

2022 TURKISH WINDOW AND GLASS MARKET REPORT

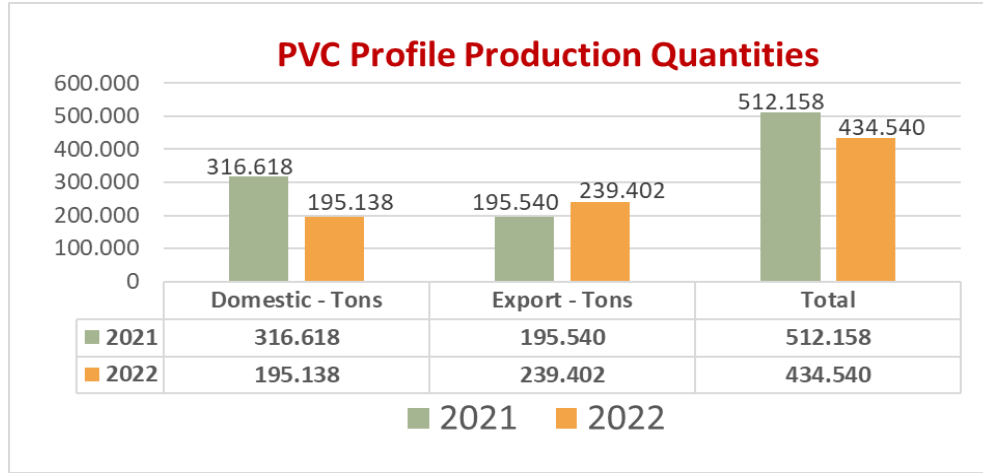
1- INTRODUCTION

This report provides an overview of the Turkish window market in **2022** based on TURKSTAT data and presents quantitative data in relation to glass and accessories used for windows.

2- SUMMARY

In **2022**, **23.32 million sqm** of PVC windows were produced for **1,555 million** domestic residences in old/new residential and non-residential categories, as calculated on a typical residential unit basis. **40.82 million sqm** of single panes were used in these windows. **11.76 million** espagnolettes were used for the opening and closing of windows and doors in the domestic market and export market; about half of them were single-opening and the other half were double-opening windows.

There is another figure worthy of note for the PVC profile industry; In 2022, **434,540 tons of PVC profiles** were produced, **239,402 tons** of which were turned into ready-made windows for the domestic and export markets, and the remaining **195,138 tons** were exported as profiles. Imported profiles account for 1.54% of the domestic market.



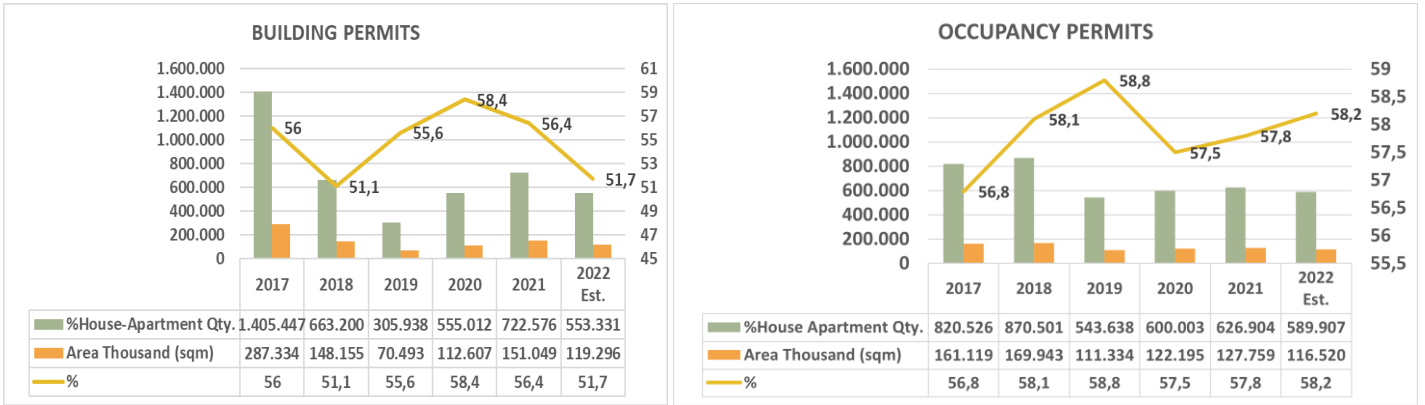
3- REPORT STRUCTURE

The first part of the report addresses residential construction activities in the last 6 months based on TURKSTAT data. The figures in this part serve as a basis for the calculation of every type of windows to be used in new buildings on an annual basis. Windows are also used in non-residential buildings and restoration of old structures (residential and non-residential). Part of the report is allocated to the description of this type of works and calculation assumptions. The next part contains general definitions and explanations related to windows. The subsequent part of the report presents assumptions and technical data related to PVC windows.

