.9 | 0.4 | 8.4 |
| Cakes, biscuits, baked products | 560 | 5.1 | 637 | 5.2 | 2.6 | 76.9 |
| Chocolate & sugar confectionery | 885 | 8.1 | 964 | 7.9 | 1.7 | 78.7 |
| Chilled foods | 402 | 3.7 | 520 | 4.2 | 5.3 | 117.6 |
| Dry beverages | 228 | 2.1 | 258 | 2.1 | 2.5 | 30.1 |
| Food to go | 361 | 3.3 | 453 | 3.7 | 4.7 | 92.4 |
| Frozen food | 983 | 9.0 | 1211 | 9.9 | 4.3 | 228.3 |
| Soft drinks & beer | 562 | 5.1 | 703 | 5.7 | 4.6 | 140.6 |
| Wines & spirits | 375 | 3.4 | 437 | 3.6 | 3.1 | 62.0 |
| Other foods | 861 | 7.9 | 1026 | 8.4 | 3.6 | 164.9 |
| Sub-total Food | 5684 | 51.9 | 6684 | 54.5 | 3.3 | 1000.0 |
| Non-Food | | | | | | |
| Cigarettes, tobacco, accessories | 293 | 2.7 | 277 | 2.3 | -1.1 | -16.3 |
| Cleaning & laundry products | 322 | 2.9 | 348 | 2.8 | 1.6 | 26.0 |
| Cosmetics & beauty | 721 | 6.6 | 833 | 6.8 | 2.9 | 112.4 |
| Misc household products | 393 | 3.6 | 396 | 3.2 | 0.1 | 2.8 |
| Paper, stationery & related goods | 249 | 2.3 | 253 | 2.1 | 0.3 | 3.4 |
| Personal hygiene | 371 | 3.4 | 409 | 3.3 | 2.0 | 38.0 |
| Pharmaceuticals & medical products | 1756 | 16.0 | 1898 | 15.5 | 1.6 | 142.1 |
| Other non-foods | 1154 | 10.5 | 1176 | 9.6 | 0.4 | 22.0 |
| Sub-total Non-food | 5259 | 48.1 | 5590 | 45.5 | 1.2 | 330.4 |
| TOTAL | 10944 | 100.0 | 12274 | 100.0 | 2.3 | 1330.5 |

NB: 1 Soft drinks & beer includes multipacks

NB: 2 Cigarettes, tobacco & accessories includes vaping & tobacco substitutes

Forecasts of Incremental Carton Sales Generated by Each Market Ranked by Size of Increment – 2018 to 2023 – € Million

| Country | € M Incr | % |
|------------------------------------|---------------|--------------|
| Frozen food | 228.3 | 17.2 |
| Other foods | 164.9 | 12.4 |
| Pharmaceuticals & medical products | 142.1 | 10.7 |
| Soft drinks & beer | 140.6 | 10.6 |
| Chilled foods | 117.6 | 8.8 |
| Cosmetics & beauty | 112.4 | 8.4 |
| Food to go | 92.4 | 6.9 |
| Chocolate & sugar confectionery | 78.7 | 5.9 |
| Cakes, biscuits, baked products | 76.9 | 5.8 |
| Wines & spirits | 62.0 | 4.7 |
| Personal hygiene | 38.0 | 2.9 |
| Dry beverages | 30.1 | 2.3 |
| Cleaning & laundry products | 26.0 | 2.0 |
| Other non-foods | 22.0 | 1.7 |
| Breakfast cereal products | 8.4 | 0.6 |
| Paper, stationery & related goods | 3.4 | 0.3 |
| Misc household products | 2.8 | 0.2 |
| Cigarettes, tobacco, accessories | -16.3 | -1.2 |
| TOTAL | 1330.5 | 100.0 |

NB: 1 Soft drinks & beer includes multipacks

NB: 2 Cigarettes, tobacco & accessories includes vaping & tobacco substitutes

Output of Cartonboard Cartons & Litho Laminated Microflute Cartons - Analysed by Country - 2018 - 000 Tonnes

| Country | Cartonboard Cartons | | Litho Printed Microflute Cartons | | Total | |
|------------------------------|---------------------|-------------|----------------------------------|-------------|-------------|--------------|
| | 000 Tonnes | % | 000 Tonnes | % | 000 Tonnes | % |
| Austria | 124 | 90.9 | 12 | 9.1 | 136 | 100.0 |
| Belgium | 67 | 56.5 | 52 | 43.5 | 119 | 100.0 |
| France | 429 | 80.0 | 107 | 20.0 | 536 | 100.0 |
| Germany | 854 | 80.6 | 205 | 19.4 | 1059 | 100.0 |
| Italy | 432 | 64.7 | 236 | 35.3 | 668 | 100.0 |
| Netherlands | 198 | 76.1 | 62 | 23.9 | 260 | 100.0 |
| Spain | 224 | 61.9 | 138 | 38.1 | 362 | 100.0 |
| Switzerland | 74 | 85.3 | 13 | 14.7 | 87 | 100.0 |
| Turkey | 351 | 66.9 | 174 | 33.1 | 525 | 100.0 |
| U.K. | 570 | 91.7 | 52 | 8.3 | 621 | 100.0 |
| Other Western Europe | 151 | 74.4 | 52 | 25.6 | 204 | 100.0 |
| Sub-total West Europe | 3475 | 75.9 | 1103 | 24.1 | 4577 | 100.0 |
| Nordic Region | 126 | 76.5 | 39 | 23.5 | 165 | 100.0 |
| Poland | 397 | 79.5 | 103 | 20.5 | 500 | 100.0 |
| Other Central Europe | 260 | 76.3 | 80 | 23.7 | 340 | 100.0 |
| Central Europe | 657 | 78.2 | 183 | 21.8 | 840 | 100.0 |
| Total Europe | 4258 | 76.3 | 1324 | 23.7 | 5583 | 100.0 |

| Comparison of Carton Output Index & GDP/Retail Sales Composite Index - 2013 to 2018 - 2013=100 | | |
|--|---------------------|-------------------------------|
| Country | Carton Output Index | Comp. GDP/ Retail Sales Index |
| Austria | 109 | 108 |
| Belgium | 94 | 107 |
| France | 103 | 106 |
| Germany | 102 | 110 |
| Italy | 113 | 104 |
| Netherlands | 99 | 111 |
| Spain | 113 | 114 |
| Switzerland | 86 | 108 |
| Turkey | 137 | 122 |
| U.K. | 106 | 111 |
| Other Western Europe | 105 | 106 |
| Sub-total West Europe | 108 | 110 |
| Nordic Region | 107 | 111 |
| Poland | 133 | 121 |
| Other Central Europe | 121 | 121 |
| Central Europe | 128 | 121 |
| Total Europe | 111 | 112 |

NB: The composite index comprises 80% GDP & 20% Retail Sales

12.1.1 Austria

| Table 1 – Summary of Carton Production – Austria – 2018 - 000 Tonnes | |
|--|------------|
| Cartonboard Consumption for Cartons | 151 |
| Cartonboard Consumption for Litho Printed Corrugated | 6 |
| Sub-Total Cartonboard Consumption | 158 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 9 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 167 |
| LESS: Wastage | 31 |
| TOTAL CARTON OUTPUT | 136 |
| | |
| Value per Tonne of Carton Output € / Tonne | 2161 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 294 |
| Waste % | 18.5 |

NB1: Historic values expressed at current prices, forecasts at constant 2018 prices

NB2: Weighted composite index consists of 80% GDP & 20% Retail Sales

Table 2 - Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Austria – 2013 to 2023 - 000 Tonnes & € Million

| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
|------|-----------------------|-----------|-----------------|---------------|-----------|-----------------|------------------------|--------------|--------|-----------------|
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 145 | -0.7 | 100 | 125 | -0.7 | 100 | 100 | 267 | -0.4 | 100 |
| 2014 | 146 | 0.7 | 101 | 126 | 0.8 | 101 | 100 | 269 | 0.7 | 101 |
| 2015 | 142 | -2.8 | 98 | 122 | -3.2 | 98 | 101 | 270 | 0.3 | 101 |
| 2016 | 142 | 0.0 | 98 | 122 | 0.0 | 98 | 103 | 275 | 1.9 | 103 |
| 2017 | 155 | 9.2 | 107 | 133 | 9.0 | 106 | 106 | 297 | 8.0 | 111 |
| 2018 | 158 | 1.9 | 109 | 136 | 2.3 | 109 | 108 | 294 | -1.0 | 110 |
| 2019 | 160 | 1.3 | 110 | 138 | 1.4 | 110 | 110 | 297 | 0.9 | 111 |
| 2020 | 162 | 1.1 | 111 | 140 | 1.2 | 112 | 112 | 299 | 0.7 | 112 |
| 2021 | 163 | 1.1 | 113 | 141 | 1.2 | 113 | 114 | 301 | 0.7 | 113 |
| 2022 | 165 | 1.1 | 114 | 143 | 1.2 | 114 | 115 | 303 | 0.7 | 113 |
| 2023 | 167 | 1.0 | 115 | 144 | 1.1 | 116 | 117 | 304 | 0.6 | 114 |

Table 3 – Folding Carton Production Analysed by Market Sector - Austria - 2013, 2018, 2023 – € Million

| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|-------------|
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast Cereal Product | | | | | | | | |
| Cakes, biscuits, baked products | | | | | | | | |
| Chocolate & sugar confectionery | | | | | | | | |
| Dry Beverages | | | | | | | | |
| Frozen/chilled food, meats, desserts | | | | | | | | |
| Wines, spirits, beer, soft drinks | | | | | | | | |
| Other foods | | | | | | | | |
| Sub Total Food | 94.0 | 35.2 | 102.9 | 35.0 | 118.9 | 39.1 | 1.8 | 2.9 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | | | | | | | | |
| Cleaning, laundry products | | | | | | | | |
| Cosmetics, beauty care, pers. hyg. | | | | | | | | |
| Miscellaneous household products | | | | | | | | |
| Paper, stationery & related goods | | | | | | | | |
| Pharmaceuticals, medical products | | | | | | | | |
| Other non-foods | | | | | | | | |
| Sub Total Non-Food | 173.0 | 64.8 | 191.1 | 65.0 | 185.5 | 60.9 | 2.0 | -0.6 |
| TOTAL | 267.0 | 100.0 | 294.0 | 100.0 | 304.4 | 100.0 | 1.9 | 0.7 |

12.1.2 Belgium

| Table 1 – Summary of Carton Production – Belgium – 2018 - 000 Tonnes | |
|--|------------|
| Cartonboard Consumption for Cartons | 81 |
| Cartonboard Consumption for Litho Printed Corrugated | 26 |
| Sub-Total Cartonboard Consumption | 107 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 39 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 146 |
| LESS: Wastage | 27 |
| TOTAL CARTON OUTPUT | 119 |
| Value per Tonne of Carton Output € / Tonne | 1873 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 223 |
| Waste % | 18.2 |

| Table 2 - Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Belgium – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|-----------|-----------------|---------------|-----------|-----------------|------------------------|--------------|--------|-----------------|
| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 126 | 7.0 | 100 | 127 | 7.1 | 100 | 100 | 246 | 3.6 | 100 |
| 2014 | 110 | -12.2 | 88 | 116 | -9.1 | 91 | 101 | 229 | -7.1 | 93 |
| 2015 | 110 | -0.1 | 88 | 115 | -0.1 | 91 | 103 | 222 | -2.8 | 90 |
| 2016 | 109 | -1.3 | 87 | 114 | -1.3 | 90 | 104 | 215 | -3.1 | 87 |
| 2017 | 109 | 0.0 | 87 | 115 | 1.0 | 91 | 106 | 217 | 0.8 | 88 |
| 2018 | 113 | 3.3 | 89 | 119 | 3.6 | 94 | 107 | 223 | 3.0 | 91 |
| 2019 | 114 | 1.0 | 90 | 121 | 1.1 | 95 | 109 | 225 | 0.9 | 92 |
| 2020 | 115 | 1.1 | 91 | 122 | 1.2 | 96 | 110 | 228 | 1.0 | 93 |
| 2021 | 116 | 1.2 | 92 | 124 | 1.3 | 97 | 112 | 230 | 1.1 | 94 |
| 2022 | 118 | 1.2 | 94 | 125 | 1.3 | 99 | 113 | 233 | 1.1 | 95 |
| 2023 | 119 | 1.2 | 95 | 127 | 1.3 | 100 | 115 | 235 | 1.1 | 96 |

NB1: Historic values expressed at current prices, forecasts at constant 2018 prices

NB2: Weighted composite index consists of 80% GDP & 20% Retail Sales

Table 3 – Folding Carton Production Analysed by Market Sector - Belgium - 2013, 2018, 2023 – € Million

| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|------------|
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast Cereal Product | 4.4 | 1.8 | 3.5 | 1.5 | 3.0 | 1.3 | -4.8 | -3.0 |
| Cakes, biscuits, baked products | 11.4 | 4.6 | 10.1 | 4.5 | 10.1 | 4.3 | -2.4 | 0.1 |
| Chocolate & sugar confectionery | 22.6 | 9.2 | 19.4 | 8.7 | 18.7 | 7.9 | -3.1 | -0.7 |
| Dry Beverages | 1.6 | 0.6 | 1.4 | 0.6 | 1.5 | 0.6 | -2.0 | 0.5 |
| Frozen/chilled food, meats, desserts | 37.0 | 15.0 | 35.6 | 15.9 | 41.0 | 17.4 | -0.8 | 2.8 |
| Wines, spirits, beer, soft drinks | 17.6 | 7.1 | 17.2 | 7.7 | 19.8 | 8.4 | -0.5 | 2.9 |
| Other foods | 33.1 | 13.5 | 30.1 | 13.5 | 32.1 | 13.6 | -1.9 | 1.3 |
| Sub Total Food | 127.7 | 51.9 | 117.3 | 52.5 | 126.1 | 53.6 | -1.7 | 1.5 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | 2.3 | 0.9 | 2.0 | 0.9 | 1.9 | 0.8 | -2.8 | -0.5 |
| Cleaning, laundry products | 12.7 | 5.2 | 10.0 | 4.5 | 10.4 | 4.4 | -4.7 | 0.8 |
| Cosmetics, beauty care, pers. hyg. | 13.8 | 5.6 | 14.3 | 6.4 | 16.4 | 7.0 | 0.8 | 2.7 |
| Miscellaneous household products | 4.1 | 1.6 | 3.0 | 1.4 | 2.5 | 1.1 | -5.5 | -4.1 |
| Paper, stationery & related goods | 2.2 | 0.9 | 1.8 | 0.8 | 1.6 | 0.7 | -4.1 | -2.0 |
| Pharmaceuticals, medical products | 52.6 | 21.4 | 49.2 | 22.0 | 52.0 | 22.1 | -1.3 | 1.1 |
| Other non-foods | 30.7 | 12.5 | 25.8 | 11.6 | 24.5 | 10.4 | -3.4 | -1.0 |
| Sub Total Non-Food | 118.3 | 48.1 | 106.1 | 47.5 | 109.3 | 46.4 | -2.1 | 0.6 |
| TOTAL | 246.0 | 100.0 | 223.3 | 100.0 | 235.4 | 100.0 | -1.9 | 1.1 |

NB: Some companies exporting into UK will be affected by structural shifts in the supply chain due to Brexit and reliance on current business in UK

12.1.3 France

| Table 1 – Summary of Carton Production – France – 2018 - 000 Tonnes | |
|---|-------------|
| Cartonboard Consumption for Cartons | 515 |
| Cartonboard Consumption for Litho Printed Corrugated | 54 |
| Sub-Total Cartonboard Consumption | 569 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 78 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 647 |
| LESS: Wastage | 111 |
| TOTAL CARTON OUTPUT | 536 |
| Value per Tonne of Carton Output € / Tonne | 2392 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 1281 |
| Waste % | 17.2 |

| Table 2 - Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - France – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|-----------------|---------------|--------|-----------------|------------------------|--------------|-----------|-----------------|
| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 542 | 1.9 | 100.0 | 520 | 2.0 | 100 | 100 | 1237 | 2.51 | 100 |
| 2014 | 539 | -0.5 | 100 | 517 | -0.5 | 100 | 101 | 1237 | 0.0 | 100 |
| 2015 | 544 | 1.0 | 100 | 522 | 1.0 | 100 | 102 | 1243 | 0.5 | 101 |
| 2016 | 550 | 1.0 | 101 | 528 | 1.0 | 101 | 103 | 1256 | 1.0 | 102 |
| 2017 | 556 | 1.1 | 103 | 533 | 1.1 | 103 | 105 | 1275 | 1.5 | 103 |
| 2018 | 558 | 0.4 | 103 | 536 | 0.5 | 103 | 106 | 1281 | 0.5 | 104 |
| 2019 | 565 | 1.3 | 104 | 543 | 1.4 | 105 | 107 | 1300 | 1.4 | 105 |
| 2020 | 578 | 2.3 | 107 | 557 | 2.4 | 107 | 109 | 1331 | 2.4 | 108 |
| 2021 | 589 | 1.8 | 109 | 567 | 1.9 | 109 | 110 | 1357 | 1.9 | 110 |
| 2022 | 600 | 1.8 | 111 | 578 | 1.9 | 111 | 112 | 1383 | 1.9 | 112 |
| 2023 | 610 | 1.8 | 113 | 589 | 1.9 | 113 | 113 | 1409 | 1.9 | 114 |

NB1: Historic values expressed at current prices, forecasts at constant 2018 prices

NB2: Weighted composite index consists of 80% GDP & 20% Retail Sales

Table 3 – Folding Carton Production Analysed by Market Sector - France - 2013, 2018, 2023 – € Million

| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
|--------------------------------------|---------------|--------------|---------------|--------------|---------------|--------------|------------|------------|
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast Cereal Product | 27.7 | 2.2 | 24.2 | 1.9 | 21.5 | 1.5 | -2.7 | -2.3 |
| Cakes, biscuits, baked products | 55.4 | 4.5 | 55.1 | 4.3 | 57.6 | 4.1 | -0.1 | 0.9 |
| Chocolate & sugar confectionery | 43.0 | 3.5 | 43.1 | 3.4 | 45.3 | 3.2 | 0.0 | 1.0 |
| Dry Beverages | 29.0 | 2.3 | 29.6 | 2.3 | 31.8 | 2.3 | 0.4 | 1.4 |
| Frozen/chilled food, meats, desserts | 221.5 | 17.9 | 242.0 | 18.9 | 293.3 | 20.8 | 1.8 | 3.9 |
| Wines, spirits, beer, soft drinks | 203.7 | 16.5 | 212.8 | 16.6 | 244.8 | 17.4 | 0.9 | 2.8 |
| Other foods | 98.0 | 7.9 | 105.6 | 8.2 | 123.4 | 8.8 | 1.5 | 3.2 |
| Sub Total Food | 678.4 | 54.8 | 712.3 | 55.6 | 817.6 | 58.0 | 1.0 | 2.8 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | 16.4 | 1.3 | 13.4 | 1.0 | 10.2 | 0.7 | -3.9 | -5.4 |
| Cleaning, laundry products | 40.8 | 3.3 | 37.1 | 2.9 | 39.9 | 2.8 | -1.9 | 1.5 |
| Cosmetics, beauty care, pers. hyg. | 110.8 | 9.0 | 124.1 | 9.7 | 139.0 | 9.9 | 2.3 | 2.3 |
| Miscellaneous household products | 38.8 | 3.1 | 35.7 | 2.8 | 32.5 | 2.3 | -1.7 | -1.9 |
| Paper, stationery & related goods | 25.1 | 2.0 | 24.8 | 1.9 | 24.7 | 1.8 | -0.2 | -0.1 |
| Pharmaceuticals, medical products | 161.4 | 13.0 | 171.5 | 13.4 | 184.7 | 13.1 | 1.2 | 1.5 |
| Other non-foods | 165.2 | 13.4 | 162.3 | 12.7 | 160.7 | 11.4 | -0.4 | -0.2 |
| Sub Total Non-Food | 558.6 | 45.2 | 569.0 | 44.4 | 591.7 | 42.0 | 0.4 | 0.8 |
| TOTAL | 1237.0 | 100.0 | 1281.3 | 100.0 | 1409.3 | 100.0 | 0.7 | 1.9 |

