

History of the Papermaking Industry in Turkey: the Past, Present and Future

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ABSTRACT

Paper is made in the following steps: fibrillation, swelling and cutting alongside the beating process, forming sheets by draining the suspension through a filtration unit and the creation of strong sheets that build hydrogen bonds between fibres during the drying process. Paper is more important than petroleum products for many applications in human life. Books, newspapers, magazines, notebooks, packaging, diapers, tissue papers, paper money, etc. are indispensable for us. The per capita consumption of paper is one of the indicators showing how much the community develops. The global paper industry is still growing, even though there are many crises in the world. However, the growth is far greater than in previous years. The total paper production reached 410 million tonnes. Since 2007, the production of packaging and tissue papers continuously increased, while the printing and writing paper production decreased. It is clear that Asia, Europe and North America have the biggest potential for production and consumption. North America and Western Europe export paper and board to other regions. It is clear that newsprint is produced in regions which are rich in mechanical pulp and its resources. The export of bleached softwood fibres from North and South America is higher than the import. Short fibres such as fibres from Eucalyptus trees are distributed from South America (Brazil, Chile, Uruguay, Argentina). North America and Western Europe have a higher waste paper export. Asia is the biggest consumer of recycled fibres used in paper production because the Chinese paper industry has been growing year after year.

Keywords: Paper, cellulose, fibers.

Introduction

Paper is made in the following steps: fibrillation, swelling and cutting alongside the beating process, forming sheets by draining the suspension through a filtration unit and the creation of strong sheets that build hydrogen bonds between fibres during the drying process. Paper is more important than petroleum products for many applications in human life. Books, newspapers, magazines, notebooks, packaging, diapers, tissue papers, paper money, etc. are indispensable for us. The per capita consumption of paper is one of the indicators showing how much the community develops. It is clear that Asia, Europe and North America have the biggest potential for production and consumption.

The history of paper in Turkey

Even though it is claimed that paper was invented by Tsai Lun, the archaeological heritage in the 20th century and the latest one in 1978 showed that paper and goods similar to it go way back to 300 B.C. in Turkestan. Ramie and flax fibres were used in the production of these papers. Paper was produced by fibrillation, just like felt. Previous investigations showed that felts have been made and derived by the Turks. "Kepenek", a type of felt, has been used for making shelter and garments for herdsman and villagers. It is still used in Anatolia. Sigrid Hunke wrote that Tsai-Lun was inspired by the felts made by Turkish tribes when he invented paper. Recent

studies in Central Asia proved this. "Kakat" is a name given by the Turks to a sheet produced from silk fibres by pounding. Additionally, they named pastrami produced by pounding buffalo meat as "Kakaç". In the old Turkish language, "kakaç" means pounding and years later, it became "kakat". In many languages this word has a similar pronunciation, such as "kagez" in Indian, "kami" in Japanese, "kokci" in Chinese, and "kağat, kakaz, kağad" in Iranian, Afghanistan and Urdu languages. Samarkand was the centre of paper production from cotton and cotton textile residues because Central Asia was rich in cotton plantations. When the Arabs came to Central Asia, they recognized the advanced papermaking techniques in Samarkand and thus, the Islamic World was introduced to papermaking by the Turks. It was proved that Turkish papermakers played a role in the expansion of papermaking through Europe during the Crusades (1).

The pioneering paper mills in Europe were established by skilled men experienced in paper mills from Anatolia. Yalakabat paper mill was built in 1746 in Yalova to meet the paper demand of the first modern press house. Another mill was placed near Kağıthane River and it operated periodically from 1453 to the reign of Selim III (1789-1807). It is known that there was a paper mill located in Bursa during the reign of Beyazıt II (1477-1512) (1).

The first paper mill was built in Halkapınar-Izmir in 1846, during the Ottoman period. Mason Scott provided machines and equipment for Hamidiye Paper Mill built in 1980. Straw and textile residues were used and water was taken from Beykoz River. One of the four machines produced cigarette papers. Its operations stopped and the copper and bell metal parts were disassembled to make war merchandise in 1915 (1).