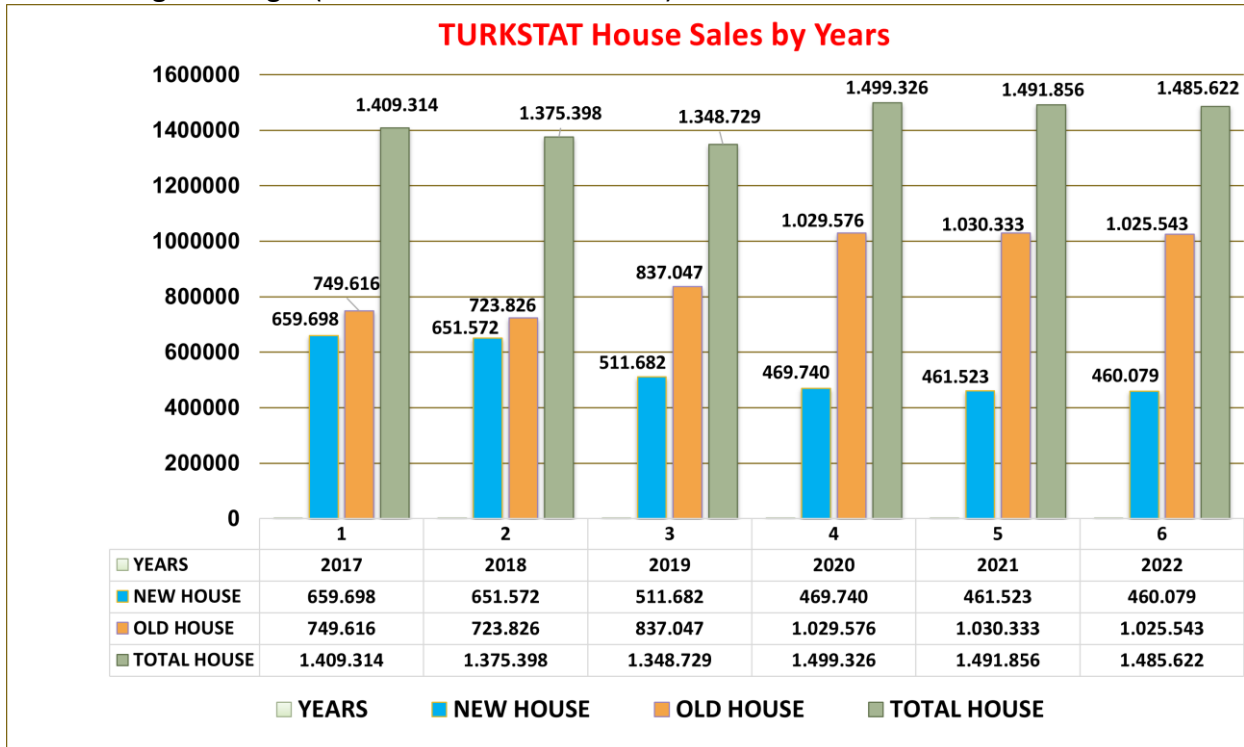
6-month Import-Export quantities and USD values for PVC Raw Material, PVC Ready Made Windows and PVC Profiles are presented based on TURKSTAT data. Next, an estimation of glass and accessories used in PVC windows and projections for year 2022 PVC market is presented. The report is concluded with a warning and expectation paragraph.