12.1.4 Germany

| Table 1 – Summary of Carton Production – Germany – 2018 - 000 Tonnes | |
|--|-------------|
| Cartonboard Consumption for Cartons | 1024 |
| Cartonboard Consumption for Litho Printed Corrugated | 103 |
| Sub-Total Cartonboard Consumption | 1127 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 150 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 1278 |
| LESS: Wastage | 218 |
| TOTAL CARTON OUTPUT | 1059 |
| | |
| Value per Tonne of Carton Output € / Tonne | 1982 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 2100 |
| Waste % | 17.1 |

| Table 2 - Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Germany – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|--|-----------------------|-----------|-----------------|---------------|-----------|-----------------|------------------------|--------------|--------|-----------------|
| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 1118 | -1.0 | 100 | 1035 | -0.9 | 100 | 100 | 2111 | -0.6 | 100 |
| 2014 | 1103 | -1.4 | 99 | 1021 | -1.3 | 99 | 102 | 2111 | 0.0 | 100 |
| 2015 | 1127 | 2.2 | 101 | 1045 | 2.3 | 101 | 104 | 2096 | -0.7 | 99 |
| 2016 | 1104 | -2.0 | 99 | 1025 | -1.9 | 99 | 106 | 2048 | -2.3 | 97 |
| 2017 | 1122 | 1.6 | 100 | 1042 | 1.7 | 101 | 108 | 2091 | 2.1 | 99 |
| 2018 | 1148 | 2.3 | 103 | 1059 | 1.6 | 102 | 110 | 2100 | 0.4 | 99 |
| 2019 | 1152 | 0.3 | 103 | 1064 | 0.4 | 103 | 111 | 2083 | -0.8 | 99 |
| 2020 | 1165 | 1.1 | 104 | 1077 | 1.2 | 104 | 112 | 2088 | 0.2 | 99 |
| 2021 | 1181 | 1.4 | 106 | 1093 | 1.5 | 106 | 114 | 2115 | 1.3 | 100 |
| 2022 | 1197 | 1.3 | 107 | 1108 | 1.4 | 107 | 115 | 2141 | 1.2 | 101 |
| 2023 | 1215 | 1.5 | 109 | 1127 | 1.6 | 109 | 117 | 2172 | 1.4 | 103 |

| Table 3 – Folding Carton Production Analysed by Market Sector - Germany - 2013, 2018, 2023 – € Million | | | | | | | | |
|--|---------------|--------------|---------------|--------------|---------------|--------------|-------------|-------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast Cereal Product | 122.6 | 5.8 | 110.2 | 5.2 | 100.1 | 4.6 | -2.1 | -1.9 |
| Cakes, biscuits, baked products | 59.9 | 2.8 | 60.5 | 2.9 | 62.6 | 2.9 | 0.2 | 0.7 |
| Chocolate & sugar confectionery | 236.3 | 11.2 | 226.9 | 10.8 | 222.2 | 10.2 | -0.8 | -0.4 |
| Dry Beverages | 42.7 | 2.0 | 46.1 | 2.2 | 50.5 | 2.3 | 1.5 | 1.9 |
| Frozen/chilled food, meats, desserts | 235.3 | 11.1 | 264.6 | 12.6 | 318.7 | 14.7 | 2.4 | 3.8 |
| Wines, spirits, beer, soft drinks | 46.1 | 2.2 | 52.1 | 2.5 | 62.3 | 2.9 | 2.5 | 3.6 |
| Other foods | 154.5 | 7.3 | 169.2 | 8.1 | 194.7 | 9.0 | 1.8 | 2.9 |
| Sub Total Food | 897.5 | 42.5 | 929.5 | 44.3 | 1011.2 | 46.6 | 0.7 | 1.7 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | 94.6 | 4.5 | 76.2 | 3.6 | 58.9 | 2.7 | -4.2 | -5.0 |
| Cleaning, laundry products | 64.1 | 3.0 | 53.4 | 2.5 | 52.6 | 2.4 | -3.6 | -0.3 |
| Cosmetics, beauty care, pers. hyg. | 276.5 | 13.1 | 271.3 | 12.9 | 270.9 | 12.5 | -0.4 | 0.0 |
| Miscellaneous household products | 92.1 | 4.4 | 80.4 | 3.8 | 70.3 | 3.2 | -2.7 | -2.6 |
| Paper, stationery & related goods | 39.9 | 1.9 | 37.7 | 1.8 | 36.3 | 1.7 | -1.2 | -0.7 |
| Pharmaceuticals, medical products | 379.2 | 18.0 | 391.8 | 18.7 | 414.0 | 19.1 | 0.7 | 1.1 |
| Other non-foods | 267.3 | 12.7 | 259.4 | 12.4 | 257.7 | 11.9 | -0.6 | -0.1 |
| Sub Total Non-Food | 1213.7 | 57.5 | 1170.0 | 55.7 | 1160.6 | 53.4 | -0.7 | -0.2 |
| TOTAL | 2111.1 | 100.0 | 2099.5 | 100.0 | 2171.8 | 100.0 | -0.1 | 0.7 |

12.1.5 Italy

| Table 1 – Summary of Carton Production – Italy – 2018 - 000 Tonnes | |
|--|-------------|
| Cartonboard Consumption for Cartons | 516 |
| Cartonboard Consumption for Litho Printed Corrugated | 119 |
| Sub-Total Cartonboard Consumption | 636 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 173 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 809 |
| LESS: Wastage | 141 |
| TOTAL CARTON OUTPUT | 668 |
| | |
| Value per Tonne of Carton Output € / Tonne | 1986 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 1327 |
| Waste % | 17.4 |

Table 2 - Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Italy – 2013 to 2023 - 000 Tonnes & € Million

| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
|------|-----------------------|-----------|-----------------|---------------|-----------|-----------------|------------------------|--------------|--------|-----------------|
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 578 | -0.9 | 100 | 589 | -0.8 | 100 | 100 | 1163 | -0.3 | 100 |
| 2014 | 606 | 4.9 | 105 | 618 | 4.9 | 105 | 100 | 1198 | 3.0 | 103 |
| 2015 | 633 | 4.5 | 110 | 646 | 4.5 | 110 | 101 | 1240 | 3.5 | 107 |
| 2016 | 637 | 0.7 | 110 | 650 | 0.7 | 110 | 102 | 1245 | 0.4 | 107 |
| 2017 | 649 | 1.9 | 112 | 662 | 1.9 | 112 | 104 | 1282 | 3.0 | 110 |
| 2018 | 655 | 0.9 | 113 | 668 | 0.9 | 113 | 104 | 1327 | 3.5 | 114 |
| 2019 | 660 | 0.7 | 114 | 674 | 0.8 | 114 | 104 | 1338 | 0.8 | 115 |
| 2020 | 668 | 1.3 | 116 | 683 | 1.4 | 116 | 105 | 1357 | 1.4 | 117 |
| 2021 | 677 | 1.2 | 117 | 692 | 1.3 | 118 | 106 | 1375 | 1.3 | 118 |
| 2022 | 685 | 1.3 | 119 | 702 | 1.4 | 119 | 107 | 1394 | 1.4 | 120 |
| 2023 | 694 | 1.3 | 120 | 712 | 1.4 | 121 | 107 | 1413 | 1.4 | 122 |

NB1: Historic values expressed at current prices, forecasts at constant 2018 prices

NB2: Weighted composite index consists of 80% GDP & 20% Retail Sales

| Table 3 – Folding Carton Production Analysed by Market Sector - Italy - 2013, 2018, 2023 – € Million | | | | | | | | |
|--|---------------|--------------|---------------|--------------|---------------|--------------|------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast Cereal Product | 14.9 | 1.3 | 14.3 | 1.1 | 12.4 | 0.9 | -0.7 | -2.8 |
| Cakes, biscuits, baked products | 89.7 | 7.7 | 104.7 | 7.9 | 113.4 | 8.0 | 3.1 | 1.6 |
| Chocolate & sugar confectionery | 113.4 | 9.8 | 126.5 | 9.5 | 130.6 | 9.2 | 2.2 | 0.6 |
| Dry Beverages | 36.7 | 3.2 | 44.9 | 3.4 | 50.8 | 3.6 | 4.2 | 2.5 |
| Frozen/chilled food, meats, desserts | 117.0 | 10.1 | 148.0 | 11.2 | 181.9 | 12.9 | 4.8 | 4.2 |
| Wines, spirits, beer, soft drinks | 38.2 | 3.3 | 49.0 | 3.7 | 60.2 | 4.3 | 5.1 | 4.2 |
| Other foods | 121.4 | 10.4 | 146.5 | 11.0 | 168.9 | 12.0 | 3.8 | 2.9 |
| Sub Total Food | 531.2 | 45.7 | 634.0 | 47.8 | 718.1 | 50.8 | 3.6 | 2.5 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | 60.7 | 5.2 | 53.5 | 4.0 | 38.5 | 2.7 | -2.5 | -6.4 |
| Cleaning, laundry products | 43.5 | 3.7 | 43.4 | 3.3 | 46.2 | 3.3 | 0.0 | 1.3 |
| Cosmetics, beauty care, pers. hyg. | 110.0 | 9.5 | 146.5 | 11.0 | 172.1 | 12.2 | 5.9 | 3.3 |
| Miscellaneous household products | 51.7 | 4.4 | 50.3 | 3.8 | 43.0 | 3.0 | -0.5 | -3.1 |
| Paper, stationery & related goods | 34.6 | 3.0 | 35.5 | 2.7 | 32.6 | 2.3 | 0.5 | -1.7 |
| Pharmaceuticals, medical products | 148.8 | 12.8 | 168.6 | 12.7 | 173.6 | 12.3 | 2.5 | 0.6 |
| Other non-foods | 182.3 | 15.7 | 195.1 | 14.7 | 188.9 | 13.4 | 1.4 | -0.6 |
| Sub Total Non-Food | 631.6 | 54.3 | 693.0 | 52.2 | 695.0 | 49.2 | 1.9 | 0.1 |
| TOTAL | 1162.8 | 100.0 | 1327.0 | 100.0 | 1413.1 | 100.0 | 2.7 | 1.3 |

12.1.6 Netherlands

| Table 1 – Summary of Carton Production – Netherlands – 2018 - 000 Tonnes | |
|--|------------|
| Cartonboard Consumption for Cartons | 238 |
| Cartonboard Consumption for Litho Printed Corrugated | 31 |
| Sub-Total Cartonboard Consumption | 269 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 46 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 315 |
| LESS: Wastage | 54 |
| TOTAL CARTON OUTPUT | 260 |
| | |
| Value per Tonne of Carton Output € / Tonne | 2126 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 553 |
| Waste % | 17.3 |

| Table 2 - Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Netherlands – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|--|-----------------------|-----------|---------------------|---------------|-----------|---------------------|------------------------|--------------|--------|---------------------|
| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| | 000 Tonnes | % p.a. | Index 13=10 0 | 000 Tonnes | % p.a. | Index 13=10 0 | Index 13=10 0 | €M | % p.a. | Index 13=10 0 |
| 2013 | 283 | 0.2 | 100 | 263 | 0.3 | 100 | 100 | 536 | 0 | 100 |
| 2014 | 285 | 0.8 | 101 | 265 | 0.8 | 101 | 101 | 542 | 1.1 | 101 |
| 2015 | 288 | 1.1 | 102 | 270 | 1.9 | 103 | 103 | 553 | 2.0 | 103 |
| 2016 | 288 | -0.1 | 102 | 270 | 0.0 | 103 | 105 | 554 | 0.1 | 103 |
| 2017 | 270 | -6.1 | 96 | 254 | -5.9 | 97 | 108 | 526 | -5.0 | 98 |
| 2018 | 277 | 2.4 | 98 | 260 | 2.4 | 99 | 111 | 553 | 5.1 | 103 |
| 2019 | 284 | 2.8 | 101 | 268 | 2.9 | 102 | 113 | 570 | 3.0 | 106 |
| 2020 | 294 | 3.2 | 104 | 277 | 3.3 | 105 | 115 | 589 | 3.4 | 110 |
| 2021 | 300 | 2.3 | 106 | 283 | 2.4 | 108 | 116 | 604 | 2.5 | 113 |
| 2022 | 307 | 2.3 | 109 | 290 | 2.4 | 110 | 118 | 619 | 2.5 | 115 |
| 2023 | 314 | 2.2 | 111 | 297 | 2.3 | 113 | 120 | 634 | 2.4 | 118 |

NB1: Historic values expressed at current prices, forecasts at constant 2018 prices

NB2: Weighted composite index consists of 80% GDP & 20% Retail Sales

NB: 2016 to 2018 includes adjustments to allow for the closure of a plant in Eindhoven reduced output at another plant in Bergen op Zoom

| Table 3 – Folding Carton Production Analysed by Market Sector - Netherlands - 2013, 2018, 2023 – € Million | | | | | | | | |
|--|--------------|--------------|--------------|--------------|--------------|--------------|-------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast cereal products | 20.7 | 3.9 | 22.2 | 4.0 | 25.8 | 4.1 | 1.4 | 3.0 |
| Cakes, biscuits, baked products | 26.9 | 5.0 | 28.1 | 5.1 | 31.8 | 5.0 | 0.9 | 2.5 |
| Chocolate & sugar confectionery | 20.7 | 3.9 | 20.7 | 3.7 | 22.3 | 3.5 | 0.0 | 1.5 |
| Dry Beverages | 8.0 | 1.5 | 9.1 | 1.6 | 11.0 | 1.7 | 2.6 | 4.0 |
| Frozen/chilled food, meats, desserts | 67.4 | 12.6 | 84.4 | 15.3 | 117.4 | 18.5 | 4.6 | 6.8 |
| Wines, spirits, beer, soft drinks | 93.3 | 17.4 | 93.3 | 16.9 | 105.7 | 16.7 | 0.0 | 2.5 |
| Other foods | 68.8 | 12.8 | 76.2 | 13.8 | 94.7 | 14.9 | 2.1 | 4.4 |
| Sub Total Food | 305.8 | 57.0 | 334.0 | 60.4 | 408.7 | 64.5 | 1.8 | 4.1 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | 21.8 | 4.1 | 3.4 | 0.6 | 2.4 | 0.4 | -30.9 | -6.6 |
| Cleaning, laundry products | 15.6 | 2.9 | 13.3 | 2.4 | 12.9 | 2.0 | -3.1 | -0.6 |
| Cosmetics, beauty care, pers. hyg. | 17.5 | 3.3 | 19.7 | 3.6 | 22.1 | 3.5 | 2.4 | 2.3 |
| Miscellaneous household products | 16.8 | 3.1 | 15.6 | 2.8 | 14.2 | 2.2 | -1.5 | -1.9 |
| Paper, stationery & related goods | 10.9 | 2.0 | 10.9 | 2.0 | 10.7 | 1.7 | 0.0 | -0.2 |
| Pharmaceuticals, medical products | 76.2 | 14.2 | 82.2 | 14.9 | 87.1 | 13.7 | 1.5 | 1.2 |
| Other non-foods | 71.5 | 13.3 | 73.9 | 13.4 | 75.6 | 11.9 | 0.6 | 0.5 |
| Sub Total Non-Food | 230.3 | 43.0 | 219.0 | 39.6 | 225.2 | 35.5 | -1.0 | 0.6 |
| TOTAL | 536.0 | 100.0 | 553.0 | 100.0 | 633.9 | 100.0 | 0.6 | 2.8 |

12.1.7 Spain

| Table 1 – Summary of Carton Production – Spain – 2018 - 000 Tonnes | |
|--|------------|
| Cartonboard Consumption for Cartons | 267 |
| Cartonboard Consumption for Litho Printed Corrugated | 70 |
| Sub-Total Cartonboard Consumption | 336 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 101 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 438 |
| LESS: Wastage | 76 |
| TOTAL CARTON OUTPUT | 362 |
| Value per Tonne of Carton Output € / Tonne | 2037 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 737 |
| Waste % | 17.3 |

| Table 2 - Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Spain – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|--|-----------------------|-----------|-----------------|---------------|-----------|-----------------|------------------------|--------------|--------|---------------------|
| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=10 0 |
| 2013 | 340 | -1.3 | 100 | 320 | -1.2 | 100 | 100 | 670 | -0.9 | 100 |
| 2014 | 344 | 1.3 | 101 | 325 | 1.4 | 101 | 101 | 665 | -0.7 | 99 |
| 2015 | 356 | 3.5 | 105 | 336 | 3.5 | 105 | 105 | 677 | 1.8 | 101 |
| 2016 | 363 | 2.0 | 107 | 342 | 1.9 | 107 | 108 | 695 | 2.7 | 104 |
| 2017 | 375 | 3.3 | 110 | 352 | 2.8 | 110 | 111 | 715 | 2.9 | 107 |
| 2018 | 386 | 2.9 | 114 | 362 | 2.8 | 113 | 114 | 737 | 3.1 | 110 |
| 2019 | 399 | 3.3 | 117 | 374 | 3.4 | 117 | 116 | 765 | 3.7 | 114 |
| 2020 | 408 | 2.3 | 120 | 383 | 2.4 | 120 | 119 | 786 | 2.7 | 117 |
| 2021 | 417 | 2.2 | 123 | 392 | 2.3 | 123 | 121 | 806 | 2.6 | 120 |
| 2022 | 426 | 2.1 | 125 | 401 | 2.2 | 125 | 123 | 826 | 2.5 | 123 |
| 2023 | 434 | 2.1 | 128 | 409 | 2.2 | 128 | 125 | 846 | 2.5 | 126 |

NB1: Historic values expressed at current prices, forecasts at constant 2018 prices

NB2: Weighted composite index consists of 80% GDP & 20% Retail Sales

Table 3 – Folding Carton Production Analysed by Market Sector - Spain - 2013, 2018, 2023 – € Million

| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|------------|------------|
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| | Food | | | | | | | |
| Breakfast Cereal Product | 25.1 | 3.7 | 24.3 | 3.3 | 23.4 | 2.8 | -0.6 | -0.8 |
| Cakes, biscuits, baked products | 31.9 | 4.8 | 35.7 | 4.8 | 40.4 | 4.8 | 2.3 | 2.5 |
| Chocolate & sugar confectionery | 47.3 | 7.1 | 52.1 | 7.1 | 57.8 | 6.8 | 1.9 | 2.1 |
| Dry Beverages | 13.5 | 2.0 | 16.0 | 2.2 | 19.1 | 2.3 | 3.5 | 3.6 |
| Frozen/chilled food, meats, desserts | 95.6 | 14.3 | 117.9 | 16.0 | 153.7 | 18.2 | 4.3 | 5.5 |
| Wines, spirits, beer, soft drinks | 80.5 | 12.0 | 102.0 | 13.8 | 132.8 | 15.7 | 4.9 | 5.4 |
| Other foods | 35.8 | 5.3 | 42.1 | 5.7 | 49.8 | 5.9 | 3.3 | 3.4 |
| Sub Total Food | 329.6 | 49.2 | 390.1 | 52.9 | 477.1 | 56.4 | 3.4 | 4.1 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | 14.4 | 2.2 | 9.1 | 1.2 | 5.7 | 0.7 | -8.9 | -8.8 |
| Cleaning, laundry products | 67.1 | 10.0 | 60.2 | 8.2 | 62.2 | 7.4 | -2.1 | 0.6 |
| Cosmetics, beauty care, pers. hyg. | 53.1 | 7.9 | 61.4 | 8.3 | 71.0 | 8.4 | 2.9 | 2.9 |
| Miscellaneous household products | 34.5 | 5.2 | 32.2 | 4.4 | 29.3 | 3.5 | -1.4 | -1.9 |
| Paper, stationery & related goods | 31.5 | 4.7 | 32.1 | 4.4 | 32.8 | 3.9 | 0.4 | 0.4 |
| Pharmaceuticals, medical products | 83.6 | 12.5 | 92.7 | 12.6 | 103.8 | 12.3 | 2.1 | 2.3 |
| Other non-foods | 55.9 | 8.3 | 59.6 | 8.1 | 64.3 | 7.6 | 1.3 | 1.5 |
| Sub Total Non-Food | 340.2 | 50.8 | 347.3 | 47.1 | 369.1 | 43.6 | 0.4 | 1.2 |
| TOTAL | 669.8 | 100.0 | 737.5 | 100.0 | 846.3 | 100.0 | 1.9 | 2.8 |

12.1.8 Switzerland

| Table 1 – Summary of Carton Production – Switzerland – 2018 - 000 Tonnes | |
|--|------------|
| Cartonboard Consumption for Cartons | 90 |
| Cartonboard Consumption for Litho Printed Corrugated | 6 |
| Sub-Total Cartonboard Consumption | 96 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 9 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 106 |
| LESS: Wastage | 18 |
| TOTAL CARTON OUTPUT | 87 |
| Value per Tonne of Carton Output € / Tonne | 3658 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 319 |
| Waste % | 17.3 |

| Table 2b - Estimates & Forecasts of Cartonboard Sales Values in € Million & Swiss Franc- Switzerland - 2013 to 2023 | | | | | | | | |
|---|-----------|--------|--------------|------------|-------------|--------|--------------|------------------|
| Year | € Million | | | Curr. | Swiss Franc | | | Compo site Index |
| | €M | % p.a. | Index 13=100 | Exch. Rate | CHF M | % p.a. | Index 13=100 | Index 13=100 |
| 2013 | 363 | -9.9 | 100 | 1.231 | 447 | -8.1 | 100 | 100 |
| 2014 | 342 | -5.8 | 94 | 1.215 | 415 | -7.0 | 93 | 102 |
| 2015 | 381 | 11.4 | 105 | 1.068 | 407 | -2.0 | 91 | 103 |
| 2016 | 361 | -5.2 | 99 | 1.090 | 394 | -3.3 | 88 | 105 |
| 2017 | 342 | -5.2 | 94 | 1.112 | 380 | -3.4 | 85 | 106 |
| 2018 | 319 | -6.7 | 88 | 1.155 | 369 | -3.0 | 83 | 108 |
| 2019 | 309 | -3.3 | 85 | 1.155 | 357 | -3.3 | 80 | 110 |
| 2020 | 300 | -2.8 | 83 | 1.155 | 347 | -2.8 | 78 | 111 |
| 2021 | 294 | -1.9 | 81 | 1.155 | 340 | -1.9 | 76 | 113 |
| 2022 | 289 | -1.8 | 80 | 1.155 | 334 | -1.8 | 75 | 114 |
| 2023 | 284 | -1.8 | 78 | 1.155 | 328 | -1.8 | 73 | 116 |