In the Turkish Republic, governments built several paper mills named SEKA:

- İzmit Paper Mill, in 1938,
- Zonguldak-Çaycuma Paper Mill: Kraft pulp and paper, in 1970,
- Giresun Paper Mill: Mechanical pulp and newsprint, in 1970,
- Dalaman Paper Mill: fine paper, cardboard and bleached pulp, in 1971,
- Afyon Pulp mill: bleached pulp from annual plants, in 1979,
- Balıkesir Pulp and paper mill: thermomechanical pulp and newsprint, in 1981,
- Silifke Kraft pulp and testliner paper, in 1984,
- Kastamonu paper mill, in 1984

Governments sold all these paper mills to a private company in 2000s and totally withdrew from the paper industry. In addition to the privatized paper mills, 28 paper mills operated in those years. Following these investments, paper production capacity exceeded 2 million tonnes.

Today's paper industry

According to the report of the Pulp and Paper Industry Foundation in Turkey, the growth of paper industry amounted to 2.4% in 2016, in comparison with the previous year. The real growth, excluding a decrease in newsprint and wrapping paper production, was 4.8%. The per capita consumption of paper increased from 74.5 to 75.2 kg in 2016 (2).

Paper production capacity

In 2016, half of the total paper production capacity was used for producing corrugated paper, which is a trend similar to past years. Newsprint demand was met by the imports since it is not produced in Turkey.



Figure 1: The production capacity and actual production of the paper industry in 2016

It is clear that the total production increased to 250.000 tonnes in 2016. The corrugated paper production amounts to 2.280.532 tonnes/year with

56.67% proportion in industry. Tissue paper is the second with 811.572 tonnes/year and a proportion of 20.17%.

Table 1: The production capacity and actual production of the paper industry

	Capacity in 2016 (tonne/year)	Actual production in 2015 (tonne/year)	Actual production in 2016 (tonne/year)
Newsprint	0	0	0
Printing paper	298.500	232.500	237.100
Wrapping paper	144.000	80.000	75.000
Corrugated board	2.860.500	2.190.028	2.280.352
Paperboard	751.000	577.291	614.898
Tissue paper	971.000	660.487	811.572
Cigarette and thin special paper	15.000	5.000	5.000
Total	5.040.000	3.745.306	4.023.922

The Main Components of Papermaking

Recycled paper use reached 2.9 million tonnes in 2016, which is 72% of the total raw material. The use of virgin pulp, both short and long fibre, was about 1 million tonnes, which is 2% of the total raw material. Pulp production decreased drastically after the privatization of state paper mills. Today, only Oyka paper mill in Zonguldak produces Kraft pulp.

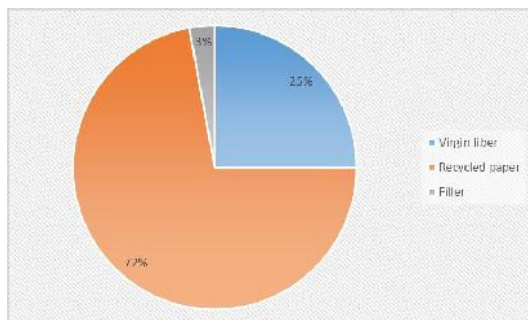


Figure 2: Raw materials used in paper industry

Table 2: The amounts of raw material used for papermaking

	Tonne/year
Virgin fibre	1.006.856
Recycled paper	2.900.927
Filler	116.500
Total	4.024.283

The use of waste paper

Corrugated and Kraft packaging paper represent 64% of the consumed recycled paper. The second is mixed waste paper followed by 1st class office waste paper used in paperboard and tissue production.