4- RESIDENTIAL PRODUCTION AND SALES STATISTICS

BUILDING AND OCCUPANCY PERMITS OBTAINED IN THE LAST 6 YEARS



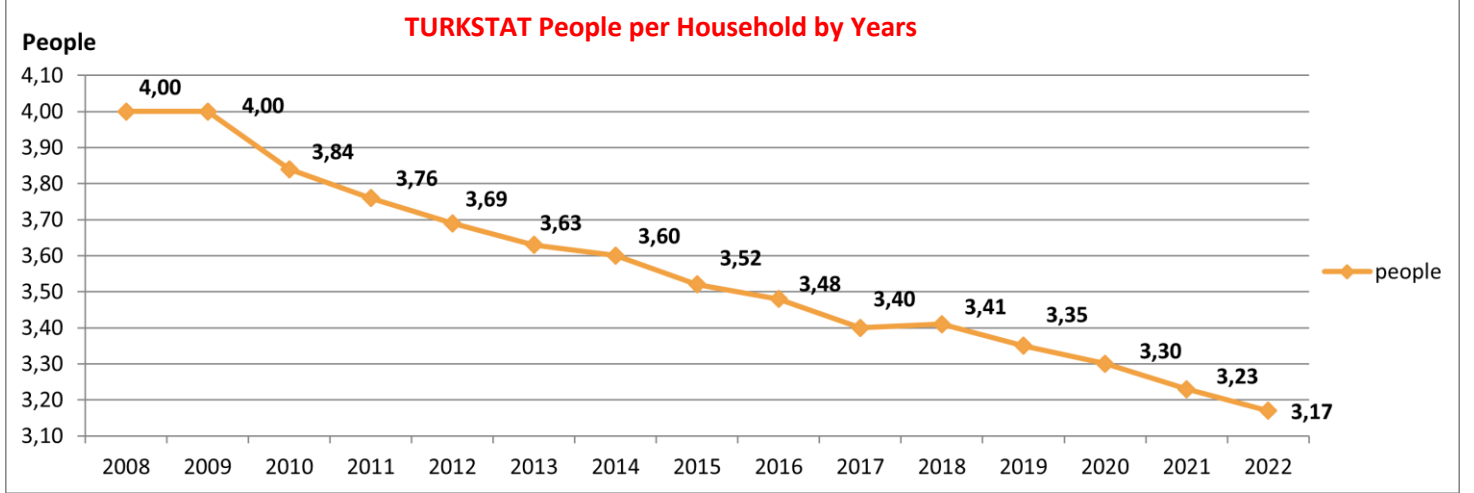
The sum of apartments corresponding to the square meter area of building permits obtained in the last 6 years has approached the number of apartments corresponding to the square meter area of occupancy permits. In a sense, this has been a period when virtually all that have been constructed have been sold. In conclusion, it is seen that the rate of residential units in constructions with a building permit is 51.7%, whereas the rate of residential units with an occupancy permit is 58.2%. This makes it quite easier to calculate actual window and glass usage. (Source: TUKSTAT statistics)



Recently, construction companies have reduced the number of new projects and focused on selling out their housing stock. In addition to the disrupted supply and demand balance in international raw material and semi-finished material markets during and after the pandemic, the increased international energy costs caused commodity prices in general to go up.

The rise in construction costs which was above the general inflation rate led to a rise in the prices of new houses. This situation brought about an increase in the sale of old or second-hand houses.

Assuming that the population of Turkey was **85,289,552** and an average **household** consisted of **3.17** people in 2021, it can be said that **the number of households** in Turkey is **26,905,221**.