NB1: Historic values expressed at current prices, forecasts at constant 2018 prices

NB2: Weighted composite index consists of 80% GDP & 20% Retail Sales

| Table 3 – Folding Carton Production Analysed by Market Sector - Switzerland - 2013, 2018, 2023 – € Million | | | | | | | | |
|--|--------------|--------------|--------------|--------------|--------------|--------------|-------------|-------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast Cereal Product | | | | | | | | |
| Cakes, biscuits, baked products | | | | | | | | |
| Chocolate & sugar confectionery | | | | | | | | |
| Dry Beverages | | | | | | | | |
| Frozen/chilled food, meats, desserts | | | | | | | | |
| Wines, spirits, beer, soft drinks | | | | | | | | |
| Other foods | | | | | | | | |
| Sub Total Food | 174.0 | 47.9 | 155.3 | 48.7 | 143.0 | 50.4 | -2.2 | -1.6 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | | | | | | | | |
| Cleaning, laundry products | | | | | | | | |
| Cosmetics, beauty care, pers. hyg. | | | | | | | | |
| Miscellaneous household products | | | | | | | | |
| Paper, stationery & related goods | | | | | | | | |
| Pharmaceuticals, medical products | | | | | | | | |
| Other non-foods | | | | | | | | |
| Sub Total Non-Food | 189.0 | 52.1 | 163.9 | 51.3 | 140.7 | 49.6 | -2.8 | -3.0 |
| TOTAL | 363.0 | 100.0 | 319.2 | 100.0 | 283.7 | 100.0 | -2.5 | -2.3 |

12.1.9 Turkey

| Table 1 – Summary of Carton Production – Turkey – 2018 - 000 Tonnes | |
|---|------------|
| Cartonboard Consumption for Cartons | 444 |
| Cartonboard Consumption for Litho Printed Corrugated | 112 |
| Sub-Total Cartonboard Consumption | 557 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 108 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 664 |
| LESS: Wastage | 140 |
| TOTAL CARTON OUTPUT | 525 |
| Value per Tonne of Carton Output € / Tonne | 1450 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 761 |
| Waste % | 21.0 |

**Table 2a - Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Turkey
– 2013 to 2023 - 000 Tonnes & € Million**

| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
|------|-----------------------|--------|-----------------|---------------|-----------|-----------------|------------------------|--------------|--------|-----------------|
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 408 | 8.9 | 100 | 382 | 8.9 | 100 | 100 | 650 | 4.8 | 100 |
| 2014 | 500 | 22.4 | 122 | 450 | 17.7 | 118 | 104 | 675 | 3.8 | 104 |
| 2015 | 512 | 2.4 | 125 | 473 | 5.1 | 124 | 109 | 696 | 3.1 | 107 |
| 2016 | 515 | 0.6 | 126 | 490 | 3.6 | 128 | 112 | 735 | 5.6 | 113 |
| 2017 | 599 | 16.3 | 147 | 573 | 16.9 | 150 | 120 | 859 | 16.9 | 132 |
| 2018 | 561 | -6.3 | 137 | 525 | -8.4 | 137 | 122 | 761 | -11.4 | 117 |
| 2019 | 575 | 2.4 | 141 | 538 | 2.5 | 141 | 119 | 783 | 2.9 | 120 |
| 2020 | 619 | 7.6 | 151 | 580 | 7.7 | 152 | 122 | 847 | 8.1 | 130 |
| 2021 | 659 | 6.5 | 161 | 618 | 6.6 | 162 | 126 | 906 | 7.0 | 139 |
| 2022 | 702 | 6.5 | 172 | 659 | 6.6 | 172 | 130 | 969 | 7.0 | 149 |
| 2023 | 750 | 6.9 | 184 | 705 | 7.0 | 184 | 135 | 1041 | 7.4 | 160 |

NB1: Historic values expressed at current prices, forecasts at constant 2018 prices

NB2: Weighted composite index consists of 80% GDP & 20% Retail Sales

Table 2b - Estimates & Forecasts of Cartonboard Sales Values in € Million & Turkish Lira - Turkey - 2013 to 2023

| Year | € Million | | | Curr. | Local Currency | | | Compo site Index |
|------|-----------|--------|-----------------|---------------|----------------|--------|-----------------|------------------------|
| | €M | % p.a. | Index 13=100 | Exch. Rate | Tky Lira M | % p.a. | Index 13=100 | Index 13=100 |
| 2013 | 650 | 4.8 | 100 | 2.531 | 1645 | 14.6 | 100 | 100 |
| 2014 | 675 | 3.8 | 104 | 2.905 | 1961 | 19.2 | 119 | 104 |
| 2015 | 696 | 3.1 | 107 | 3.022 | 2103 | 7.3 | 128 | 109 |
| 2016 | 735 | 5.6 | 113 | 3.342 | 2457 | 16.8 | 149 | 112 |
| 2017 | 859 | 16.9 | 132 | 4.118 | 3537 | 44.0 | 215 | 120 |
| 2018 | 761 | -11.4 | 117 | 5.697 | 4336 | 22.6 | 264 | 122 |
| 2019 | 783 | 2.9 | 120 | 5.697 | 4462 | 2.9 | 271 | 119 |
| 2020 | 847 | 8.1 | 130 | 5.697 | 4825 | 8.1 | 293 | 122 |
| 2021 | 906 | 7.0 | 139 | 5.697 | 5161 | 7.0 | 314 | 126 |
| 2022 | 969 | 7.0 | 149 | 5.697 | 5523 | 7.0 | 336 | 130 |
| 2023 | 1041 | 7.4 | 160 | 5.697 | 5933 | 7.4 | 361 | 135 |

| Table 3 – Folding Carton Production Analysed by Market Sector - Turkey - 2013, 2018, 2023 – € Million | | | | | | | | |
|---|--------------|--------------|--------------|--------------|---------------|--------------|------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast Cereal Product | 46.2 | 7.1 | 50.8 | 6.7 | 64.3 | 6.2 | 1.9 | 4.8 |
| Cakes, biscuits, baked products | 39.1 | 6.0 | 48.1 | 6.3 | 68.1 | 6.5 | 4.2 | 7.2 |
| Chocolate & sugar confectionery | 115.0 | 17.7 | 138.5 | 18.2 | 192.0 | 18.4 | 3.8 | 6.7 |
| Dry Beverages | 6.5 | 1.0 | 8.2 | 1.1 | 11.7 | 1.1 | 4.5 | 7.5 |
| Frozen/chilled food, meats, desserts | 33.2 | 5.1 | 51.6 | 6.8 | 92.0 | 8.8 | 9.2 | 12.3 |
| Wines, spirits, beer, soft drinks | 47.9 | 7.4 | 63.2 | 8.3 | 99.6 | 9.6 | 5.7 | 9.5 |
| Other foods | 47.7 | 7.3 | 58.6 | 7.7 | 85.9 | 8.3 | 4.2 | 8.0 |
| Sub Total Food | 335.7 | 51.6 | 419.0 | 55.1 | 613.7 | 58.9 | 4.5 | 7.9 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | 31.7 | 4.9 | 43.1 | 5.7 | 66.0 | 6.3 | 6.3 | 8.9 |
| Cleaning, laundry products | 6.2 | 1.0 | 6.6 | 0.9 | 9.7 | 0.9 | 1.3 | 8.0 |
| Cosmetics, beauty care, pers. hyg. | 83.5 | 12.8 | 94.1 | 12.4 | 121.6 | 11.7 | 2.4 | 5.3 |
| Miscellaneous household products | 41.4 | 6.4 | 49.2 | 6.5 | 67.4 | 6.5 | 3.5 | 6.5 |
| Paper, stationery & related goods | 17.7 | 2.7 | 17.5 | 2.3 | 19.2 | 1.8 | -0.3 | 1.9 |
| Pharmaceuticals, medical products | 58.3 | 9.0 | 60.2 | 7.9 | 70.5 | 6.8 | 0.7 | 3.2 |
| Other non-foods | 75.5 | 11.6 | 71.3 | 9.4 | 73.2 | 7.0 | -1.1 | 0.5 |
| Sub Total Non-Food | 314.3 | 48.4 | 342.0 | 44.9 | 427.6 | 41.1 | 1.7 | 4.6 |
| TOTAL | 650.0 | 100.0 | 761.0 | 100.0 | 1041.3 | 100.0 | 3.2 | 6.5 |

12.1.10 UK

| Table 1 – Summary of Carton Production – UK – 2018 - 000 Tonnes | |
|--|-------------|
| Cartonboard Consumption for Cartons | 683 |
| Cartonboard Consumption for Litho Printed Corrugated | 27 |
| Sub-Total Cartonboard Consumption | 710 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 36 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 746 |
| LESS: Wastage | 125 |
| TOTAL CARTON OUTPUT | 621 |
| Value per Tonne of Carton Output € / Tonne | 2128 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 1322 |
| Waste % | 16.8 |

Table 2a - Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - UK – 2013 to 2023 - 000 Tonnes & € Million

| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
|------|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 605 | -1.5 | 100 | 586 | -1.1 | 100 | 100 | 1279 | 6.5 | 100 |
| 2014 | 607 | 0.2 | 100 | 587 | 0.2 | 100 | 103 | 1240 | -3.0 | 97 |
| 2015 | 607 | 0.0 | 100 | 593 | 1.0 | 101 | 106 | 1521 | 22.7 | 119 |
| 2016 | 605 | -0.3 | 100 | 582 | -1.9 | 99 | 107 | 1313 | -13.7 | 103 |
| 2017 | 654 | 8.1 | 108 | 606 | 4.1 | 103 | 109 | 1317 | 0.4 | 103 |
| 2018 | 670 | 2.5 | 111 | 621 | 2.5 | 106 | 111 | 1322 | 0.3 | 103 |
| 2019 | 682 | 1.8 | 113 | 633 | 1.9 | 108 | 112 | 1351 | 2.2 | 106 |
| 2020 | 696 | 2.0 | 115 | 646 | 2.1 | 110 | 114 | 1383 | 2.4 | 108 |
| 2021 | 710 | 2.1 | 117 | 660 | 2.2 | 113 | 116 | 1417 | 2.5 | 111 |
| 2022 | 725 | 2.1 | 120 | 675 | 2.2 | 115 | 118 | 1453 | 2.5 | 114 |
| 2023 | 741 | 2.1 | 122 | 690 | 2.2 | 118 | 119 | 1489 | 2.5 | 116 |

NB1: Historic values expressed at current prices, forecasts at constant 2018 prices

NB2: Weighted composite index consists of 80% GDP & 20% Retail Sales

Table 2b - Estimates & Forecasts of Cartonboard Sales Values in € Million & UK Pounds Sterling - UK - 2013 to 2023

| Year | € Million | | | Curr. | UK Pounds Sterling | | | Compo site Index |
|------|-----------|--------|--------------|------------|--------------------|--------|--------------|------------------|
| | €M | % p.a. | Index 13=100 | Exch. Rate | £M | % p.a. | Index 13=100 | Index 13=100 |
| 2013 | 1279 | 6.5 | 100 | 0.849 | 1086 | 11.5 | 100 | 100 |
| 2014 | 1240 | -3.0 | 97 | 0.806 | 1000 | -7.9 | 92 | 103 |
| 2015 | 1521 | 22.7 | 119 | 0.727 | 1105 | 10.5 | 102 | 106 |
| 2016 | 1313 | -13.7 | 103 | 0.819 | 1075 | -2.7 | 99 | 107 |
| 2017 | 1317 | 0.4 | 103 | 0.876 | 1155 | 7.4 | 106 | 109 |
| 2018 | 1322 | 0.3 | 103 | 0.885 | 1170 | 1.3 | 108 | 111 |
| 2019 | 1351 | 2.2 | 106 | 0.885 | 1196 | 2.2 | 110 | 112 |
| 2020 | 1383 | 2.4 | 108 | 0.885 | 1224 | 2.4 | 113 | 114 |
| 2021 | 1417 | 2.5 | 111 | 0.885 | 1254 | 2.5 | 116 | 116 |
| 2022 | 1453 | 2.5 | 114 | 0.885 | 1286 | 2.5 | 118 | 118 |
| 2023 | 1489 | 2.5 | 116 | 0.885 | 1318 | 2.5 | 121 | 119 |

| Table 3 – Folding Carton Production Analysed by Market Sector - UK - 2013, 2018, 2023 – € Million | | | | | | | | |
|---|---------------|--------------|---------------|--------------|---------------|--------------|-------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast Cereal Product | 129.0 | 10.1 | 126.9 | 9.6 | 132.4 | 8.9 | -0.3 | 0.8 |
| Cakes, biscuits, baked products | 97.1 | 7.6 | 108.4 | 8.2 | 128.0 | 8.6 | 2.2 | 3.4 |
| Chocolate & sugar confectionery | 88.1 | 6.9 | 84.6 | 6.4 | 85.6 | 5.7 | -0.8 | 0.2 |
| Dry Beverages | 26.8 | 2.1 | 27.8 | 2.1 | 30.5 | 2.1 | 0.7 | 1.9 |
| Frozen/chilled food, meats, desserts | 315.5 | 24.7 | 351.7 | 26.6 | 439.0 | 29.5 | 2.2 | 4.5 |
| Wines, spirits, beer, soft drinks | 157.1 | 12.3 | 163.9 | 12.4 | 190.4 | 12.8 | 0.9 | 3.0 |
| Other foods | 61.3 | 4.8 | 64.8 | 4.9 | 75.2 | 5.1 | 1.1 | 3.0 |
| Sub Total Food | 875.0 | 68.4 | 928.0 | 70.2 | 1081.1 | 72.6 | 1.2 | 3.1 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | 30.7 | 2.4 | 7.9 | 0.6 | 8.7 | 0.6 | -23.7 | 1.8 |
| Cleaning, laundry products | 5.1 | 0.4 | 5.3 | 0.4 | 7.9 | 0.5 | 0.7 | 8.3 |
| Cosmetics, beauty care, pers. hyg. | 44.6 | 3.5 | 46.3 | 3.5 | 50.7 | 3.4 | 0.7 | 1.8 |
| Miscellaneous household products | 12.8 | 1.0 | 13.2 | 1.0 | 16.0 | 1.1 | 0.7 | 3.8 |
| Paper, stationery & related goods | 17.9 | 1.4 | 17.2 | 1.3 | 17.5 | 1.2 | -0.8 | 0.3 |
| Pharmaceuticals, medical products | 222.3 | 17.4 | 234.0 | 17.7 | 233.4 | 15.7 | 1.0 | 0.0 |
| Other non-foods | 70.3 | 5.5 | 70.1 | 5.3 | 74.2 | 5.0 | -0.1 | 1.2 |
| Sub Total Non-Food | 403.6 | 31.6 | 394.0 | 29.8 | 408.3 | 27.4 | -0.5 | 0.7 |
| TOTAL | 1278.6 | 100.0 | 1322.0 | 100.0 | 1489.4 | 100.0 | 0.7 | 2.4 |

12.1.11 Other Western European countries

| Table 1 – Summary of Carton Production – Other Western Europe – 2018 - 000 Tonnes | |
|---|------------|
| Cartonboard Consumption for Cartons | 182 |
| Cartonboard Consumption for Litho Printed Corrugated | 26 |
| Sub-Total Cartonboard Consumption | 208 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 38 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 246 |
| LESS: Wastage | 43 |
| TOTAL CARTON OUTPUT | 204 |
| Value per Tonne of Carton Output € / Tonne | 1929 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 393 |
| Waste % | 17.3 |

Table 2 - Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Other Western Europe – 2013 to 2023 - 000 Tonnes & € Million

| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
|------|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 198 | -2.0 | 100 | 194 | -1.9 | 100 | 100 | 373 | -1.7 | 100 |
| 2014 | 199 | 0.6 | 101 | 195 | 0.6 | 101 | 101 | 375 | 0.3 | 100 |
| 2015 | 200 | 0.4 | 101 | 196 | 0.6 | 101 | 101 | 374 | -0.2 | 100 |
| 2016 | 201 | 0.6 | 102 | 197 | 0.6 | 102 | 102 | 377 | 0.8 | 101 |
| 2017 | 204 | 1.7 | 103 | 200 | 1.6 | 103 | 104 | 385 | 2.2 | 103 |
| 2018 | 208 | 1.6 | 105 | 204 | 1.6 | 105 | 106 | 393 | 1.9 | 105 |
| 2019 | 211 | 1.9 | 107 | 208 | 2.0 | 107 | 108 | 402 | 2.3 | 108 |
| 2020 | 215 | 1.8 | 109 | 211 | 1.9 | 109 | 110 | 410 | 2.2 | 110 |
| 2021 | 218 | 1.4 | 110 | 215 | 1.5 | 111 | 112 | 418 | 1.8 | 112 |
| 2022 | 221 | 1.3 | 112 | 218 | 1.4 | 112 | 113 | 425 | 1.7 | 114 |
| 2023 | 224 | 1.4 | 113 | 221 | 1.4 | 114 | 115 | 432 | 1.7 | 116 |

NB1: Historic values expressed at current prices, forecasts at constant 2018 prices

NB2: Weighted composite index consists of 80% GDP & 20% Retail Sales

Table 3 – Folding Carton Production Analysed by Market Sector - Other Western Europe - 2013, 2018, 2023 – € Million

| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|------------|------------|
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast Cereal Product | | | | | | | | |
| Cakes, biscuits, baked products | | | | | | | | |
| Chocolate & sugar confectionery | | | | | | | | |
| Dry Beverages | | | | | | | | |
| Frozen/chilled food, meats, desserts | | | | | | | | |
| Wines, spirits, beer, soft drinks | | | | | | | | |
| Other foods | | | | | | | | |
| Sub Total Food | 136.4 | 36.5 | 145.5 | 37.0 | 165.1 | 38.2 | 1.3 | 2.6 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | | | | | | | | |
| Cleaning, laundry products | | | | | | | | |
| Cosmetics, beauty care, pers. hyg. | | | | | | | | |
| Miscellaneous household products | | | | | | | | |
| Paper, stationery & related goods | | | | | | | | |
| Pharmaceuticals, medical products | | | | | | | | |
| Other non-foods | | | | | | | | |
| Sub Total Non-Food | 237.0 | 63.5 | 247.3 | 63.0 | 267.1 | 61.8 | 0.9 | 1.6 |
| TOTAL | 373.4 | 100.0 | 392.8 | 100.0 | 432.2 | 100.0 | 1.0 | 1.9 |

| Table 1 – Summary of Carton Production – Total Western Europe – 2018 - 000 Tonnes | |
|---|-------------|
| Cartonboard Consumption for Cartons | 4190 |
| Cartonboard Consumption for Litho Printed Corrugated | 582 |
| Sub-Total Cartonboard Consumption | 4772 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 788 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 5561 |
| LESS: Wastage | 984 |
| TOTAL CARTON OUTPUT | 4577 |
| | |
| Value per Tonne of Carton Output € / Tonne | 2034 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 9311 |
| Waste % | 17.7 |

| Table 2 - Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Total Western Europe – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 4460 | 0.2 | 100 | 4241 | 0.4 | 100 | 100 | 8895 | 0.9 | 100 |
| 2014 | 4551 | 2.0 | 102 | 4317 | 1.8 | 102 | 102 | 8882 | -0.1 | 100 |
| 2015 | 4632 | 1.8 | 104 | 4418 | 2.3 | 104 | 104 | 9273 | 4.4 | 104 |
| 2016 | 4619 | -0.3 | 104 | 4413 | -0.1 | 104 | 106 | 9074 | -2.2 | 102 |
| 2017 | 4795 | 3.8 | 107 | 4561 | 3.3 | 108 | 108 | 9307 | 2.6 | 105 |
| 2018 | 4831 | 0.8 | 108 | 4577 | 0.4 | 108 | 110 | 9311 | 0.0 | 105 |
| 2019 | 4899 | 1.4 | 110 | 4645 | 1.5 | 110 | 111 | 9422 | 1.2 | 106 |
| 2020 | 5015 | 2.4 | 112 | 4760 | 2.5 | 112 | 113 | 9617 | 2.1 | 108 |
| 2021 | 5126 | 2.2 | 115 | 4869 | 2.3 | 115 | 114 | 9823 | 2.1 | 110 |
| 2022 | 5240 | 2.2 | 117 | 4982 | 2.3 | 117 | 116 | 10034 | 2.2 | 113 |
| 2023 | 5363 | 2.4 | 120 | 5103 | 2.4 | 120 | 118 | 10261 | 2.3 | 115 |