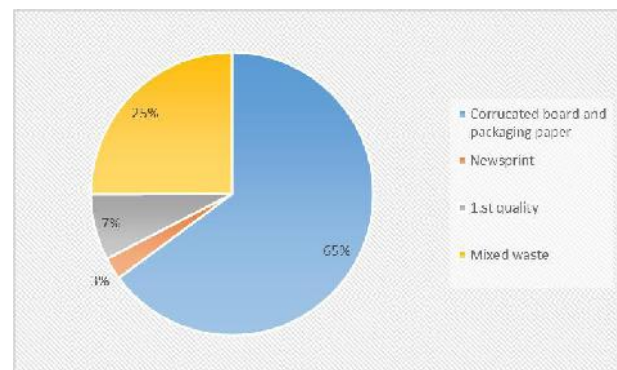


Figure 3: Types of recycled paper

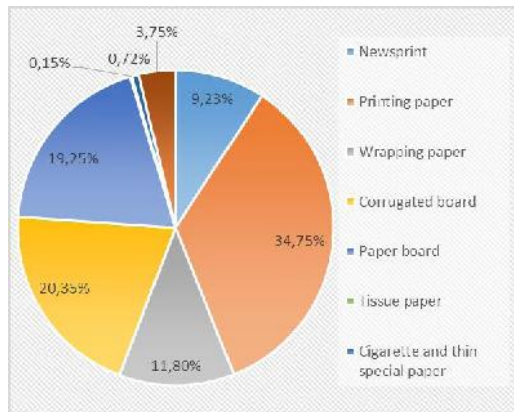
Table 3: Types of recycled paper and their amounts

	Tonne/year
Corrugated board and packaging paper	1.887.815
Newsprint	74.051
1st quality	219.508
Mixed waste	729.553
Total	2.910.927

Exported and imported papers

Import data shows that the amount of printing paper is the first among imported papers. The amount of newsprint decreased to 262.763 tonnes/year in 2016.

Import



The total imported paper also decreased in 2016.

It is also clear that the amount of exported tissue and corrugated board have a higher portion among the other papers. It is interesting that there is exported newsprint from Turkey. It is due to direct exports after newsprint is imported.

Export

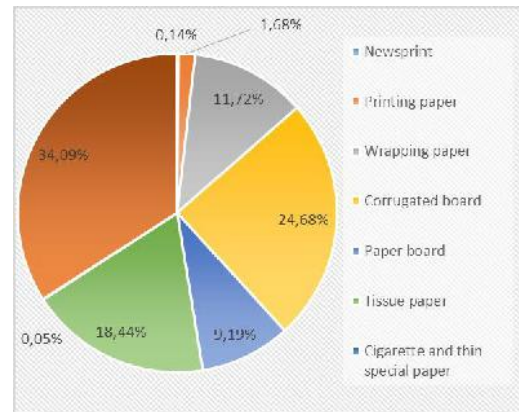


Figure 4: The export and import amounts by paper types in 2016

Table 4: The amount of export and import by paper types in 2015 and 2016

	Import (tonne/year)		Export (tonne/year)	
	2015	2016	2015	2016
Newsprint	347.614	262.763	1.261	949
Printing paper	959.930	989.412	15.261	24.331
Wrapping paper	348.313	336.063	106.276	122.272
Corrugated board	570.224	579.540	223.734	270.072
Paperboard	538.339	548.029	83.332	77.600
Tissue paper	7.674	4.307	167.193	266.200
Cigarette and thin special paper	19.081	20.499	447	468
Other paper products	127.333	106.638	309.102	349.565
Total	2.918.508	2.847.251	906.606	1.111.457

The Future of the Turkish paper industry

The total production of paper amounted to 4 million

tonnes in 2016, and it is expected to reach 4.5 million tonnes in 2019. Tissue and corrugated board productions seem to increase.