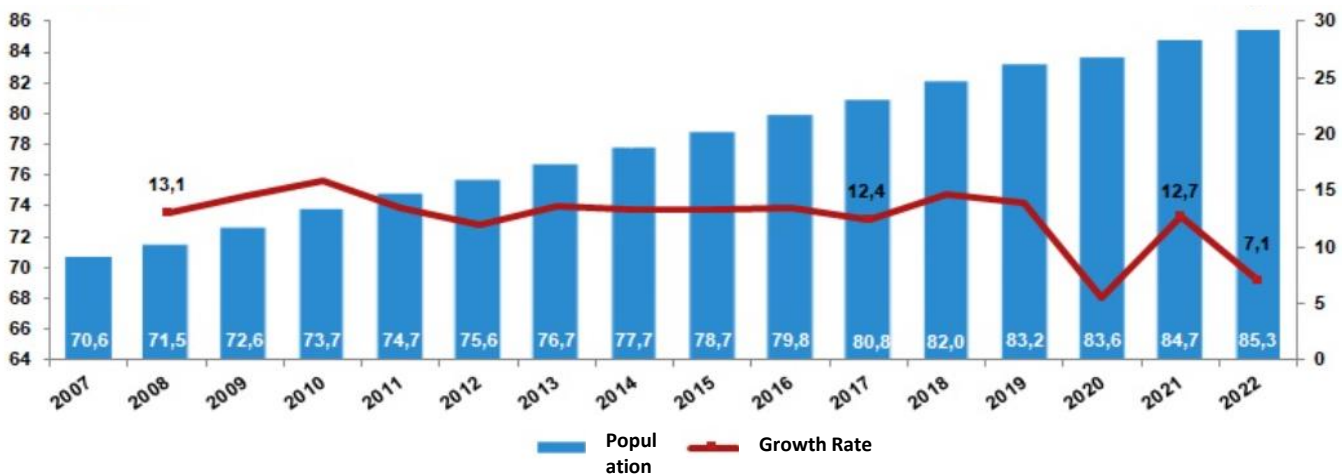
In 2021, the country's population was 84.7 million and the size of an average household was 3.23 people. In 2022, the country's population reached 85.3 million, and as expected, the size of a household declined to 3.17. As it is known, the same figure is 2.9 in Europe, and Turkey is expected to fall to that figure in the 30 years ahead. According to the National Address Database, the total number of houses in Turkey (houses, boardings, winter houses/seasonal houses, housekeeper's apartments, and house constructions) which was 40.2 million in 2021, increased by 1.1 million in 2022, and is estimated to be 41.3 million houses. In 2022, there were on average **0.48 houses per person** in Turkey. In this case, there are $3.17 \times 0.48 = 1.52$ houses per household consisting of 3.17 people. The annual population growth rate which was 12.7 thousandths in 2021 was 7.1 thousandths in 2022.

The rate which increased by 12.7 thousandth in 2021, increased by 7.1 thousandth in 2022.

Population and annual population growth rate, 2007-2022

Population (million)

Growth rate (thousand)



When the average population growth of the last two years is calculated with an estimated value of 9.9 thousandths, the population increased by 0,84 million (85.3 million x 0.0099) and is estimated to reach **86.14 million** in **2023**.

When calculated using 0.48 houses per person, given the increase by 0.84 million people in **2023**, it may be considered that **400,000 new houses**, including apartments / boardings, summer houses/seasonal houses doorkeeper's apartments, etc. will be added.

5- NON-RESIDENTIAL BUILDINGS AND REPLACEMENT MARKET

As it is known, the statistics related to new houses are as follows: There are no statistics from which practical results can be derived regarding material usage in non-residential buildings. From the statistics related to factories, warehouses, hospitals, sanctuaries, schools, dormitories, civilian and military buildings, temporary lodging houses, shopping malls, and other commercial buildings, it was not possible to deduce results regarding use of materials, and in particular, of windows. In this regard, apart from the estimates related to the works performed by members of our association, the common areas for which occupancy permits were obtained were calculated to correspond to 202,717 residential units if we assume that these areas are equivalent to 20.2% of the residential units according to TURKSTAT data.

At this point, the non-residential buildings for which occupancy permits were obtained were calculated to correspond to 220,962 residential units if we assume that these areas are equivalent to 21.8% of the residential units according to TURKSTAT data.

The same ratios for non-residential buildings are as follows: PVC 30%, Aluminum 69%, Other materials 1%; In **2022**, Non-residential Buildings 220,962 X PVC 30% = **66,289 units of** equivalent non-residential units,

Renewal of existing structures represents a significant area of use for the construction materials industry, and making healthy estimates brings about challenges.

For PVC window industry, the following finding can be made:

With the emergence of the urban transformation concept, the plans for the replacement of windows were either deferred or waived in respect of many existing houses. This had a negative impact on the operations of window producers. The increased prices of new houses in the recent years did not only reduce the number of new house sales, but also led to an increase in second-hand house sales and replacement window sales.

Starting from mid-1990s, double-pane PVC windows triggered a trend to replace old windows that used to suffer from great heat leakages. About 20 years later, a huge number of windows were replaced, and unreplaced window stock decreased. **The recent increase in heating energy costs brought about a parallel increase the replacement of old PVC windows with new-generation PVC windows that offer quality insulation, aesthetical, functional and comfortable accessory systems.**

In the report, an assumption has also been made in respect of the ratio of newly produced PVC windows that are used in replacement works. As it is known, system producers manufacture profiles and deliver them to window producers. Many window producers of variable sizes that serve the end-customer and the number of which exceeds ten thousand are able to make a rough estimate of how many of the windows they produce are

used for new buildings, and how many of them are used for old buildings. Indeed, the fact that there are also companies that do not produce windows but carry out assembly services of the windows that they get subcontractors to produce makes it also difficult to make such estimates. Therefore, the estimates of PVC window producers in this respect that are presented in this report call for further research.