NB1: Historic values expressed at current prices, forecasts at constant 2018 prices

NB2: Weighted composite index consists of 80% GDP & 20% Retail Sales

| Table 3 – Folding Carton Production Analysed by Market Sector - Total Western Europe - 2013, 2018, 2023 – € Million | | | | | | | | |
|---|---------------|--------------|---------------|--------------|----------------|--------------|------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast Cereal Product | 429.4 | 4.8 | 410.4 | 4.4 | 413.9 | 4.0 | -0.9 | 0.2 |
| Cakes, biscuits, baked products | 452.1 | 5.1 | 491.4 | 5.3 | 553.7 | 5.4 | 1.7 | 2.4 |
| Chocolate & sugar confectionery | 754.6 | 8.5 | 776.3 | 8.3 | 837.4 | 8.2 | 0.6 | 1.5 |
| Dry Beverages | 181.2 | 2.0 | 199.6 | 2.1 | 223.8 | 2.2 | 2.0 | 2.3 |
| Frozen/chilled food, meats, desserts | 1233.8 | 13.9 | 1412.8 | 15.2 | 1770.1 | 17.3 | 2.7 | 4.6 |
| Wines, spirits, beer, soft drinks | 752.2 | 8.5 | 821.7 | 8.8 | 990.0 | 9.6 | 1.8 | 3.8 |
| Other foods | 682.1 | 7.7 | 755.7 | 8.1 | 891.9 | 8.7 | 2.1 | 3.4 |
| Sub-Total Food | 4485.4 | 50.4 | 4867.9 | 52.3 | 5680.8 | 55.4 | 1.7 | 3.1 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | 315.4 | 3.5 | 241.3 | 2.6 | 220.9 | 2.2 | -5.2 | -1.7 |
| Cleaning, laundry products | 295.2 | 3.3 | 265.3 | 2.8 | 277.9 | 2.7 | -2.1 | 0.9 |
| Cosmetics, beauty care, pers. hyg. | 821.4 | 9.2 | 899.8 | 9.7 | 992.3 | 9.7 | 1.8 | 2.0 |
| Miscellaneous household products | 338.0 | 3.8 | 323.6 | 3.5 | 316.0 | 3.1 | -0.9 | -0.5 |
| Paper, stationery & related goods | 208.0 | 2.3 | 205.2 | 2.2 | 201.6 | 2.0 | -0.3 | -0.4 |
| Pharmaceuticals, medical products | 1368.2 | 15.4 | 1446.2 | 15.5 | 1515.4 | 14.8 | 1.1 | 0.9 |
| Other non-foods | 1063.1 | 12.0 | 1061.4 | 11.4 | 1056.1 | 10.3 | 0.0 | -0.1 |
| Sub-Total Non-Food | 4409.5 | 49.6 | 4442.7 | 47.7 | 4580.2 | 44.6 | 0.2 | 0.6 |
| TOTAL | 8894.8 | 100.0 | 9310.6 | 100.0 | 10260.9 | 100.0 | 0.9 | 2.0 |

12.1.12 Other Central European countries

| Table 1 – Summary of Carton Production – Poland – 2018 - 000 Tonnes | |
|---|------------|
| Cartonboard Consumption for Cartons | 483 |
| Cartonboard Consumption for Litho Printed Corrugated | 66 |
| Sub-Total Cartonboard Consumption | 550 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 62 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 612 |
| LESS: Wastage | 112 |
| TOTAL CARTON OUTPUT | 500 |
| | |
| Value per Tonne of Carton Output € / Tonne | 1565 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 783 |
| Waste % | 18.3 |

Table 2 - Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Poland – 2013 to 2023 - 000 Tonnes & € Million

| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
|------|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 415 | 1.6 | 100 | 375 | 1.7 | 100 | 100 | 588 | 1.7 | 100.0 |
| 2014 | 434 | 4.7 | 105 | 393 | 4.8 | 105 | 103 | 619 | 5.3 | 105.3 |
| 2015 | 458 | 5.5 | 110 | 415 | 5.6 | 111 | 107 | 656 | 5.9 | 111.6 |
| 2016 | 480 | 4.9 | 116 | 436 | 5.0 | 116 | 110 | 662 | 0.9 | 112.6 |
| 2017 | 514 | 7.1 | 124 | 467 | 7.2 | 125 | 115 | 730 | 10.2 | 124.1 |
| 2018 | 550 | 7.0 | 133 | 500 | 7.1 | 133 | 121 | 783 | 7.2 | 133.1 |
| 2019 | 587 | 6.6 | 141 | 533 | 6.7 | 142 | 125 | 837 | 7.0 | 142.4 |
| 2020 | 617 | 5.1 | 149 | 561 | 5.2 | 150 | 129 | 883 | 5.5 | 150.2 |
| 2021 | 645 | 4.6 | 155 | 587 | 4.7 | 157 | 133 | 927 | 5.0 | 157.7 |
| 2022 | 674 | 4.5 | 163 | 615 | 4.6 | 164 | 137 | 973 | 4.9 | 165.5 |
| 2023 | 706 | 4.7 | 170 | 644 | 4.8 | 172 | 140 | 1023 | 5.1 | 173.9 |

NB1: Historic values expressed at current prices, forecasts at constant 2018 prices

NB2: Weighted composite index consists of 80% GDP & 20% Retail Sales

Table 2b - Estimates & Forecasts of Cartonboard Sales Values in € Million & Polish Zloty - Poland - 2013 to 2023

| Year | € Million | | | Curr. | Polish Zloty | | | Compo site Index |
|------|-----------|--------|--------------|------------|--------------|--------|--------------|------------------|
| | €M | % p.a. | Index 13=100 | Exch. Rate | PLN | % p.a. | Index 13=100 | Index 13=100 |
| 2013 | 588 | 1.7 | 100 | 4.196 | 2466 | 2.0 | 100 | 100 |
| 2014 | 619 | 5.3 | 105 | 4.185 | 2592 | 5.1 | 105 | 103 |
| 2015 | 656 | 5.9 | 112 | 4.183 | 2744 | 5.9 | 111 | 107 |
| 2016 | 662 | 0.9 | 113 | 4.364 | 2889 | 5.3 | 117 | 110 |
| 2017 | 730 | 10.2 | 124 | 4.257 | 3107 | 7.5 | 126 | 115 |
| 2018 | 783 | 7.2 | 133 | 4.262 | 3335 | 7.4 | 135 | 121 |
| 2019 | 837 | 7.0 | 142 | 4.262 | 3568 | 7.0 | 145 | 125 |
| 2020 | 883 | 5.5 | 150 | 4.262 | 3765 | 5.5 | 153 | 129 |
| 2021 | 927 | 5.0 | 158 | 4.262 | 3952 | 5.0 | 160 | 133 |
| 2022 | 973 | 4.9 | 165 | 4.262 | 4147 | 4.9 | 168 | 137 |
| 2023 | 1023 | 5.1 | 174 | 4.262 | 4358 | 5.1 | 177 | 140 |

| Table 3 – Folding Carton Production Analysed by Market Sector - Poland - 2013, 2018, 2023 – € Million | | | | | | | | |
|---|--------------|--------------|--------------|--------------|---------------|--------------|------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast Cereal Product | | | | | | | | |
| Cakes, biscuits, baked products | | | | | | | | |
| Chocolate & sugar confectionery | | | | | | | | |
| Dry Beverages | | | | | | | | |
| Frozen/chilled food, meats, desserts | | | | | | | | |
| Wines, spirits, beer, soft drinks | | | | | | | | |
| Other foods | | | | | | | | |
| Sub Total Food | 218.4 | 37.1 | 294.2 | 37.6 | 395.8 | 38.7 | 6.1 | 6.1 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | | | | | | | | |
| Cleaning, laundry products | | | | | | | | |
| Cosmetics, beauty care, pers. hyg. | | | | | | | | |
| Miscellaneous household products | | | | | | | | |
| Paper, stationery & related goods | | | | | | | | |
| Pharmaceuticals, medical products | | | | | | | | |
| Other non-foods | | | | | | | | |
| Sub Total Non-Food | 369.6 | 62.9 | 488.4 | 62.4 | 626.8 | 61.3 | 5.7 | 5.1 |
| TOTAL | 588.0 | 100.0 | 782.6 | 100.0 | 1022.5 | 100.0 | 5.9 | 5.5 |

| Table 1 – Summary of Carton Production – Other Central Europe – 2018 - 000 Tonnes | |
|---|------------|
| Cartonboard Consumption for Cartons | 315 |
| Cartonboard Consumption for Litho Printed Corrugated | 41 |
| Sub-Total Cartonboard Consumption | 356 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 60 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 416 |
| LESS: Wastage | 76 |
| TOTAL CARTON OUTPUT | 340 |
| | |
| Value per Tonne of Carton Output € / Tonne | 1557 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 529 |
| Waste % | 18.3 |

Table 2 - Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Other Central Europe – 2013 to 2023 - 000 Tonnes & € Million

| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
|------|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 310 | 0.7 | 100 | 281 | 0.8 | 100 | 100 | 440 | -0.2 | 100 |
| 2014 | 320 | 3.0 | 103 | 289 | 3.1 | 103 | 103 | 446 | 1.4 | 101 |
| 2015 | 332 | 3.8 | 107 | 301 | 3.9 | 107 | 107 | 465 | 4.4 | 106 |
| 2016 | 344 | 3.6 | 111 | 312 | 3.7 | 111 | 111 | 484 | 3.9 | 110 |
| 2017 | 361 | 4.9 | 116 | 328 | 5.0 | 117 | 117 | 511 | 5.6 | 116 |
| 2018 | 374 | 3.7 | 121 | 340 | 3.8 | 121 | 121 | 529 | 3.7 | 120 |
| 2019 | 387 | 3.5 | 125 | 352 | 3.6 | 126 | 125 | 550 | 3.9 | 125 |
| 2020 | 400 | 3.2 | 129 | 364 | 3.3 | 130 | 128 | 570 | 3.6 | 130 |
| 2021 | 412 | 3.2 | 133 | 376 | 3.3 | 134 | 131 | 590 | 3.6 | 134 |
| 2022 | 425 | 3.0 | 137 | 388 | 3.1 | 138 | 135 | 610 | 3.4 | 139 |
| 2023 | 438 | 3.1 | 141 | 400 | 3.2 | 142 | 138 | 631 | 3.5 | 144 |

NB1: Historic values expressed at current prices, forecasts at constant 2018 prices

NB2: Weighted composite index consists of 80% GDP & 20% Retail Sales

Table 2b - Estimates & Forecasts of Cartonboard Sales Values in € Million & Local Currency Equivalent - Other Central Europe - 2013 to 2023

| Year | € Million | | | Curr. | Central Europe Currency Equivalent | | | Compo site Index |
|------|-----------|--------|--------------|------------|------------------------------------|--------|--------------|------------------|
| | €M | % p.a. | Index 13=100 | Exch. Rate | Cur. Equiv | % p.a. | Index 13=100 | Index 13=100 |
| 2013 | 440 | -0.2 | 100 | 25.911 | 11398 | 0.7 | 100 | 100 |
| 2014 | 446 | 1.4 | 101 | 26.437 | 11791 | 3.4 | 103 | 103 |
| 2015 | 465 | 4.4 | 106 | 26.404 | 12290 | 4.2 | 108 | 107 |
| 2016 | 484 | 3.9 | 110 | 26.428 | 12783 | 4.0 | 112 | 111 |
| 2017 | 511 | 5.6 | 116 | 26.359 | 13464 | 5.3 | 118 | 117 |
| 2018 | 529 | 3.7 | 120 | 26.476 | 14018 | 4.1 | 123 | 121 |
| 2019 | 550 | 3.9 | 125 | 26.476 | 14569 | 3.9 | 128 | 125 |
| 2020 | 570 | 3.6 | 130 | 26.476 | 15091 | 3.6 | 132 | 128 |
| 2021 | 590 | 3.6 | 134 | 26.476 | 15627 | 3.6 | 137 | 131 |
| 2022 | 610 | 3.4 | 139 | 26.476 | 16160 | 3.4 | 142 | 135 |
| 2023 | 631 | 3.5 | 144 | 26.476 | 16718 | 3.5 | 147 | 138 |

| Table 3 – Folding Carton Production Analysed by Market Sector - Other Central Europe - 2013, 2018, 2023 – € Million | | | | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|--------------|------------|------------|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 |
| Food | | | | | | | | |
| Breakfast Cereal Product | | | | | | | | |
| Cakes, biscuits, baked products | | | | | | | | |
| Chocolate & sugar confectionery | | | | | | | | |
| Dry Beverages | | | | | | | | |
| Frozen/chilled food, meats, desserts | | | | | | | | |
| Wines, spirits, beer, soft drinks | | | | | | | | |
| Other foods | | | | | | | | |
| Sub Total Food | 163.4 | 37.1 | 199.1 | 37.6 | 244.4 | 38.7 | 4.0 | 4.2 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | | | | | | | | |
| Cleaning, laundry products | | | | | | | | |
| Cosmetics, beauty care, pers. hyg. | | | | | | | | |
| Miscellaneous household products | | | | | | | | |
| Paper, stationery & related goods | | | | | | | | |
| Pharmaceuticals, medical products | | | | | | | | |
| Other non-foods | | | | | | | | |
| Sub Total Non-Food | 276.5 | 62.9 | 330.4 | 62.4 | 387.0 | 61.3 | 3.6 | 3.2 |
| TOTAL | 439.9 | 100.0 | 529.5 | 100.0 | 631.4 | 100.0 | 3.8 | 3.6 |

| Table 1 – Summary of Carton Production – Total Central Europe – 2018 - 000 Tonnes | |
|---|-------------|
| Cartonboard Consumption for Cartons | 799 |
| Cartonboard Consumption for Litho Printed Corrugated | 107 |
| Sub-Total Cartonboard Consumption | 906 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 122 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 1028 |
| LESS: Wastage | 188 |
| TOTAL CARTON OUTPUT | 840 |
| Value per Tonne of Carton Output € / Tonne | 1562 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 1312 |
| Waste % | 18.3 |

| Table 2 - Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Total Central Europe – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 725 | 1.2 | 100 | 656 | 1.3 | 100 | 100 | 1028 | 0.8 | 100 |
| 2014 | 754 | 4.0 | 104 | 682 | 4.1 | 104 | 103 | 1065 | 3.6 | 104 |
| 2015 | 790 | 4.8 | 109 | 716 | 4.9 | 109 | 107 | 1121 | 5.3 | 109 |
| 2016 | 824 | 4.4 | 114 | 747 | 4.5 | 114 | 111 | 1146 | 2.2 | 111 |
| 2017 | 875 | 6.2 | 121 | 795 | 6.3 | 121 | 116 | 1241 | 8.3 | 121 |
| 2018 | 925 | 5.6 | 128 | 840 | 5.7 | 128 | 121 | 1312 | 5.8 | 128 |
| 2019 | 974 | 5.3 | 134 | 886 | 5.4 | 135 | 125 | 1387 | 5.7 | 135 |
| 2020 | 1016 | 4.3 | 140 | 925 | 4.4 | 141 | 129 | 1453 | 4.7 | 141 |
| 2021 | 1057 | 4.0 | 146 | 963 | 4.1 | 147 | 132 | 1518 | 4.4 | 148 |
| 2022 | 1099 | 3.9 | 152 | 1002 | 4.0 | 153 | 136 | 1583 | 4.3 | 154 |
| 2023 | 1143 | 4.1 | 158 | 1044 | 4.2 | 159 | 139 | 1654 | 4.5 | 161 |

NB1: Historic values expressed at current values, forecasts at constant 2018 prices

NB2: Weighted composite index consists of 80% GDP & 20% Retail Sales

| Table 3 – Folding Carton Production Analysed by Market Sector - Total Central Europe - 2013, 2018, 2023 – € Million | | | | | | | | | |
|---|---------------|--------------|---------------|--------------|---------------|--------------|------------|------------|--|
| Sector | 2013 | | 2018 | | 2023 | | % p.a. | % p.a. | |
| | €M | % | €M | % | €M | % | 13 to 18 | 18 to 23 | |
| Food | | | | | | | | | |
| Breakfast Cereal Product | | | | | | | | | |
| Cakes, biscuits, baked products | | | | | | | | | |
| Chocolate & sugar confectionery | | | | | | | | | |
| Dry Beverages | | | | | | | | | |
| Frozen/chilled food, meats, desserts | | | | | | | | | |
| Wines, spirits, beer, soft drinks | | | | | | | | | |
| Other foods | | | | | | | | | |
| Sub-Total Food | 381.8 | 37.1 | 493.3 | 37.6 | 640.2 | 38.7 | 5.3 | 5.4 | |
| Non-Food | | | | | | | | | |
| Cigarettes, tobacco, accessories | | | | | | | | | |
| Cleaning, laundry products | | | | | | | | | |
| Cosmetics, beauty care, pers. hyg. | | | | | | | | | |
| Miscellaneous household products | | | | | | | | | |
| Paper, stationery & related goods | | | | | | | | | |
| Pharmaceuticals, medical products | | | | | | | | | |
| Other non-foods | | | | | | | | | |
| Sub-Total Non-Food | 646.1 | 62.9 | 818.8 | 62.4 | 1013.8 | 61.3 | 4.9 | 4.4 | |
| TOTAL | 1027.9 | 100.0 | 1312.1 | 100.0 | 1654.0 | 100.0 | 5.0 | 4.7 | |

12.1.13 Nordic region

| Table 1 – Summary of Carton Production – Nordic – 2018 - 000 Tonnes | |
|---|------------|
| Cartonboard Consumption for Cartons | 151 |
| Cartonboard Consumption for Litho Printed Corrugated | 19 |
| Sub-Total Cartonboard Consumption | 170 |
| Consumption of Inner Liners & Fluting for Litho Printed Corrugated | 28 |
| TOTAL CARTONBOARD & CONTAINERBOARD CONSUMPTION | 198 |
| LESS: Wastage | 33 |
| TOTAL CARTON OUTPUT | 165 |
| Value per Tonne of Carton Output € / Tonne | 1942 |
| TOTAL VALUE OF CARTON OUTPUT - €M | 321 |
| Waste % | 16.7 |

| Table 2a - Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Nordic – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|--|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 166 | 0.6 | 100 | 154 | 0.6 | 100 | 100 | 344 | -0.5 | 100 |
| 2014 | 168 | 1.1 | 101 | 156 | 1.1 | 101 | 102 | 338 | -2.0 | 98 |
| 2015 | 171 | 1.7 | 103 | 158 | 1.7 | 103 | 104 | 327 | -3.1 | 95 |
| 2016 | 173 | 1.3 | 104 | 160 | 1.3 | 104 | 106 | 325 | -0.5 | 94 |
| 2017 | 176 | 1.7 | 106 | 163 | 1.7 | 106 | 109 | 330 | 1.3 | 96 |
| 2018 | 178 | 1.3 | 107 | 165 | 1.3 | 107 | 111 | 321 | -2.7 | 93 |
| 2019 | 181 | 1.4 | 109 | 168 | 1.4 | 109 | 113 | 326 | 1.8 | 95 |
| 2020 | 184 | 1.7 | 111 | 170 | 1.7 | 111 | 114 | 333 | 2.1 | 97 |
| 2021 | 187 | 2.1 | 113 | 174 | 2.1 | 113 | 116 | 341 | 2.5 | 99 |
| 2022 | 192 | 2.2 | 115 | 178 | 2.2 | 115 | 119 | 350 | 2.6 | 102 |
| 2023 | 196 | 2.2 | 118 | 182 | 2.2 | 118 | 121 | 359 | 2.6 | 104 |

NB1: Historic values expressed at current prices, forecasts at constant 2018 prices

NB2: Weighted composite index consists of 80% GDP & 20% Retail Sales

NB3: Nordic sales value based on changes in average price per tonne for Euro countries adjusted for currency exchange rate movement.