Table 5: The expected production change in paper industry per years

	2015 (tonne/year)	2016 (tonne/year)	2017 (tonne/year)	2018 (tonne/year)	2019 (tonne/year)
Printing paper	232.500	237.100	245.000	250.000	250.000
Wrapping paper	80.000	75.000	75.500	76.500	78.500
Corrugated board	2.190.028	2.280.352	2.482.500	2.525.000	2.580.000
Paperboard	577.291	614.989	643.500	677.000	677.500
Tissue paper	660.487	811.572	894.00	908.500	916.500
Cigarette and thin sp. paper	5.000	5.000	5.000	5.000	5.000
Total	3.745.306	4.024.013	3.451.500	4.442.000	4.507.500

Paper Industry in the World

The global paper industry is still growing, even though there are many crises in the world. However, the growth is far greater than in previous years. The

total paper production reached 410 million tonnes.

Since 2007, the production of packaging and tissue papers continuously increased, while the printing and writing paper production decreased.

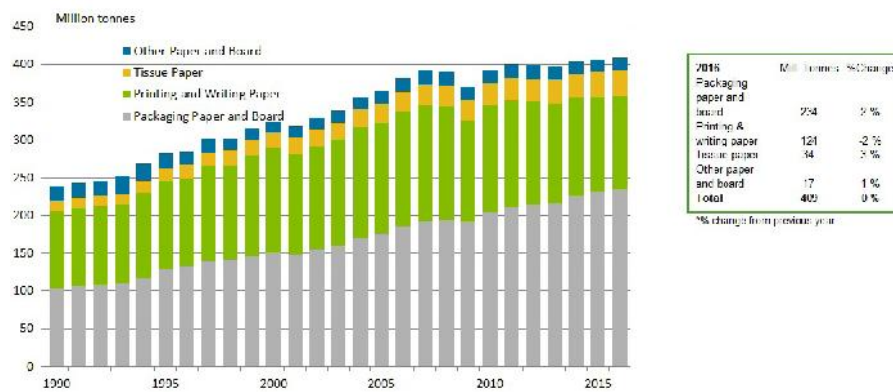


Figure 5: The total production of different kinds of paper (4)

Figure 8. shows that Asia is the biggest paper consumer when compared to other continents.

However, paper consumption in North America didn't change noticeably.

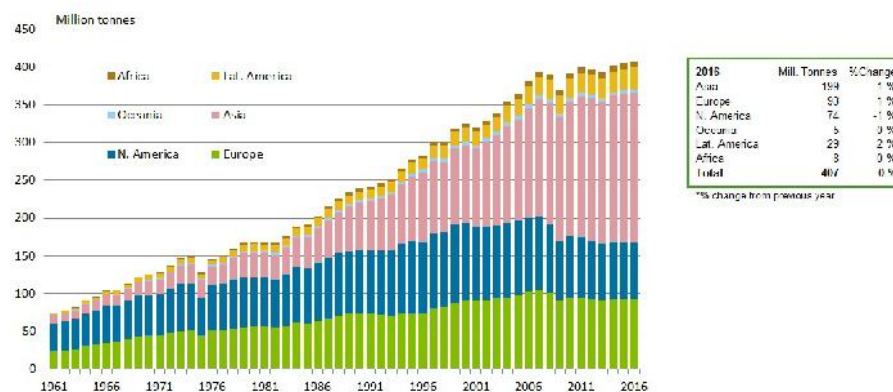


Figure 6: Paper consumption by continents (4)

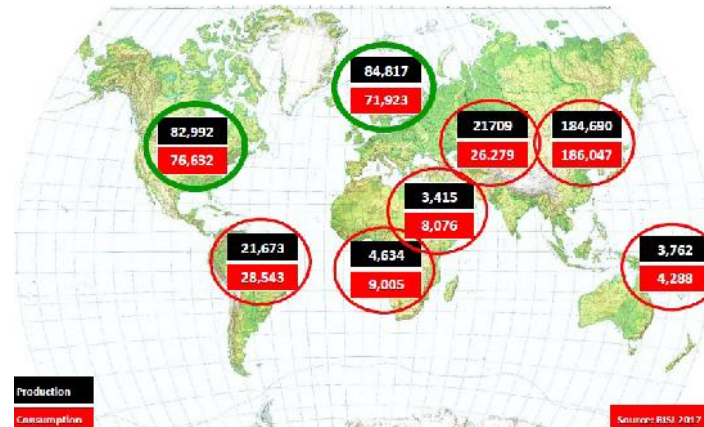


Figure 7: Paper production and consumption in different continents (3)

It is clear that Asia, Europe and North America have the biggest potential for production and consumption.