The annual growth rates of the construction materials industry are not equivalent to those of the sub-industries, giving rise to differences due to characteristics peculiar to every industry. Every industry does not enjoy the same share in the replacement market. In general, the total use of construction materials is not directly proportional to residential and non-residential building production also because:

Iron, steel and cement are used in higher quantities for infrastructural investments (roads and railways, water sets, ponds, airports, sport facilities, ports, etc.), and the exact quantity is not known.

6- TURKISH WINDOW MARKET

The common feature of products that are generally called windows is that they consist of profiles, the spaces are completely or partially filled with glass, and are opened and closed with the help of hardware. The following products fall under the window definition:

- Windows
- Glass Balcony Doors
- Glass Cladding
- Winter Gardens

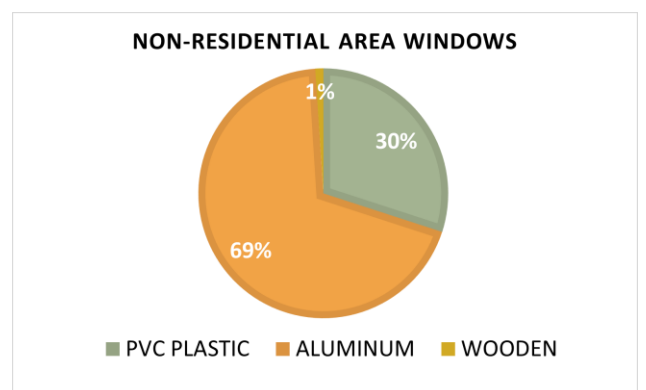
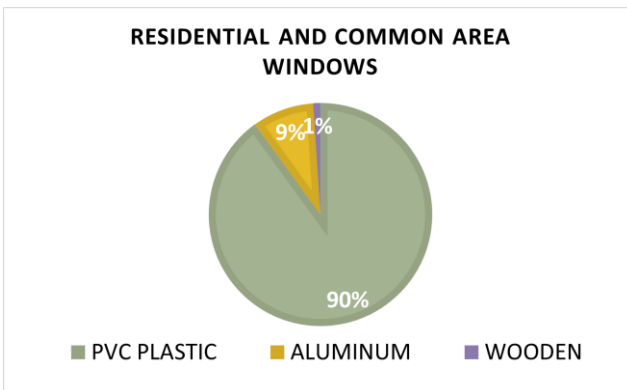
Products of the window industry are also used for interior partitions. This report does not provide an in-depth definition and description of this subject.

The window industry uses the following products as joinery materials:

- PVC joinery
- Aluminum joinery
- Wooden joinery
- Iron joinery
- Composite joinery (Products PVC/Aluminum/Wooden materials are used in combinations involving two or even three of them)

The information available to our association relating to usage ratios of different materials are presented below. However, this information might not be accurate and requires confirmation.

- PVC, aluminum, wooden and other materials account for about 90%, 9%, and 1% of house and public area production, respectively.



- These ratios are as follows in non-residential buildings: PVC 30%, Aluminum 69%, other materials 1%

7- ASSUMPTIONS AND TECHNICAL DATA RELATED TO PVC WINDOWS

The following assumptions are used for the calculations specific to PVC windows:

- Sector statistics indicate that averagely 5.5 linear meters of main profile are used per sqm of PVC window.
- Averagely 9 kg of PVC profiles are used per sqm of PVC window (1 linear meter is used for auxiliary profiles like bar profiles which are considered to correspond to 1.6 kg of PVC profile (1.6 kg/linear meter x 5,5 linear meter / sqm = 9.0 kg / sqm)).
- 5 foldable panes and 1,5 balcony doors are mounted in an average residential unit, the total area of which is approximately 15 sqm. These values represent the mean of old and new structures.
- Accordingly, 15 sqm x 9 kg/m = 135 kg of PVC profiles are used per residential unit.

In summary, it is calculated that 15 sqm of windows, i.e. 135 kg of PVC profile are used in a residential unit.

Note: As it is known, PVC Window System Producers that are members of PÜKAD have a market share above 60%. There are also PÜKAD members among companies that produce windows by purchasing materials from system manufacturers. Assumptions that represent the country in general were formed with estimated data derived from PÜKAD member system manufacturers and window manufacturers.