Table 2b - Estimates & Forecasts of Cartonboard Sales Values in € Million & Nordic Currency Average - Nordic - 2013 to 2023

| Year | € Million | | | Curr. Exch. Rate | Nordic Average | | | Composite Index 13=100 |
|------|-----------|--------|--------------|------------------|----------------|--------|--------------|------------------------|
| | €M | % p.a. | Index 13=100 | | Local Curr. M | % p.a. | Index 13=100 | |
| 2013 | 344 | -0.5 | 100 | 7.973 | 2746 | 0.7 | 100 | 100 |
| 2014 | 338 | -2.0 | 98 | 8.304 | 2804 | 2.1 | 102 | 102 |
| 2015 | 327 | -3.1 | 95 | 8.588 | 2809 | 0.2 | 102 | 104 |
| 2016 | 325 | -0.5 | 94 | 8.736 | 2843 | 1.2 | 104 | 106 |
| 2017 | 330 | 1.3 | 96 | 8.802 | 2901 | 2.0 | 106 | 109 |
| 2018 | 321 | -2.7 | 93 | 9.108 | 2922 | 0.7 | 106 | 111 |
| 2019 | 326 | 1.8 | 95 | 9.108 | 2973 | 1.8 | 108 | 113 |
| 2020 | 333 | 2.1 | 97 | 9.108 | 3034 | 2.1 | 110 | 114 |
| 2021 | 341 | 2.5 | 99 | 9.108 | 3109 | 2.5 | 113 | 116 |
| 2022 | 350 | 2.6 | 102 | 9.108 | 3189 | 2.6 | 116 | 119 |
| 2023 | 359 | 2.6 | 104 | 9.108 | 3270 | 2.6 | 119 | 121 |

Table 3 – Folding Carton Production Analysed by Market Sector - Nordic - 2013, 2018, 2023 – € Million

| Sector | 2013 | | 2018 | | 2023 | | % p.a. 13 to 18 | % p.a. 18 to 23 |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|-----------------|-----------------|
| | €M | % | €M | % | €M | % | | |
| Food | | | | | | | | |
| Breakfast Cereal Product | | | | | | | | |
| Cakes, biscuits, baked products | | | | | | | | |
| Chocolate & sugar confectionery | | | | | | | | |
| Dry Beverages | | | | | | | | |
| Frozen/chilled food, meats, desserts | | | | | | | | |
| Wines, spirits, beer, soft drinks | | | | | | | | |
| Other foods | | | | | | | | |
| Sub Total Food | 197.9 | 57.4 | 187.5 | 58.5 | 215.9 | 60.1 | -1.1 | 2.9 |
| Non-Food | | | | | | | | |
| Cigarettes, tobacco, accessories | | | | | | | | |
| Cleaning, laundry products | | | | | | | | |
| Cosmetics, beauty care, pers. hyg. | | | | | | | | |
| Miscellaneous household products | | | | | | | | |
| Paper, stationery & related goods | | | | | | | | |
| Pharmaceuticals, medical products | | | | | | | | |
| Other non-foods | | | | | | | | |
| Sub Total Non-Food | 146.6 | 42.6 | 133.3 | 41.5 | 143.1 | 39.9 | -1.9 | 1.4 |
| TOTAL | 344.4 | 100.0 | 320.8 | 100.0 | 359.1 | 100.0 | -1.4 | 2.3 |

12.2 ECMA Country Overview

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Total Europe – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|-----------------|---------------|--------|-----------------|------------------------|--------------|--------|-----------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 5351 | 0.3 | 100.0 | 5051 | 0.5 | 100.0 | 100.0 | 10267 | 0.8 | 100.0 |
| 2014 | 5472 | 2.3 | 102.3 | 5155 | 2.1 | 102.1 | 101.9 | 10285 | 0.2 | 100.2 |
| 2015 | 5593 | 2.2 | 104.5 | 5292 | 2.7 | 104.8 | 104.2 | 10722 | 4.2 | 104.4 |
| 2016 | 5616 | 0.4 | 105.0 | 5321 | 0.5 | 105.3 | 106.4 | 10545 | -1.7 | 102.7 |
| 2017 | 5846 | 4.1 | 109.2 | 5518 | 3.7 | 109.3 | 109.4 | 10877 | 3.2 | 105.9 |
| 2018 | 5934 | 1.5 | 110.9 | 5583 | 1.2 | 110.5 | 111.5 | 10944 | 0.6 | 106.6 |
| 2019 | 6053 | 2.0 | 113.1 | 5699 | 2.1 | 112.8 | 112.8 | 11136 | 1.8 | 108.5 |
| 2020 | 6215 | 2.7 | 116.1 | 5855 | 2.7 | 115.9 | 114.7 | 11404 | 2.4 | 111.1 |
| 2021 | 6370 | 2.5 | 119.0 | 6007 | 2.6 | 118.9 | 116.7 | 11682 | 2.4 | 113.8 |
| 2022 | 6530 | 2.5 | 122.0 | 6162 | 2.6 | 122.0 | 118.7 | 11968 | 2.4 | 116.6 |
| 2023 | 6702 | 2.6 | 125.2 | 6329 | 2.7 | 125.3 | 120.8 | 12274 | 2.6 | 119.5 |
| Average % p.a. 13 to 18 | 2.1 | | | 2.0 | | | 2.2 | 1.3 | | |
| Average % p.a. 18 to 23 | 2.5 | | | 2.5 | | | 1.6 | 2.3 | | |

Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Austria – 2013 to 2023 - 000 Tonnes & € Million

| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
|-------------------------------|-----------------------|--------|-----------------|---------------|--------|-----------------|------------------------|--------------|--------|-----------------|
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 145 | -0.7 | 100.0 | 125 | -0.7 | 100.0 | 100.0 | 267 | -0.4 | 100.0 |
| 2014 | 146 | 0.7 | 100.7 | 126 | 0.8 | 100.8 | 100.4 | 269 | 0.7 | 100.7 |
| 2015 | 142 | -2.8 | 97.9 | 122 | -3.2 | 97.6 | 101.4 | 270 | 0.3 | 101.1 |
| 2016 | 142 | 0.0 | 97.9 | 122 | 0.0 | 97.6 | 103.4 | 275 | 1.9 | 103.0 |
| 2017 | 155 | 9.2 | 106.9 | 133 | 9.0 | 106.4 | 105.7 | 297 | 8.0 | 111.2 |
| 2018 | 158 | 1.9 | 108.9 | 136 | 2.3 | 108.8 | 108.3 | 294 | -1.0 | 110.1 |
| 2019 | 160 | 1.3 | 110.3 | 138 | 1.4 | 110.3 | 110.3 | 297 | 0.9 | 111.1 |
| 2020 | 162 | 1.1 | 111.5 | 140 | 1.2 | 111.6 | 112.0 | 299 | 0.7 | 111.8 |
| 2021 | 163 | 1.1 | 112.7 | 141 | 1.2 | 113.0 | 113.6 | 301 | 0.7 | 112.6 |
| 2022 | 165 | 1.1 | 113.9 | 143 | 1.2 | 114.3 | 115.1 | 303 | 0.7 | 113.4 |
| 2023 | 167 | 1.0 | 115.0 | 144 | 1.1 | 115.5 | 116.5 | 304 | 0.6 | 114.0 |
| Average % p.a. 13 to 18 | 1.7 | | | 1.7 | | | 1.6 | 1.9 | | |
| Average % p.a. 18 to 23 | 1.1 | | | 1.2 | | | 1.5 | 0.7 | | |

Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Belgium – 2013 to 2023 - 000 Tonnes & € Million

| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
|-------------------------------|-----------------------|--------|-----------------|---------------|--------|-----------------|------------------------|--------------|--------|-----------------|
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 126 | 7.0 | 100.0 | 127 | 7.1 | 100.0 | 100.0 | 246 | 3.6 | 100.0 |
| 2014 | 110 | -12.2 | 87.8 | 116 | -9.1 | 90.9 | 101.2 | 229 | -7.1 | 92.9 |
| 2015 | 110 | -0.1 | 87.7 | 115 | -0.1 | 90.8 | 102.8 | 222 | -2.8 | 90.3 |
| 2016 | 109 | -1.3 | 86.6 | 114 | -1.3 | 89.6 | 104.2 | 215 | -3.1 | 87.5 |
| 2017 | 109 | 0.0 | 86.6 | 115 | 1.0 | 90.5 | 105.9 | 217 | 0.8 | 88.2 |
| 2018 | 113 | 3.3 | 89.4 | 119 | 3.6 | 93.8 | 107.3 | 223 | 3.0 | 90.8 |
| 2019 | 114 | 1.0 | 90.3 | 121 | 1.1 | 94.8 | 108.6 | 225 | 0.9 | 91.6 |
| 2020 | 115 | 1.1 | 91.3 | 122 | 1.2 | 96.0 | 110.0 | 228 | 1.0 | 92.5 |
| 2021 | 116 | 1.2 | 92.5 | 124 | 1.3 | 97.2 | 111.5 | 230 | 1.1 | 93.6 |
| 2022 | 118 | 1.2 | 93.6 | 125 | 1.3 | 98.5 | 113.1 | 233 | 1.1 | 94.6 |
| 2023 | 119 | 1.2 | 94.7 | 127 | 1.3 | 99.8 | 114.7 | 235 | 1.1 | 95.7 |
| Average % p.a. 13 to 18 | -2.2 | | | -1.3 | | | 1.4 | -1.9 | | |
| Average % p.a. 18 to 23 | 1.2 | | | 1.3 | | | 1.3 | 1.1 | | |

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - France – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 542 | 1.9 | 100.0 | 520 | 2.0 | 100.0 | 100.0 | 1237 | 2.5 | 100.0 |
| 2014 | 539 | -0.5 | 99.5 | 517 | -0.5 | 99.5 | 100.6 | 1237 | 0.0 | 100.0 |
| 2015 | 544 | 1.0 | 100.5 | 522 | 1.0 | 100.5 | 101.6 | 1243 | 0.5 | 100.5 |
| 2016 | 550 | 1.0 | 101.5 | 528 | 1.0 | 101.5 | 102.7 | 1256 | 1.0 | 101.5 |
| 2017 | 556 | 1.1 | 102.6 | 533 | 1.1 | 102.6 | 104.8 | 1275 | 1.5 | 103.1 |
| 2018 | 558 | 0.4 | 103.0 | 536 | 0.5 | 103.1 | 106.2 | 1281 | 0.5 | 103.6 |
| 2019 | 565 | 1.3 | 104.3 | 543 | 1.4 | 104.5 | 107.4 | 1300 | 1.4 | 105.1 |
| 2020 | 578 | 2.3 | 106.8 | 557 | 2.4 | 107.1 | 108.8 | 1331 | 2.4 | 107.6 |
| 2021 | 589 | 1.8 | 108.7 | 567 | 1.9 | 109.1 | 110.2 | 1357 | 1.9 | 109.7 |
| 2022 | 600 | 1.8 | 110.7 | 578 | 1.9 | 111.2 | 111.6 | 1383 | 1.9 | 111.8 |
| 2023 | 610 | 1.8 | 112.7 | 589 | 1.9 | 113.4 | 113.1 | 1409 | 1.9 | 113.9 |
| Average % p.a. 13 to 18 | 0.6 | | | 0.6 | | | 1.2 | 0.7 | | |
| Average % p.a. 18 to 23 | 1.8 | | | 1.9 | | | 1.3 | 1.9 | | |

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Germany – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|--|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 1118 | -1.0 | 100.0 | 1035 | -0.9 | 100.0 | 100.0 | 2111 | -0.6 | 100.0 |
| 2014 | 1103 | -1.4 | 98.6 | 1021 | -1.3 | 98.7 | 101.9 | 2111 | 0.0 | 100.0 |
| 2015 | 1127 | 2.2 | 100.8 | 1045 | 2.3 | 101.0 | 103.8 | 2096 | -0.7 | 99.3 |
| 2016 | 1104 | -2.0 | 98.8 | 1025 | -1.9 | 99.1 | 106.1 | 2048 | -2.3 | 97.0 |
| 2017 | 1122 | 1.6 | 100.3 | 1042 | 1.7 | 100.7 | 108.5 | 2091 | 2.1 | 99.1 |
| 2018 | 1148 | 2.3 | 102.6 | 1059 | 1.6 | 102.3 | 109.9 | 2100 | 0.4 | 99.4 |
| 2019 | 1152 | 0.3 | 103.0 | 1064 | 0.4 | 102.8 | 110.7 | 2083 | -0.8 | 98.7 |
| 2020 | 1165 | 1.1 | 104.1 | 1077 | 1.2 | 104.0 | 112.2 | 2088 | 0.2 | 98.9 |
| 2021 | 1181 | 1.4 | 105.6 | 1093 | 1.5 | 105.6 | 113.7 | 2115 | 1.3 | 100.2 |
| 2022 | 1197 | 1.3 | 107.0 | 1108 | 1.4 | 107.1 | 115.2 | 2141 | 1.2 | 101.4 |
| 2023 | 1215 | 1.5 | 108.7 | 1127 | 1.6 | 108.9 | 116.7 | 2172 | 1.4 | 102.9 |
| Average % p.a. 13 to 18 | 0.5 | | | 0.5 | | | 1.9 | -0.1 | | |
| Average % p.a. 18 to 23 | 1.1 | | | 1.2 | | | 1.2 | 0.7 | | |

NB: Forecast downgraded due to relocation of business to Poland and general downturn

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Italy – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|--|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 578 | -0.9 | 100.0 | 589 | -0.8 | 100.0 | 100.0 | 1163 | -0.3 | 100.0 |
| 2014 | 606 | 4.9 | 104.9 | 618 | 4.9 | 104.9 | 100.1 | 1198 | 3.0 | 103.0 |
| 2015 | 633 | 4.5 | 109.6 | 646 | 4.5 | 109.6 | 101.0 | 1240 | 3.5 | 106.6 |
| 2016 | 637 | 0.7 | 110.4 | 650 | 0.7 | 110.3 | 102.0 | 1245 | 0.4 | 107.1 |
| 2017 | 649 | 1.9 | 112.4 | 662 | 1.9 | 112.4 | 103.6 | 1282 | 3.0 | 110.3 |
| 2018 | 655 | 0.9 | 113.4 | 668 | 0.9 | 113.4 | 104.4 | 1327 | 3.5 | 114.1 |
| 2019 | 660 | 0.7 | 114.2 | 674 | 0.8 | 114.4 | 104.5 | 1338 | 0.8 | 115.1 |
| 2020 | 668 | 1.3 | 115.7 | 683 | 1.4 | 116.0 | 105.3 | 1357 | 1.4 | 116.7 |
| 2021 | 677 | 1.2 | 117.2 | 692 | 1.3 | 117.5 | 106.0 | 1375 | 1.3 | 118.2 |
| 2022 | 685 | 1.3 | 118.7 | 702 | 1.4 | 119.2 | 106.7 | 1394 | 1.4 | 119.9 |
| 2023 | 694 | 1.3 | 120.2 | 712 | 1.4 | 120.8 | 107.4 | 1413 | 1.4 | 121.5 |
| Average % p.a. 13 to 18 | 2.5 | | | 2.6 | | | 0.9 | 2.7 | | |
| Average % p.a. 18 to 23 | 1.2 | | | 1.3 | | | 0.6 | 1.3 | | |

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Netherlands – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|--|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 283 | 0.2 | 100.0 | 263 | 0.3 | 100.0 | 100.0 | 536 | 0.0 | 100.0 |
| 2014 | 285 | 0.8 | 100.8 | 265 | 0.8 | 100.8 | 101.3 | 542 | 1.1 | 101.1 |
| 2015 | 288 | 1.1 | 101.9 | 270 | 1.9 | 102.7 | 103.2 | 553 | 2.0 | 103.2 |
| 2016 | 288 | -0.1 | 101.7 | 270 | 0.0 | 102.7 | 105.4 | 554 | 0.1 | 103.3 |
| 2017 | 270 | -6.1 | 95.5 | 254 | -5.9 | 96.6 | 108.4 | 526 | -5.0 | 98.1 |
| 2018 | 277 | 2.4 | 97.8 | 260 | 2.4 | 98.9 | 111.1 | 553 | 5.1 | 103.2 |
| 2019 | 284 | 2.8 | 100.6 | 268 | 2.9 | 101.8 | 112.9 | 570 | 3.0 | 106.3 |
| 2020 | 294 | 3.2 | 103.8 | 277 | 3.3 | 105.2 | 114.7 | 589 | 3.4 | 109.9 |
| 2021 | 300 | 2.3 | 106.2 | 283 | 2.4 | 107.7 | 116.4 | 604 | 2.5 | 112.6 |
| 2022 | 307 | 2.3 | 108.6 | 290 | 2.4 | 110.3 | 118.1 | 619 | 2.5 | 115.5 |
| 2023 | 314 | 2.2 | 111.0 | 297 | 2.3 | 112.8 | 119.8 | 634 | 2.4 | 118.3 |
| Average % p.a. 13 to 18 | -0.4 | | | -0.2 | | | 2.1 | 0.6 | | |
| Average % p.a. 18 to 23 | 2.6 | | | 2.7 | | | 1.5 | 2.8 | | |

NB: For 2016 to 2018 adjustments were made to data to allow for the closure of a plant in Eindhoven reduced output at another plant in Bergen op Zoom

Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Spain – 2013 to 2023 - 000 Tonnes & € Million

| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
|-------------------------------|-----------------------|--------|-----------------|---------------|--------|-----------------|------------------------|--------------|--------|-----------------|
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 340 | -1.3 | 100.0 | 320 | -1.2 | 100.0 | 100.0 | 670 | -0.9 | 100.0 |
| 2014 | 344 | 1.3 | 101.3 | 325 | 1.4 | 101.4 | 101.3 | 665 | -0.7 | 99.3 |
| 2015 | 356 | 3.5 | 104.8 | 336 | 3.5 | 104.9 | 104.6 | 677 | 1.8 | 101.1 |
| 2016 | 363 | 2.0 | 106.9 | 342 | 1.9 | 107.0 | 107.9 | 695 | 2.7 | 103.8 |
| 2017 | 375 | 3.3 | 110.4 | 352 | 2.8 | 110.0 | 111.0 | 715 | 2.9 | 106.7 |
| 2018 | 386 | 2.9 | 113.7 | 362 | 2.8 | 113.1 | 113.7 | 737 | 3.1 | 110.1 |
| 2019 | 399 | 3.3 | 117.4 | 374 | 3.4 | 117.0 | 116.4 | 765 | 3.7 | 114.2 |
| 2020 | 408 | 2.3 | 120.2 | 383 | 2.4 | 119.8 | 118.7 | 786 | 2.7 | 117.3 |
| 2021 | 417 | 2.2 | 122.8 | 392 | 2.3 | 122.5 | 120.9 | 806 | 2.6 | 120.3 |
| 2022 | 426 | 2.1 | 125.3 | 401 | 2.2 | 125.2 | 123.0 | 826 | 2.5 | 123.3 |
| 2023 | 434 | 2.1 | 127.9 | 409 | 2.2 | 127.9 | 125.2 | 846 | 2.5 | 126.3 |
| Average % p.a. 13 to 18 | 2.6 | | | 2.5 | | | 2.6 | 1.9 | | |
| Average % p.a. 18 to 23 | 2.4 | | | 2.5 | | | 1.9 | 2.8 | | |

Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Switzerland – 2013 to 2023 - 000 Tonnes & € Million

| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
|-------------------------------|-----------------------|--------|-----------------|---------------|--------|-----------------|------------------------|--------------|--------|-----------------|
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 118 | -7.1 | 100.0 | 101 | -6.5 | 100.0 | 100.0 | 363 | -9.9 | 100.0 |
| 2014 | 112 | -5.1 | 94.9 | 98 | -3.0 | 97.0 | 102.0 | 342 | -5.8 | 94.2 |
| 2015 | 113 | 0.9 | 95.8 | 100 | 2.1 | 99.0 | 103.3 | 381 | 11.4 | 105.0 |
| 2016 | 105 | -7.1 | 89.0 | 93 | -7.0 | 92.1 | 104.8 | 361 | -5.2 | 99.4 |
| 2017 | 101 | -3.8 | 85.6 | 90 | -3.7 | 88.6 | 106.2 | 342 | -5.2 | 94.2 |
| 2018 | 98 | -2.6 | 83.3 | 87 | -2.5 | 86.4 | 108.5 | 319 | -6.7 | 87.9 |
| 2019 | 96 | -2.0 | 81.7 | 86 | -1.9 | 84.8 | 109.6 | 309 | -3.3 | 85.1 |
| 2020 | 95 | -1.2 | 80.7 | 85 | -1.1 | 83.9 | 111.2 | 300 | -2.8 | 82.7 |
| 2021 | 95 | -0.7 | 80.2 | 84 | -0.6 | 83.4 | 112.8 | 294 | -1.9 | 81.1 |
| 2022 | 94 | -0.7 | 79.6 | 84 | -0.6 | 82.9 | 114.4 | 289 | -1.8 | 79.6 |
| 2023 | 93 | -0.7 | 79.1 | 83 | -0.6 | 82.4 | 116.1 | 284 | -1.8 | 78.2 |
| Average % p.a. 13 to 18 | -3.6 | | | -2.9 | | | 1.6 | -2.5 | | |
| Average % p.a. 18 to 23 | -1.0 | | | -0.9 | | | 1.4 | -2.3 | | |

Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Turkey – 2013 to 2023 - 000 Tonnes & € Million

| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
|-------------------------|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 408 | 8.9 | 100.0 | 382 | 8.9 | 100.0 | 100.0 | 650 | 4.8 | 100.0 |
| 2014 | 500 | 22.4 | 122.4 | 450 | 17.7 | 117.7 | 103.9 | 675 | 3.8 | 103.8 |
| 2015 | 512 | 2.4 | 125.4 | 473 | 5.1 | 123.7 | 109.3 | 696 | 3.1 | 107.1 |
| 2016 | 515 | 0.6 | 126.1 | 490 | 3.6 | 128.2 | 112.4 | 735 | 5.6 | 113.1 |
| 2017 | 599 | 16.3 | 146.7 | 573 | 16.9 | 149.9 | 119.6 | 859 | 16.9 | 132.2 |
| 2018 | 561 | -6.3 | 137.4 | 525 | -8.4 | 137.3 | 121.8 | 761 | -11.4 | 117.1 |
| 2019 | 575 | 2.4 | 140.7 | 538 | 2.5 | 140.7 | 118.8 | 783 | 2.9 | 120.5 |
| 2020 | 619 | 7.6 | 151.5 | 580 | 7.7 | 151.6 | 122.1 | 847 | 8.1 | 130.3 |
| 2021 | 659 | 6.5 | 161.3 | 618 | 6.6 | 161.6 | 126.0 | 906 | 7.0 | 139.4 |
| 2022 | 702 | 6.5 | 171.8 | 659 | 6.6 | 172.3 | 130.0 | 969 | 7.0 | 149.1 |
| 2023 | 750 | 6.9 | 183.7 | 705 | 7.0 | 184.4 | 134.7 | 1041 | 7.4 | 160.2 |
| Average % p.a. 13 to 18 | 6.6 | | | 6.5 | | | 4.0 | 3.2 | | |
| Average % p.a. 18 to 23 | 6.0 | | | 6.1 | | | 2.0 | 6.5 | | |

Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - UK – 2013 to 2023 - 000 Tonnes & € Million

| Year | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
|-------------------------|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 605 | -1.5 | 100.0 | 586 | -1.1 | 100.0 | 100.0 | 1279 | 6.5 | 100.0 |
| 2014 | 607 | 0.2 | 100.2 | 587 | 0.2 | 100.2 | 103.2 | 1240 | -3.0 | 97.0 |
| 2015 | 607 | 0.0 | 100.2 | 593 | 1.0 | 101.3 | 105.5 | 1521 | 22.7 | 119.0 |
| 2016 | 605 | -0.3 | 100.0 | 582 | -1.9 | 99.4 | 107.4 | 1313 | -13.7 | 102.7 |
| 2017 | 654 | 8.1 | 108.1 | 606 | 4.1 | 103.5 | 109.3 | 1317 | 0.4 | 103.0 |
| 2018 | 670 | 2.5 | 110.8 | 621 | 2.5 | 106.0 | 110.9 | 1322 | 0.3 | 103.4 |
| 2019 | 682 | 1.8 | 112.8 | 633 | 1.9 | 108.0 | 112.3 | 1351 | 2.2 | 105.7 |
| 2020 | 696 | 2.0 | 115.0 | 646 | 2.1 | 110.3 | 114.0 | 1383 | 2.4 | 108.1 |
| 2021 | 710 | 2.1 | 117.4 | 660 | 2.2 | 112.7 | 115.7 | 1417 | 2.5 | 110.8 |
| 2022 | 725 | 2.1 | 119.8 | 675 | 2.2 | 115.2 | 117.6 | 1453 | 2.5 | 113.6 |
| 2023 | 741 | 2.1 | 122.4 | 690 | 2.2 | 117.7 | 119.5 | 1489 | 2.5 | 116.5 |
| Average % p.a. 13 to 18 | 2.1 | | | 1.2 | | | 2.1 | 0.7 | | |
| Average % p.a. 18 to 23 | 2.0 | | | 2.1 | | | 1.5 | 2.4 | | |

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Other Western Europe – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 198 | -2.0 | 100.0 | 194 | -1.9 | 100.0 | 100.0 | 373 | -1.7 | 100.0 |
| 2014 | 199 | 0.6 | 100.6 | 195 | 0.6 | 100.6 | 100.7 | 375 | 0.3 | 100.3 |
| 2015 | 200 | 0.4 | 101.0 | 196 | 0.6 | 101.2 | 101.5 | 374 | -0.2 | 100.2 |
| 2016 | 201 | 0.6 | 101.6 | 197 | 0.6 | 101.8 | 102.4 | 377 | 0.8 | 101.0 |
| 2017 | 204 | 1.7 | 103.3 | 200 | 1.6 | 103.5 | 104.4 | 385 | 2.2 | 103.2 |
| 2018 | 208 | 1.6 | 105.0 | 204 | 1.6 | 105.2 | 106.4 | 393 | 1.9 | 105.2 |
| 2019 | 211 | 1.9 | 107.0 | 208 | 2.0 | 107.2 | 108.3 | 402 | 2.3 | 107.6 |
| 2020 | 215 | 1.8 | 108.9 | 211 | 1.9 | 109.2 | 110.2 | 410 | 2.2 | 109.9 |
| 2021 | 218 | 1.4 | 110.4 | 215 | 1.5 | 110.9 | 111.7 | 418 | 1.8 | 111.9 |
| 2022 | 221 | 1.3 | 111.8 | 218 | 1.4 | 112.4 | 113.1 | 425 | 1.7 | 113.8 |
| 2023 | 224 | 1.4 | 113.4 | 221 | 1.4 | 114.0 | 114.5 | 432 | 1.7 | 115.7 |
| Average % p.a. 13 to 18 | 1.0 | | | 1.0 | | | 1.2 | 1.0 | | |
| Average % p.a. 18 to 23 | 1.6 | | | 1.6 | | | 1.5 | 1.9 | | |

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Total Western Europe – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 4460 | 0.2 | 100.0 | 4241 | 0.4 | 100.0 | 100.0 | 8895 | 0.9 | 100.0 |
| 2014 | 4551 | 2.0 | 102.0 | 4317 | 1.8 | 101.8 | 101.7 | 8882 | -0.1 | 99.9 |
| 2015 | 4632 | 1.8 | 103.9 | 4418 | 2.3 | 104.2 | 103.8 | 9273 | 4.4 | 104.3 |
| 2016 | 4619 | -0.3 | 103.6 | 4413 | -0.1 | 104.0 | 105.8 | 9074 | -2.2 | 102.0 |
| 2017 | 4795 | 3.8 | 107.5 | 4561 | 3.3 | 107.5 | 108.5 | 9307 | 2.6 | 104.6 |
| 2018 | 4831 | 0.8 | 108.3 | 4577 | 0.4 | 107.9 | 110.2 | 9311 | 0.0 | 104.7 |
| 2019 | 4899 | 1.4 | 109.8 | 4645 | 1.5 | 109.5 | 111.0 | 9422 | 1.2 | 105.9 |
| 2020 | 5015 | 2.4 | 112.4 | 4760 | 2.5 | 112.2 | 112.7 | 9617 | 2.1 | 108.1 |
| 2021 | 5126 | 2.2 | 114.9 | 4869 | 2.3 | 114.8 | 114.5 | 9823 | 2.1 | 110.4 |
| 2022 | 5240 | 2.2 | 117.5 | 4982 | 2.3 | 117.5 | 116.2 | 10034 | 2.2 | 112.8 |
| 2023 | 5363 | 2.4 | 120.2 | 5103 | 2.4 | 120.3 | 118.1 | 10261 | 2.3 | 115.4 |
| Average % p.a. 13 to 18 | 1.6 | | | 1.5 | | | 2.0 | 0.9 | | |
| Average % p.a. 18 to 23 | 2.1 | | | 2.2 | | | 1.4 | 2.0 | | |

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Nordic – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 166 | 0.6 | 100.0 | 154 | 0.6 | 100.0 | 100.0 | 344 | -0.5 | 100.0 |
| 2014 | 168 | 1.1 | 101.1 | 156 | 1.1 | 101.1 | 101.8 | 338 | -2.0 | 98.0 |
| 2015 | 171 | 1.7 | 102.8 | 158 | 1.7 | 102.8 | 104.4 | 327 | -3.1 | 95.0 |
| 2016 | 173 | 1.3 | 104.1 | 160 | 1.3 | 104.1 | 106.5 | 325 | -0.5 | 94.5 |
| 2017 | 176 | 1.7 | 105.9 | 163 | 1.7 | 105.9 | 108.8 | 330 | 1.3 | 95.7 |
| 2018 | 178 | 1.3 | 107.2 | 165 | 1.3 | 107.2 | 110.7 | 321 | -2.7 | 93.1 |
| 2019 | 181 | 1.4 | 108.7 | 168 | 1.4 | 108.7 | 112.5 | 326 | 1.8 | 94.8 |
| 2020 | 184 | 1.7 | 110.6 | 170 | 1.7 | 110.6 | 114.5 | 333 | 2.1 | 96.7 |
| 2021 | 187 | 2.1 | 112.9 | 174 | 2.1 | 112.9 | 116.4 | 341 | 2.5 | 99.1 |
| 2022 | 192 | 2.2 | 115.4 | 178 | 2.2 | 115.4 | 118.5 | 350 | 2.6 | 101.6 |
| 2023 | 196 | 2.2 | 118.0 | 182 | 2.2 | 118.0 | 120.6 | 359 | 2.6 | 104.2 |
| Average % p.a. 13 to 18 | 1.4 | | | 1.4 | | | 2.1 | -1.4 | | |
| Average % p.a. 18 to 23 | 1.9 | | | 1.9 | | | 1.7 | 2.3 | | |

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Poland – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 415 | 1.6 | 100.0 | 375 | 1.7 | 100.0 | 100.0 | 588 | 1.7 | 100.0 |
| 2014 | 434 | 4.7 | 104.7 | 393 | 4.8 | 104.8 | 103.1 | 619 | 5.3 | 105.3 |
| 2015 | 458 | 5.5 | 110.4 | 415 | 5.6 | 110.6 | 106.8 | 656 | 5.9 | 111.6 |
| 2016 | 480 | 4.9 | 115.8 | 436 | 5.0 | 116.1 | 110.2 | 662 | 0.9 | 112.6 |
| 2017 | 514 | 7.1 | 124.1 | 467 | 7.2 | 124.5 | 115.4 | 730 | 10.2 | 124.1 |
| 2018 | 550 | 7.0 | 132.7 | 500 | 7.1 | 133.3 | 120.6 | 783 | 7.2 | 133.1 |
| 2019 | 587 | 6.6 | 141.4 | 533 | 6.7 | 142.2 | 125.5 | 837 | 7.0 | 142.4 |
| 2020 | 617 | 5.1 | 148.7 | 561 | 5.2 | 149.7 | 129.4 | 883 | 5.5 | 150.2 |
| 2021 | 645 | 4.6 | 155.5 | 587 | 4.7 | 156.7 | 132.9 | 927 | 5.0 | 157.7 |
| 2022 | 674 | 4.5 | 162.5 | 615 | 4.6 | 163.9 | 136.5 | 973 | 4.9 | 165.5 |
| 2023 | 706 | 4.7 | 170.1 | 644 | 4.8 | 171.7 | 140.4 | 1023 | 5.1 | 173.9 |
| Average % p.a. 13 to 18 | 5.8 | | | 5.9 | | | 3.8 | 5.9 | | |
| Average % p.a. 18 to 23 | 5.1 | | | 5.2 | | | 3.1 | 5.5 | | |

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Other Central Europe – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 310 | 0.7 | 100.0 | 281 | 0.8 | 100.0 | 100.0 | 440 | -0.2 | 100.0 |
| 2014 | 320 | 3.0 | 103.0 | 289 | 3.1 | 103.1 | 103.0 | 446 | 1.4 | 101.4 |
| 2015 | 332 | 3.8 | 107.0 | 301 | 3.9 | 107.2 | 107.0 | 465 | 4.4 | 105.8 |
| 2016 | 344 | 3.6 | 110.9 | 312 | 3.7 | 111.2 | 111.0 | 484 | 3.9 | 110.0 |
| 2017 | 361 | 4.9 | 116.3 | 328 | 5.0 | 116.8 | 116.5 | 511 | 5.6 | 116.1 |
| 2018 | 374 | 3.7 | 120.6 | 340 | 3.8 | 121.2 | 120.8 | 529 | 3.7 | 120.4 |
| 2019 | 387 | 3.5 | 124.9 | 352 | 3.6 | 125.6 | 124.6 | 550 | 3.9 | 125.1 |
| 2020 | 400 | 3.2 | 128.9 | 364 | 3.3 | 129.7 | 128.0 | 570 | 3.6 | 129.6 |
| 2021 | 412 | 3.2 | 132.9 | 376 | 3.3 | 134.0 | 131.5 | 590 | 3.6 | 134.2 |
| 2022 | 425 | 3.0 | 136.9 | 388 | 3.1 | 138.1 | 134.9 | 610 | 3.4 | 138.8 |
| 2023 | 438 | 3.1 | 141.1 | 400 | 3.2 | 142.5 | 138.4 | 631 | 3.5 | 143.5 |
| Average % p.a. 13 to 18 | 3.8 | | | 3.9 | | | 3.9 | 3.8 | | |
| Average % p.a. 18 to 23 | 3.2 | | | 3.3 | | | 2.8 | 3.6 | | |

| Estimates & Forecasts of Cartonboard Purchases, Folding Carton Output & Sales Turnover - Total Central Europe – 2013 to 2023 - 000 Tonnes & € Million | | | | | | | | | | |
|---|-----------------------|--------|--------------|---------------|--------|--------------|------------------|--------------|--------|--------------|
| | Cartonboard Purchases | | | Carton Output | | | Compo site Index | Carton Sales | | |
| Year | 000 Tonnes | % p.a. | Index 13=100 | 000 Tonnes | % p.a. | Index 13=100 | Index 13=100 | €M | % p.a. | Index 13=100 |
| 2013 | 725 | 1.2 | 100.0 | 656 | 1.3 | 100.0 | 100.0 | 1028 | 0.8 | 100.0 |
| 2014 | 754 | 4.0 | 104.0 | 682 | 4.1 | 104.1 | 103.0 | 1065 | 3.6 | 103.6 |
| 2015 | 790 | 4.8 | 109.0 | 716 | 4.9 | 109.2 | 106.9 | 1121 | 5.3 | 109.1 |
| 2016 | 824 | 4.4 | 113.7 | 747 | 4.5 | 114.0 | 110.7 | 1146 | 2.2 | 111.5 |
| 2017 | 875 | 6.2 | 120.8 | 795 | 6.3 | 121.2 | 116.1 | 1241 | 8.3 | 120.7 |
| 2018 | 925 | 5.6 | 127.5 | 840 | 5.7 | 128.2 | 120.8 | 1312 | 5.8 | 127.6 |
| 2019 | 974 | 5.3 | 134.4 | 886 | 5.4 | 135.1 | 124.9 | 1387 | 5.7 | 135.0 |
| 2020 | 1016 | 4.3 | 140.2 | 925 | 4.4 | 141.1 | 128.5 | 1453 | 4.7 | 141.4 |
| 2021 | 1057 | 4.0 | 145.8 | 963 | 4.1 | 146.9 | 132.0 | 1518 | 4.4 | 147.6 |
| 2022 | 1099 | 3.9 | 151.6 | 1002 | 4.0 | 152.9 | 135.5 | 1583 | 4.3 | 154.0 |
| 2023 | 1143 | 4.1 | 157.7 | 1044 | 4.2 | 159.2 | 139.2 | 1654 | 4.5 | 160.9 |
| Average % p.a. 13 to 18 | 5.0 | | | 5.1 | | | 3.8 | 5.0 | | |
| Average % p.a. 18 to 23 | 4.3 | | | 4.4 | | | 2.9 | 4.7 | | |

12.3 End Use Markets

Breakfast cereal products

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 276 | 4.9 | 468 | 4.3 | 1696 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 0.4 | 468 | 476 | 8.4 | |

Cakes, biscuits, baked products

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|---------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 382 | 6.8 | 560 | 5.1 | 1468 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 2.6 | 560 | 637 | 76.9 | |

Chocolate & sugar confectionery

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 454 | 8.1 | 885 | 8.1 | 1947 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 1.7 | 885 | 964 | 78.7 | |

Chilled foods

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 256 | 4.6 | 402 | 3.7 | 1573 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 5.3 | 402 | 520 | 117.6 | |

Dry beverages

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 145 | 2.6 | 228 | 2.1 | 1572 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 2.5 | 228 | 258 | 30.1 | |

Food to go

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 214 | 3.8 | 361 | 3.3 | 1686 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 4.7 | 361 | 453 | 92.4 | |

Frozen food

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 637 | 11.4 | 983 | 9.0 | 1543 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 4.3 | 983 | 1211 | 228.3 | |

Soft drinks & beer

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 292 | 5.2 | 562 | 5.1 | 1928 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 4.6 | 562 | 703 | 140.6 | |

Wines & spirits

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 191 | 3.4 | 375 | 3.4 | 1966 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 3.1 | 375 | 437 | 62.0 | |

Other foods

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 511 | 9.2 | 861 | 7.9 | 1686 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 3.6 | 861 | 1026 | 164.9 | |

Cigarettes, tobacco, accessories

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 181 | 3.2 | 293 | 2.7 | 1623 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| -1.1 | 293 | 277 | -16.3 | |

Cleaning & laundry products

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 219 | 3.9 | 322 | 2.9 | 1472 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 1.6 | 322 | 348 | 26.0 | |

Cosmetics & beauty

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 235 | 4.2 | 721 | 6.6 | 3068 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 2.9 | 721 | 833 | 112.4 | |

Misc household products

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 212 | 3.8 | 393 | 3.6 | 1854 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 0.1 | 393 | 396 | 2.8 | |

Paper, stationery & related goods

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 122 | 2.2 | 249 | 2.3 | 2040 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 0.3 | 249 | 253 | 3.4 | |

Personal care

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 166 | 3.0 | 371 | 3.4 | 2238 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 2.0 | 371 | 409 | 38.0 | |

Pharmaceuticals & medical products

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 589 | 10.6 | 1756 | 16.0 | 2980 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 1.6 | 1756 | 1898 | 142.1 | |

Other non-foods

| Summary Market Prospects - 2018 | | | | |
|---------------------------------|------------------|---------|-------------------------|------------------|
| Volume | | Value | | Ave Value/ Tonne |
| 000 Tonnes | % Share of Total | €M | % Share of Total | € |
| 503 | 9.0 | 1154 | 10.5 | 2295 |
| Market Growth: 2018 to 2023 | | | | |
| % p.a. (Value) | 2018 €m | 2023 €m | Incremental Business €m | |
| 0.4 | 1154 | 1176 | 22.0 | |

13. GENERAL APPENDIX

13.1 Glossary and Definitions

| | |
|--------|--|
| B&M | Bricks & Mortar |
| ECMA | European Carton Makers Association |
| EPRN's | Extended Producer Responsibility Notes |
| GC | Virgin (white) Board |
| GD | Recycled (white) Board |
| FBB | Fully Bleached Board |
| FDI | Foreign Direct Investment |
| FMCG | Fast-Moving Consumer Goods |
| GDP | Gross Domestic Product |
| GSM | Grams Per Square Metre |
| GST | Goods & Service Tax |
| HQPP | High Quality Post Print |
| IP | Industrial Production |
| KOL | Key Opinion Leader |
| LLD | Limited List Discounter |
| Msm | Million Square Metres |
| PLA | Polylactic Acid, a plastic substitute made from fermented plant starch (usually corn) is quickly becoming a popular alternative to traditional petroleum-based plastics. |
| PPL | Pre-Printed Liner |
| PRN's | Producer Responsibility Notes |
| RDC | Regional Distribution Centre |
| RPC | Reusable Plastic Container |
| RRP | Retail Ready Packaging |
| SKU | Stock Keeping Unit |
| SRP | Shelf Ready Packaging |
| SUP | Single Use Plastic |