Additionally, the consumption in South America and Asia is higher.

Table 6: The export and import amounts of different papers (3)

	Exports minus Imports				
	P&B	Wood Pulp	Bleached Softwood	Bleached Hardwood	Recovered Paper
World	-1,033	-1,216	-491	-145	-771
North America	5,856	8,633	8,066	-1,199	19,775
Western Europe	13,978	-4,132	701	-4,764	7,508
Eastern Europe	-4,879	-446	-131	-762	806
Africa	-5,088	-424	-449	77	164
Asia	-89	-19,681	-9,747	-6,414	-30,053
Oceania	-566	581	232	-176	1,698
Latin America	-7,303	14,900	1,203	13,354	-1,044
Middle East	-4,647	-648	-367	-260	375

North America and Western Europe export paper and board to other regions. It is clear that newsprint is produced in regions which are rich in mechanical pulp and its resources.

The export of bleached softwood fibres from North and South America is higher than the import.

Short fibres such as fibres from Eucalyptus trees are distributed from South America (Brazil, Chile, Uruguay, Argentina). North America and Western Europe have a higher waste paper export. Asia is the biggest consumer of recycled fibres used in paper production because the Chinese paper industry has been growing year after year.

References

1. H., Eroğlu ve M., Usta., Kağıt Fabrikasyonu, Selüloz ve Kağıt Sanayii Vakfı, 2002.
2. Selüloz ve Kağıt Sanayii Vakfı, 2016 yılı raporu, İstanbul, 2017.

3. 3. R.B.Philips, Global Dynamic of the Pulp and Paper Industry, NC State University, 2017.
4. 4. <https://www.forestindustries.fi/statistics/pulp-and-paper-industry/>

Historija industrije proizvodnje papira u Turskoj: prošlost, sadašnjost i budućnost

SAŽETAK

Papir se pravi u sljedećim koracima: fibrilacija, bubrenje i sječenje sa procesom drobljenja, formiranje ploča sa odvodnjavanjem suspenzije kroz jedinicu za filtriranje i kreiranje čvrstih listova koji stvaraju vodonične veze između vlakana za vrijeme sušenja. Papir je važniji od naftnih proizvoda za mnoge primjene u ljudskom životu. Knjige, novine, časopisi, sveske, ambalaže, pelene, upijajući papir, papirni novac, itd. su nam neophodni za svakodnevnu upotrebu. Potrošnja papira po stanovniku je jedan od pokazatelja razvoja zajednice. Globalna industrija papira i dalje raste, iako je svijet pogođen mnogim krizama. Međutim, rast je dosta znatniji u odnosu na prethodne godine. Ukupna proizvodnja papira je dostigla 410 miliona tona. Nakon 2007. godine, proizvodnja papira za pakovanje i upijajućeg papira se kontinuirano povećavala, dok se proizvodnja papira za štampanje i pisanje smanjivala. Jasno je da Azija, Europa i Sjeverna Amerika imaju najveći potencijal za proizvodnju i potrošnju. Sjeverna Amerika i Zapadna Evropa izvoze papir i karton u druge regione. Novine se proizvode u regijama koje su bogate mehaničkom celulozom i njenim resursima. Izvoz beljenih vlakana od mekog drveta iz Sjeverne i Južne Amerike je veći od uvoza. Kratka vlakna, kao što su vlakna dobivena iz stabala eukaliptusa, distribuiraju se iz Južne Amerike (Brazil, Čile, Urugvaj, Argentina). Sjeverna Amerika i Zapadna Europa imaju veći izvoz otpadnog papira. Azija je najveći potrošač recikliranog vlakna za proizvodnju papira, jer papirna industrija Kine raste iz godine u godinu.

Ključne riječi: Papir, celuloza, vlakna.

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