Definitions of the End-Use Markets

| Market Sectors Definition | | | | | |
|---------------------------|---|---|---|--|--|
| Generic Markets (A) | Market Sector (B) - 18 | Segments (C) | Sub Segments (D) | Products Excluded | |
| Foods | Breakfast Cereals | Cold RTE cereals | Cold Ready to Eat cereals | Loose bran | |
| | | | | Bran products | Cereal bars (See cakes, biscuits & baked products) |
| | | | | Muesli | |
| | | | Hot cereals | Instant cereals | |
| | | | | Porridge | |
| | Cakes, Biscuits & Baked Products | Biscuits | Sweet, semi-sweet & plain biscuit, cereal bars | Chilled & frozen cakes (see frozen & chilled foods) | |
| | | Crispbreads | Crispbreads, melba toast, crackers, water biscuits | Salted biscuits (see snack foods, under other foods) | |
| | | Cakes | Multi portion cakes & individual cakes | | |
| | | Morning goods | Danish pastries & other sweet pastry products | | |
| | Chocolate & Sugar Confectionery | Chocolate confectionery | Chocolate count lines, solid chocolate, boxed assortments, Easter eggs & Christmas gift packs | | |
| Sugar confectionery | | Caramels & boiled sweets, gums & jellies, chewing gum & other sugar confectionery | | | |
| Chilled Foods | Fish & fish products | | Chilled convenience food 'on the move' | | |
| | Meat & multi-portion pies and other meat products | | | | |
| | Poultry & poultry products | | | | |
| | Ready meals | Including pizzas | | | |
| | Desserts & gateaux | | | | |
| | Chilled fruit & vegetable products | | | | |

| | | | | |
|--|----------------------|---------------------------------|---|--|
| | | Dairy products | Including cheese & dairy desserts | |
| | Dry Beverages | Instant coffee | | |
| | | Ground coffee | Including beans & coffee filters | |
| | | Tea & teabags | | |
| | | Powdered milk products | Including formula baby milk & non-dairy creamers | |
| | | Cocoa & drinking chocolate | Including malted drinks | |
| | Food To Go | Convenience 'on the move' | Including sandwiches, wraps, baguettes, salads, savoury bakery, single portion pies & pastry products, other savoury & sweet RTE foods. | Paper cups, plates, bowls & other related items |
| | | Quick serve Fast Food/Takeaways | including French fries/chips, burger boxes, other fast food containers | Food service & catering outside of the fast food/takeaway sector |

| Generic Markets (A) | Market Sector (B) - 18 | Segments (C) | Sub Segments (D) | Products Excluded |
|-------------------------|-------------------------------|----------------------------|--|-------------------|
| Food (continued) | Frozen Foods | Vegetables | | |
| | | Chips & potato products | | |
| | | Fish & fish products | | |
| | | Meat & meat products | | |
| | | Poultry & poultry products | | |
| | | Ready meals | Including pizzas | |
| | | Desserts & gateaux | | |
| | | Ice cream | Including ice cream confectionery | |
| | Soft Drinks & Beer | Beer | Including lager, light ale, pale ale, stout, brown ale, party ales | Fruit juices |
| | | Cider | Including cider perry | |
| | | Soft drinks | Still & carbonated soft drinks | |
| | | | Still & carbonated mineral water | |
| | | | Mixer drinks | |
| | | | Cordials & squashes | |

| | | | | |
|--|----------------------------|--------------------------|--|--|
| | Wines & Spirits | Wine | Still wine, sparkling wine & champagne, sherry, port & other fortified wines | |
| | | Spirits | Whisky, gin, vodka, rum, brandy & liqueurs | |
| | | | Pre-mixed spirits & mixers & alcoholic fruit drinks (including alcopops) | |
| | Other Foods | Dehydrated foods | Dehydrated ready meals | |
| | | | Soup mixes, including dehydrated & instant soup | |
| | | | Dessert mixes including instant desserts, toppings, blancmange & custard | |
| | | | Potato mixes including instant & dehydrated potato | |
| | | | Dehydrated baby foods | |
| | | | Dehydrated cheese sauce mixes & ethnic sauces | |
| | | Snack foods | Salted biscuits, nuts, crisps & extruded snacks | |
| | | Dry foods | Pasta & rice | |
| | | | Sugar | |
| | | | Condiments | |
| | | | Herbs & spices | |
| | | | Dried fruit | |
| | | Ambient wet foods | Including canned & bottled foods | |
| | | Fresh fruit & vegetables | Including ambient & fresh loose & prepared fruit & vegetables | |

| Generic Markets (A) | Market Sector (B) - 18 | Segments (C) | Sub Segments (D) | Products Excluded |
|---------------------|---------------------------------|--------------|----------------------|-------------------|
| Non-Foods | Cigarettes & Tobacco | Cigarettes | | |
| | | Cigars | Including cigarillos | |

| | | | | |
|--|---|--|--|-----------------------------------|
| | | Pipe tobacco | Including cigarette rolling tobacco | |
| | | Smoking accessories | | |
| | | Vaping & tobacco substitutes | Vaping products & related accessories | |
| | Cleaning & Laundry Products | Cleaning products | Including scouring powders, bleaches, surface cleaners, glass cleaners & lavatory cleaners | Soap (see cosmetics & toiletries) |
| | | Clothes washing detergents & rinses | Including powder, liquid & tablet forms | |
| | | Machine dishwashing detergents & rinses | Including liquids, powders & tablets | |
| | | Washing up liquid | | |
| | Cosmetics & Beauty | Cosmetics & beauty products | Fragrances | |
| | | | Make up | |
| | | | Cosmetic creams including face / body creams, moisturisers & lotions | |
| | | | Sun care products | |
| | Miscellaneous Household Products | Clothing, textiles & footwear | | |
| | | Domestic appliances & electrical goods | | |
| | | China, pottery & glass | | |
| | | Toys, games & leisure products | Including sports goods | |
| | | Household foils & films | | |
| | | DIY & garden products | | |
| | | Photographic film & other photographic goods | | |
| | Paper Products | Nappies | Including incontinence products | |
| | | Tissues | Facial tissues & make up remover tissues | |
| | | Kitchen towels | | |

| | | | | |
|--|--|---------------------------|--|--|
| | | Feminine hygiene products | Including tampons & other sanitary protection products | |
| | | Stationery | Including boxed stationery | |

| Generic Markets (A) | Market Sector (B) - 18 | Segments (C) | Sub Segments (D) | Products Excluded |
|--------------------------------|--|----------------------------------|---|---------------------------------|
| Non-Foods | Personal Care | Hair care products | Shampoo & conditioner | |
| | | | Hairspray | |
| | | | Hair perms, colorants, lotions, mousses & gels | |
| | | Toiletries | Antiperspirants & deodorants including body sprays | |
| | | | Bath & shower preparations | |
| | | | Shaving foam, cream & gels & razors | |
| | | | Toothpaste, toothbrushes & other oral hygiene products | |
| | Liquid & bar soap | | | |
| | Pharmaceutical & Medical Products | Over the counter pharmaceuticals | Including analgesics, digestive remedies, mineral supplements, salves & ointments, etc. | |
| | | | Ethical / prescription drugs | |
| | | | Medical & surgical products | |
| | | Veterinary products | | |
| | | Other Non-Foods | Consumer IT & telecom products | |
| | | | Motor spares & accessories | Including car cleaning products |
| Engineering products | | | | |
| Others not elsewhere specified | Gifts | | | |
| Others not elsewhere specified | eCommerce | | | |

| | | | | |
|--|--|-----------|---|--|
| | | Pet Foods | Cat pet foods including moist & dried | |
| | | | Dog pet foods including moist & dried | |
| | | | Treats & other pet food products | |
| | | | Pet hygiene products including cat litter | |

Details of the countries covered in this report

| ECMA Countries (14) |
|---|
| Austria |
| Belgium |
| France |
| Germany |
| Italy |
| Netherlands |
| Nordic Region |
| Poland |
| Spain |
| Switzerland |
| Turkey |
| UK |
| Other Western European countries |
| Other Central European countries |

Full details of the NOA Optimism & Confidence survey

Introduction

NOA has been using the globally recognised business confidence measure of Purchasing Managers Index (Markit PMI) in the ECMA quarterly bulletin for several years. The Markit PMI data is a generic one covering a wide range of manufacturing businesses.

Risk and uncertainty within an industry affect expectations of market performance. Risk is largely considered to be identifiable and measurable, while uncertainty usually concerns unidentifiable risks which cannot be quantified. Risk and uncertainty are not independent of each other with one likely to impact on perceptions of the other.

In this report we have undertaken our own, in-depth confidence and optimism survey. This has been done specifically with folding carton converters, board mills and allied industries. A question referring to optimism and confidence was included in the ECMA fieldwork interviews exploring the subject of risk and uncertainty within the folding carton industry.

The following is a summary of folding carton industry respondents' ratings for optimism and confidence, and compares well versus the more generic findings of Markit PMI. These results are compared with Markit Purchasing Managers Indices (PMIs) for manufacturing, selected Europe Sectors (measures of industry activity) PMI reports, and uncertainty indices published by www.policyuncertainty.com.

The inclusion of this new data has been provided as an extension to the numerical set usually provided for the European Carton Prospects report. We hope that subscribers will enjoy reading the findings in this report and agree that it adds to the breadth of supporting data available for subscribers. We would be happy to discuss on-going provision of this data as part of the ECMA quarterly bulletin.

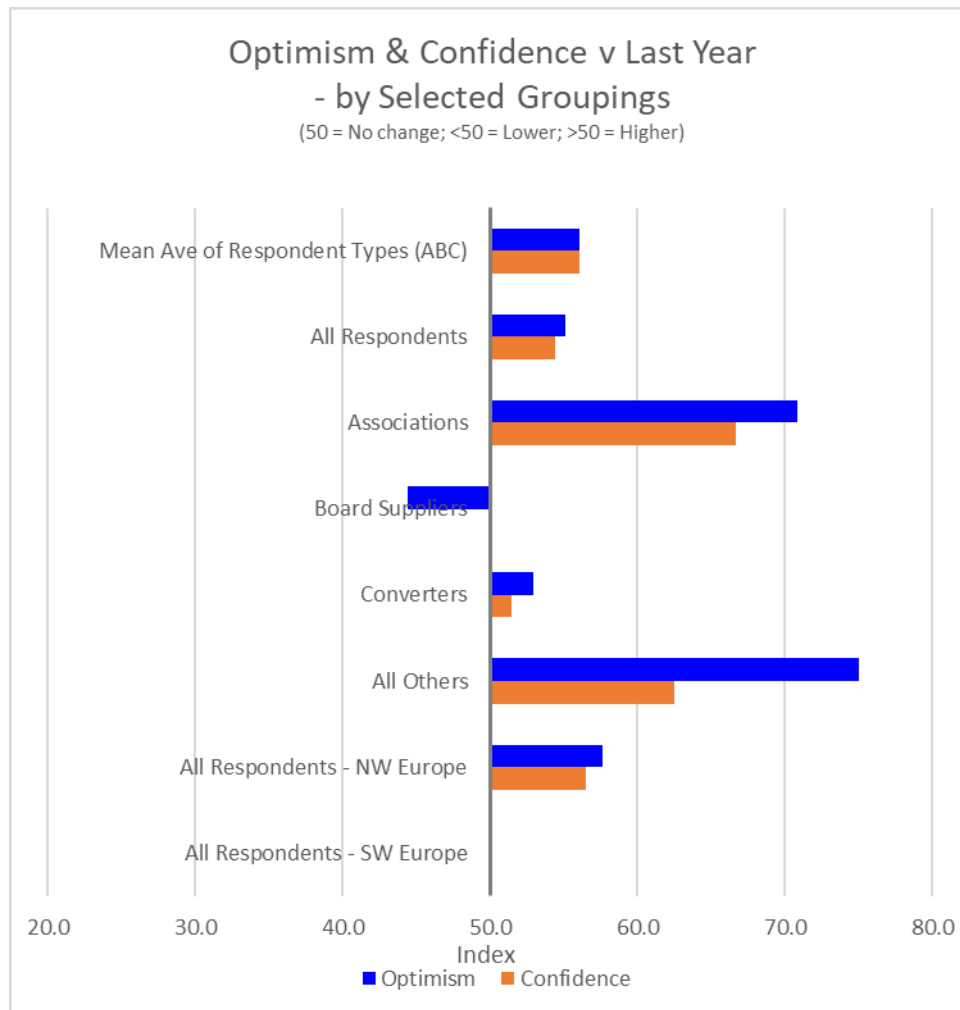
Folding Carton Industry Optimism and Confidence

Respondents were asked to rate their levels of optimism and confidence in the outlook for folding cartons compared to last year on a scale of 1 to 5. The ratings were allocated a value to generate an average rating index across respondents as follows:

- 1 = Much less optimistic/confident = 0
- 2 = Less optimistic/confident = 25
- 3 = Same level of optimism/confidence = 50
- 4 = More optimistic/confident = 75
- 5 = Much more optimistic/confident = 100

Total number of responses received and analysed at 34 was a small sample, so results will be indicative measures as a total, and more so for sub groups. When comparing between different sub groups we do see some interesting differences and initial conclusions.

Summary of Ratings for Optimism & Confidence



NB: Respondent Types ABC refers to Associations, Board Suppliers & Converters.

The chart above shows ratings for various groups of respondents. 50 equals no change from last year, above 50 is higher than last year and below 50 lower than last year. Note that where no reading is visible then the result is on or very near to 50.

While it is interesting to compare the above results, the small number of respondents at 34 means results could change significantly with the addition of new ratings.

All Respondents

- Overall results for all respondents indicates a higher level of confidence and optimism in the folding carton industry compared to last year.

Associations

- Results for associations were on average a lot more optimistic and confident than board suppliers or converters. Comments suggest potential for plastic substitution is playing a big part in this.
- NW Europe associations had a more positive average for both optimism and confidence compared to last year than associations in SW Europe.

Respondent Quotes:

“More cartonboard needed due to SUP. A clear boost to Output happening. Might become a more complex competitive scene due to mergers with converters” - (Association NWE).

“Cartons vs others – driven by focus on sustainability + EU laws are going that way” - (Association SWE).

“Stable market (no real growth and no real decline). Possible new usages from plastics” - (Association NWE).

Board Suppliers

- Board suppliers were on average less optimistic but views on confidence were more evenly divided between more confident and less confident.
- Feedback indicates global issues concerning trade, Brexit, economic growth outlook and political uncertainties are making the business climate more subdued. This follows a positive and strong year in 2018.
- Recycled board suppliers had a worse rating for optimism compared to virgin board suppliers. Reasons may be related to dynamics of pricing and input costs plus a more global market for virgin grades compared to recycled board supplies, more focussed on European markets.

Respondent Quotes:

“Less optimism and confidence due trade wars, general economic slowdown and Brexit. Not expecting a hard landing but nervousness in the market has meant customers are ... delaying and running down stocks a bit. There, has been some stock piling due to Brexit which is working through. Middle East also brewing issues” - (Board supplier Virgin grades)

“Still optimistic but less than last year. Also, less confidence. Escalation of trade war between China and US, increasing tariffs, retaliation. Whole Brexit debacle...” - (Board supplier Recycled grades)

“There is a big market still not yet discovered for folding carton boards e.g. Russia, USA also within Europe” - (Virgin board supplier)

“This year there is a little less certainty. See growing opportunities. May need time to feed through into products” - (Board supplier Recycled grades)

Converters

- Overall converter optimism and confidence was moderately higher compared to last year. The impact of plastics substitution was definitely the key positive influence; while concerns over regional economies, exchange rates, board supply and prices, the main negative factors.
- Interestingly within converters the level of optimism and confidence compared to last year for those supplying FMCG markets was much higher, while for those focussed on supplying to the non-FMCG sector, the reverse was true. Those supplying both were most optimistic and confident compared to last year.
- Reasons may include an upbeat view of the potential for plastics substitution amongst suppliers in the FMCG sector. In the non-FMCG sector, other factors such as business migration from west to east may be creating more uncertainty.
- Converters located in north west Europe were much more confident and optimistic than their counterparts in south west Europe. This is probably down to a more subdued economic outlook recently (e.g. Turkey & Italy).

Respondent Quotes:

“The outlook e.g. versus plastics presents strong opportunities and market developments are a game changer for the future for cartons” - (Converter FMCG/Non FMCG SW Europe)

“Less optimistic. Is there a crisis coming? Or is one coming only because everyone is talking about it since the end of 2018?” - (Converter Non FMCG NW Europe)

“Plastics to paper substitution. Being pushed by retailers to get out of plastic – statements from retail chains to get out of plastics completely” - (Converter FMCG NW Europe)

“Hard to predict. In pharma see moves from India/Asia to Europe – supply chain issues of medicine availability/quality. Therefore, volumes are being brought back to Europe” - (Converter Non FMCG NW Europe)

“I am less optimistic for growth because last year was a boom year for volumes although margins eroded due to rising costs.... uncertainty still around political backdrop – Brexit, Turkey, trade wars etc” - (Converter FMCG/Non FMCG NW Europe)

“Based on what our customers are saying to us growth this year is very good. 7% sales growth in existing markets without any development in new applications e.g. sub for plastic.... the outlook is more certain” - (Converter FMCG NW Europe)

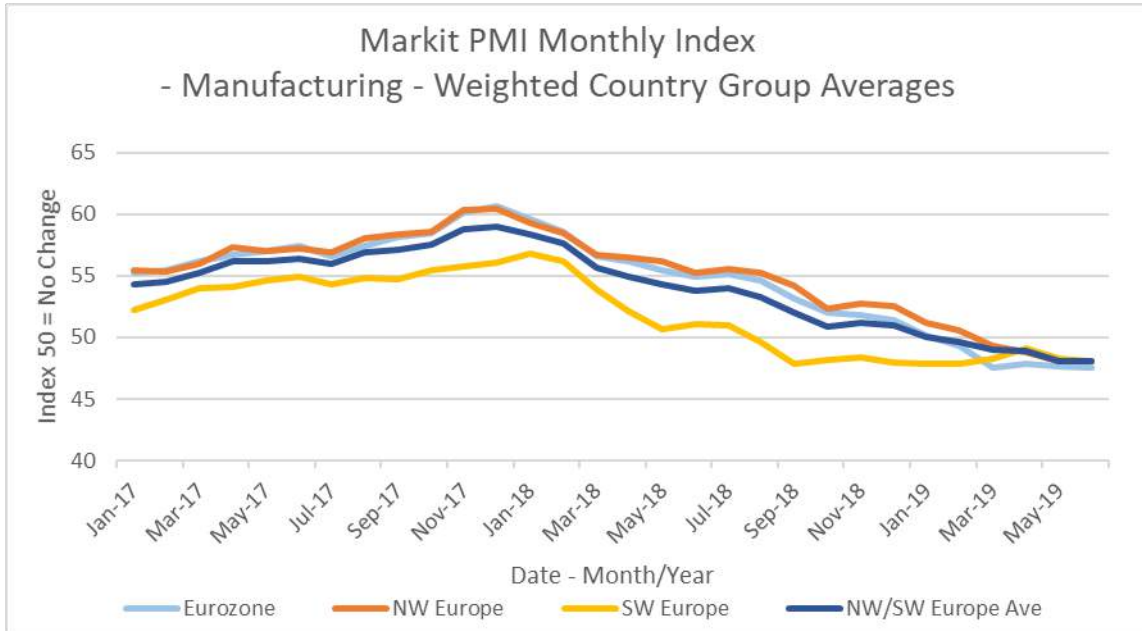
“..with increased awareness and advertising around products consumers becoming more aware about recyclability of board and pressure in branded goods and supermarkets to make changes to designs and use more cartonboard” - (Converter Non FMCG NW Europe)

“High unemployment, little investment. Economy not growing for years. Industry sick and EU management is not helping” - (Converter FMCG SW Europe)

Markit PMI

Markit Purchasing Managers Index (PMI) is a set of monthly indices of purchasing managers activity. Two sets of indices of relevance are Country Manufacturing and Europe Sector PMIs.

Markit Country Manufacturing PMI Indices

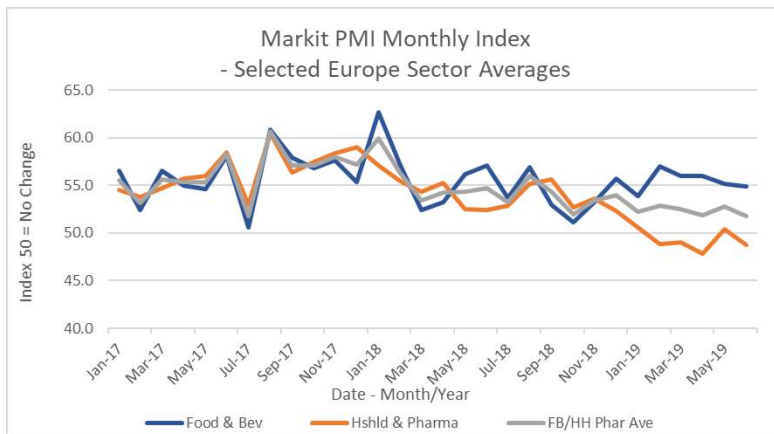


NB: The above graph uses Eurozone PMI plus calculated Total, NW & SE Europe based on 10 selected countries averages.

Country PMI Manufacturing indices have been in decline since the end of 2017. While NW Europe average index is generally higher than SW Europe average, they have tended towards convergence in recent months.

The July report for Europe covering data for June 2019 noted that Germany has been the weakest performing country while France is bucking the trend despite only modest growth.

Markit Europe Sector PMI Indices

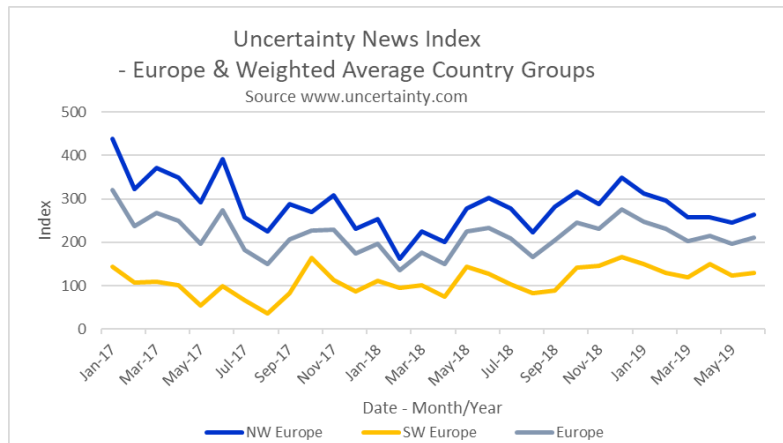


NB: Markit Hshld & Pharma is based on an average of data from PMI indices for Household & Personal Use Products & Pharmaceuticals & Biotech.

Markit PMI selected sector averages indicate more resilient activity levels within food compared to household products and pharmaceuticals. Food products appear to be holding up against a backdrop of the deteriorating outlook for manufacturing as a whole.

In the July Europe Sectors Report it was noted that while consumer goods companies, conditions improved, intermediate and investment goods producers were reporting conditions worsened.

PolicyUncertainty.com Index



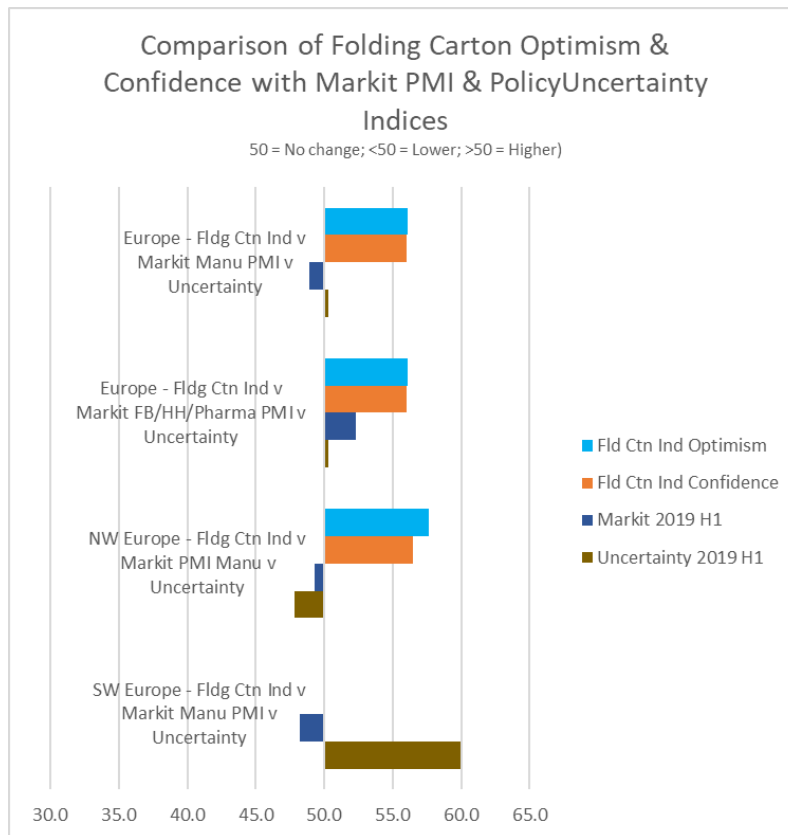
NB: Data source – www.policyuncertainty.com

www.policyuncertainty.com publishes monthly indices of uncertainty based on references to subjects in published news.

The graph of monthly uncertainty indices derived from selected country and Europe indices indicates a fall in uncertainty during 2017 followed by a rise in 2018, trending down again at the start of 2019, but more recently it has started to rise again.

For available countries a higher index measure calculated for NW Europe compared to SW Europe, may be down to differences in news reporting between these regions rather than differences in uncertainty; it does indicate that the direction of uncertainty is similar for the two regions.

Comparison of Optimism & Confidence with Markit PMI and PolicyUncertainty.com Indices



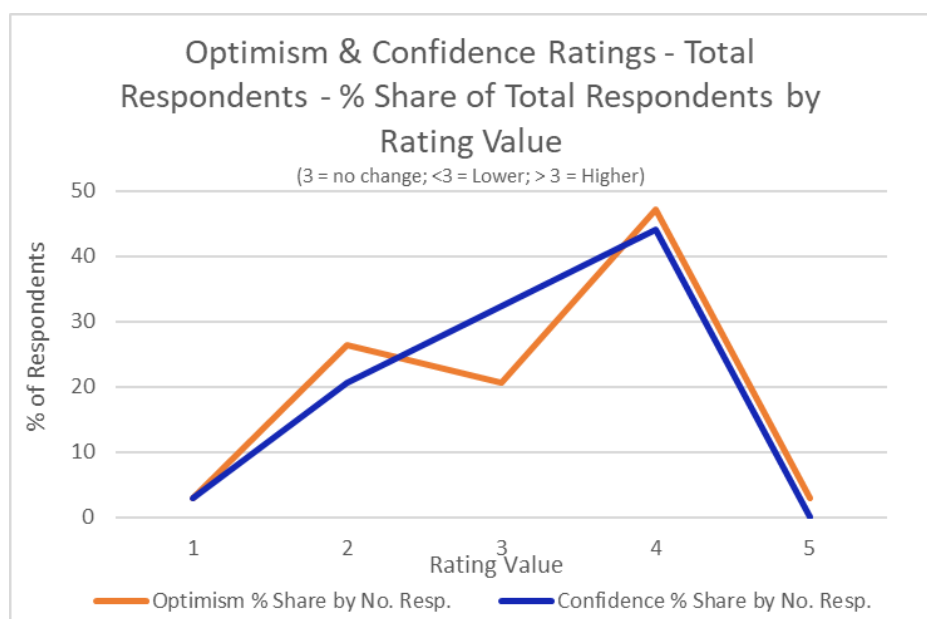
NB: Folding carton indices based on average of associations, board suppliers & converters.
 NB: Markit FB/HH/Pharma is based on an average of Europe Sector PMIs for Food & Beverage, Household & Personal Use Products & Pharmaceuticals & Biotech.
 NB: Country coverage for different data sets may vary.
 NB: PolicyUncertainty index assumes average of all months Jan 2017 to June 2019 = 50.
 NB: External sources: Markit & www.polucyuncertainty.com

The folding carton industry's optimism and confidence compared to last year is buoyant but restrained and compares well with Markit PMI for selected consumer goods sectors; folding carton interviewees are suggesting that confidence is holding up better than when compared to the Markit index for total manufacturing.

Rising uncertainty during 2019 compared to 2018 does not yet appear to have impacted on folding carton industry optimism and confidence, though lower ratings identified from the sub-group representing board suppliers does indicate concerns over wider economic and political factors.

NW Europe has a much more buoyant set of ratings for all measures compared to SW Europe, a theme picked up at other points within the European Carton Prospects report.

Statistical Tables and Charts



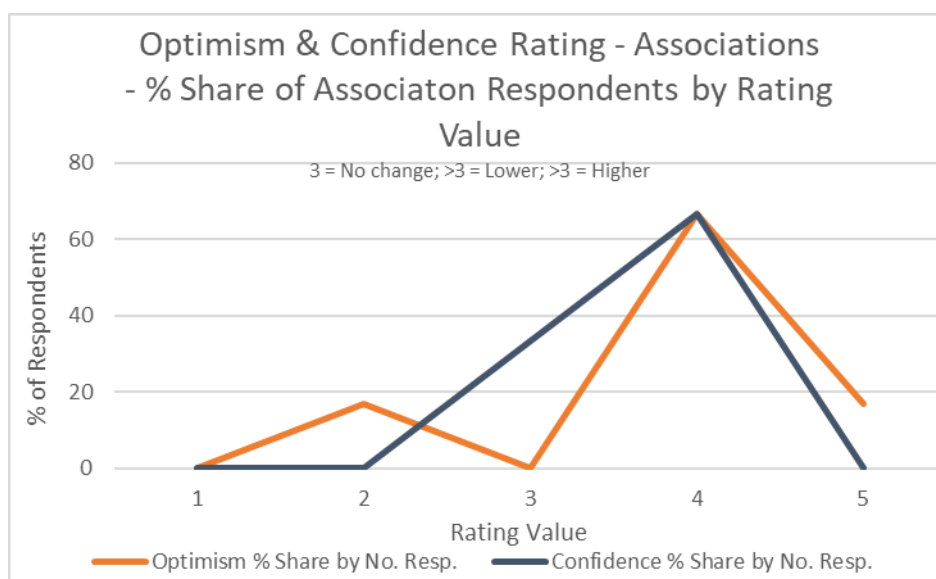
Total number of respondents = 34; Average rating optimism = 55.1, confidence = 54.4.

| Optimism & Confidence Ratings - All Respondents | | | | |
|--|------------|----------------------|------------|----------------------|
| Rating | Optimism | | Confidence | |
| | No. Resps. | % Share by No. Resp. | No. Resps. | % Share by No. Resp. |
| 1 | 1 | 3 | 1 | 3 |
| 2 | 9 | 26 | 7 | 21 |
| 3 | 7 | 21 | 11 | 32 |
| 4 | 16 | 47 | 15 | 44 |
| 5 | 1 | 3 | 0 | 0 |
| Total Resp/Ave Score | 34 | 100 | 34 | 100 |
| Average rating | | 55.1 | | 54.4 |

| Optimism & Confidence Ratings - Total By Respondent Type | | | | |
|---|------------|----------------|------------|----------------|
| Resp. Type | Optimism | | Confidence | |
| | No. Resps. | Average Rating | No. Resps. | Average Rating |
| Mean Ave of A,B,C | 34 | 56.1 | 34 | 56.0 |
| All Respondents | 34 | 55.1 | 34 | 54.4 |
| Associations (A) | 6 | 70.8 | 6 | 66.7 |
| Board Suppliers (B) | 9 | 44.4 | 9 | 50.0 |
| Converters (C) | 17 | 52.9 | 17 | 51.5 |
| Others (O) | 2 | 75.0 | 2 | 62.5 |

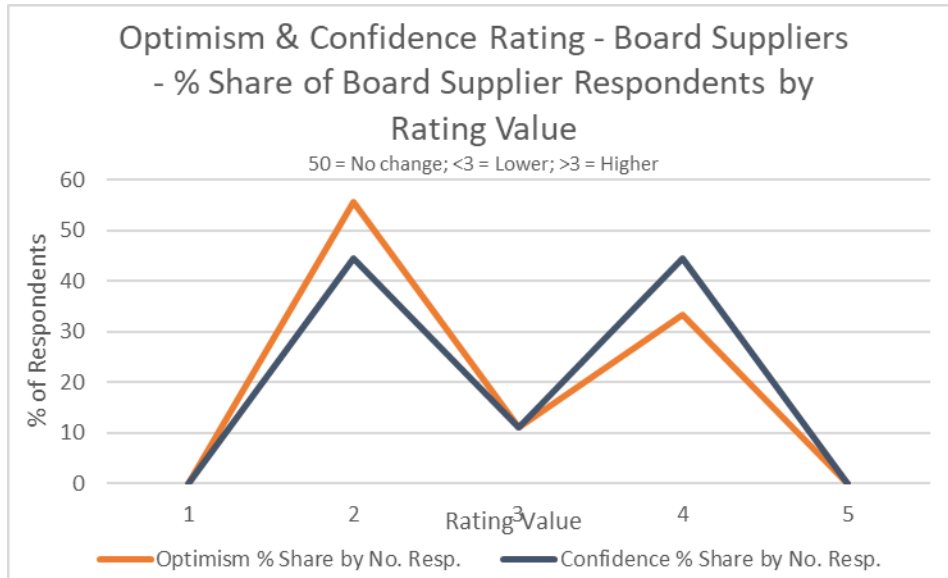
| Optimism & Confidence Ratings - Total By Region | | | | |
|---|------------|----------------|------------|----------------|
| | Optimism | | Confidence | |
| Resp. Type | No. Resps. | Average Rating | No. Resps. | Average Rating |
| Wgtd Ave. NWE & SWE | 30 | 54.9 | 34 | 54.2 |
| All Respondents | 34 | 55.1 | 34 | 54.4 |
| NW Europe | 23 | 57.6 | 23 | 56.5 |
| SW Europe | 7 | 50.0 | 7 | 50.0 |
| Other | 4 | 50.0 | 4 | 50.0 |

NB: Weighted average assumes weights of NWE = 65%, SWE = 35%
 NB: Other includes Nordic & Central Europe



Total number of respondents = 6; Average rating optimism = 70.8, confidence = 66.7

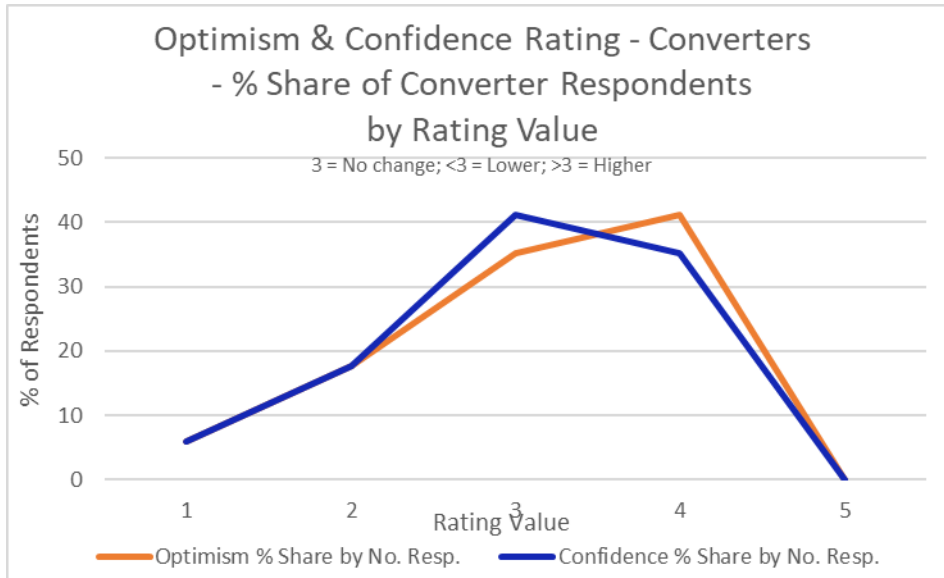
| Optimism & Confidence Ratings - Associations | | | | |
|--|------------|----------------------|------------|----------------------|
| | Optimism | | Confidence | |
| Rating | No. Resps. | % Share by No. Resp. | No. Resps. | % Share by No. Resp. |
| 1 | 0 | 0 | 0 | 0 |
| 2 | 1 | 17 | 0 | 0 |
| 3 | 0 | 0 | 2 | 33 |
| 4 | 4 | 67 | 4 | 67 |
| 5 | 1 | 17 | 0 | 0 |
| Total Resp/Ave Score | 6 | 100 | 6 | 100 |
| Average rating | | 70.8 | | 66.7 |



Total number of respondents = 9; Average rating optimism = 44.4, confidence = 50.0

| Optimism & Confidence Ratings - Board Suppliers | | | | |
|--|------------|----------------------|------------|----------------------|
| Rating | Optimism | | Confidence | |
| | No. Resps. | % Share by No. Resp. | No. Resps. | % Share by No. Resp. |
| 1 | 0 | 0 | 0 | 0 |
| 2 | 5 | 56 | 4 | 44 |
| 3 | 1 | 11 | 1 | 11 |
| 4 | 3 | 33 | 4 | 44 |
| 5 | 0 | 0 | 0 | 0 |
| Total Resp/Ave Score | 9 | 100 | 9 | 100 |
| Average rating | | 44.4 | | 50.0 |

| Optimism & Confidence Ratings - Board Suppliers by Board Type | | | | |
|--|------------|----------------|------------|----------------|
| Board Type | Optimism | | Confidence | |
| | No. Resps. | Average Rating | No. Resps. | Average Rating |
| Mean Ave. of Virgin & Recycled | 9 | 45.0 | 9 | 50.0 |
| All Board Suppliers | 9 | 44.4 | 9 | 50.0 |
| Virgin | 4 | 50.0 | 4 | 50.0 |
| Recycled | 5 | 40.0 | 5 | 50.0 |



Total number of respondents = 17; Average rating optimism = 52.9, confidence = 51.5.

| Optimism & Confidence Ratings - Converters | | | | |
|---|------------|----------------------|------------|----------------------|
| Rating | Optimism | | Confidence | |
| | No. Resps. | % Share by No. Resp. | No. Resps. | % Share by No. Resp. |
| 1 | 1 | 6 | 1 | 6 |
| 2 | 3 | 18 | 3 | 18 |
| 3 | 6 | 35 | 7 | 41 |
| 4 | 7 | 41 | 6 | 35 |
| 5 | 0 | 0 | 0 | 0 |
| Total Resp/Ave Score | 17 | 100 | 17 | 100 |
| Average rating | | 52.9 | | 51.5 |

| Optimism & Confidence Ratings - Converters by Market Sector | | | | |
|--|------------|----------------|------------|----------------|
| Market Sector | Optimism | | Confidence | |
| | No. Resps. | Average Rating | No. Resps. | Average Rating |
| Mean Ave FMCG & NonFMCG | 12 | 48.4 | 12 | 45.3 |
| All Converters | 17 | 52.9 | 17 | 51.5 |
| FMCG | 8 | 53.1 | 8 | 53.1 |
| Non FMCG | 4 | 43.8 | 4 | 37.5 |
| BOTH | 5 | 60.0 | 5 | 60.0 |

| Optimism & Confidence Ratings - Converters by Region Location | | | | |
|---|------------|----------------|------------|----------------|
| | Optimism | | Confidence | |
| Region | No. Resps. | Average Rating | No. Resps. | Average Rating |
| Wgtd Ave. NWE & SWE | 17 | 52.5 | 17 | 51.3 |
| All Converters | 17 | 52.9 | 17 | 51.5 |
| NW Europe | 13 | 53.8 | 13 | 51.9 |
| SW Europe | 4 | 50.0 | 4 | 50.0 |
| Nordic | | | | |
| Central Europe | | | | |

NB: Weighted average assumes weights of NWE = 65%, SWE = 35%

| Markit PMI & Uncertainty Indices - Selected Annual & 6 Month Averages | | | | |
|---|------------|-----------------------|---------------------|-------------|
| Year | Period | Markit FB/HH Phar Ave | Marki Manu Eurozone | Uncertainty |
| 2016 | Jan to Dec | 53.7 | 52.5 | 63.8 |
| 2017 | Jan to Dec | 56.2 | 57.4 | 52.5 |
| 2018 | Jan to Dec | 54.6 | 55.0 | 47.4 |
| | | | | |
| 2016 | Jan to Jun | 53.4 | 51.9 | 58.2 |
| 2017 | Jan to Jun | 55.5 | 56.3 | 59.8 |
| 2018 | Jan to Jun | 55.5 | 56.9 | 43.1 |
| 2019 | Jan to Jun | 52.3 | 48.4 | 50.3 |

NB: External indices sources Markit PMI, www.polcyuncertainty.com



13.2 NOA-PRISM Information

Neil Osment has enjoyed over 20 years working for major European companies in commercial and operational roles. In 2004, he set up NOA (Neil Osment Associates) to provide practical help and support to national and multi-national packaging businesses.

Simon Southern set up PRISM in 2004, having sold Marketpower in 2003. Simon has himself been involved in this industry for over 35 years providing research and analytical insight to the industry.

The PRISM database and intellectual property rights were acquired by NOA in April 2013. The activities of PRISM focus on downstream market assessments involving regular research with trade associations, folding carton converters, corrugated suppliers, paper mills, equipment manufacturers, brand owners, retailers and financial institutions. Neil and Simon continue to work closely together to produce insightful and relevant research work.

Personalized reports can be ordered on a confidential basis addressing specific requirements and answers to key, confidential questions raised by the client, relating findings to the client's market position, strategic focus and specialization. Please contact NOA-PRISM if you require additional information.



Neil Osment





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COLOPHON

This report has been prepared by NOA-PRISM for the European Carton Makers Association (ECMA).

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