8- PVC WINDOW CALCULATION FOR THE YEAR 2022

In the light of the above assumptions, the PVC profile requirement for the PVC windows produced in 2022 was calculated as follows:

a) New Residential and Common Areas

589,907 new residential units x **90%** = **530,916** new residential units with PVC windows

The profile weight of PVC windows used in these residential units is $530,916 \times 0.135$ tons = **71,674** tons.

At this juncture, consideration should be given to the following point: It was assumed that each residential unit has 15 sqm windows on average. However, in the buildings or housing estates where the residential units are located, there are also windows at locations such as stairwells, basements, outbuildings, security and social facilities that are not part of the residential units, and these windows are about 20.2% of the residential windows. We can also call these as common areas.

Therefore, there are additionally,

530,916 x 20% = 106,183 residential units with PVC windows, and in aggregate, there are

530,916 + 106,183 = 637,099 residential units with PVC windows.

Thus, PVC profile requirement would be **637,099 x 0.135 = 86,008 Tons** for PVC window profile production.

As a result, the total weight of PVC profiles in PVC windows produced for the new residential and common areas which were built in 2022 and which, according to official records, comprise **637,099** PVC windows, would be **86,008 tons**.

b) Non-residential buildings

In our country, apart from new residential constructions, non-residential buildings are constructed at a ratio of 21.8% of the residential buildings on a surface area basis. However, the usage rate of PVC windows in such structures is approximately 30%.

With these assumptions,

220,962 equivalent residential units x 30% = **62,886**, gives us the number of equivalent residential units with PVC windows. If we are to calculate the weight of PVC profiles used in non-residential units in 2022, it would be 62,886 apartments x 0.135 = **8.490 tons**.

In conclusion;

In **2022**, in new buildings;

- PVC windows were produced for **699,895** residential units and equivalent residential units;
- The end-to-end area of these windows reached **10,498,430** sqm; and
- **94,498** PVC windows with PVC profile were used.

This quantity represents the net weight, and **101,112 Tons of PVC profiles** were used in window production with approximately **7%** cutting and production waste.

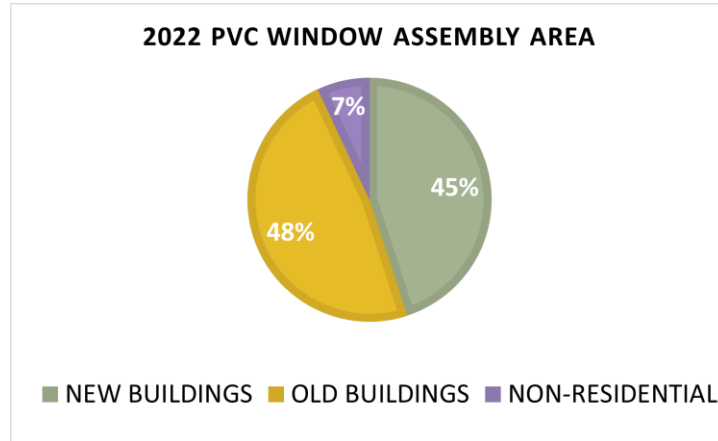
c) Dealer speculations and forecasts for the Window Replacement Market

According to the estimated average information received from window producing dealers of the PVC Profile system manufacturers; of the PVC windows produced Turkey-wide;

45% were used in new buildings: **699,895** equivalent residential units,

48% were used in old buildings: **746,554** equivalent residential units;

7% were used for non-residential replacements: **108,872** equivalent residential units.



For old residential and non-residential window replacements: The PVC profiles were produced for **855,427** equivalent residential units.

If we are to calculate the weight of PVC profiles used in old buildings and non-residential replacements in **2022**, it would be 855,427 equivalent residential units x 0.135 = **115.482 tons** of PVC profile. This quantity represents the net weight, and **123,576 Tons of PVC profiles** were used in window production with approximately **7%** cutting and production waste.

Overall and in aggregate, for old residential and non-residential window replacements; **209,968 tons of PVC profiles** were used to cater for the production corresponding to **1,555,321** equivalent residential units.

According to TURKSTAT data, the housing stock in our country which was 39.1 million in September 2020 reached 40.2 million in September 2021. This data does not include second houses, summer houses, empty houses that are not rented out. When historical replacement rates are taken into account, it can be said that replacements were made in one or 3% of every 30 residential units.

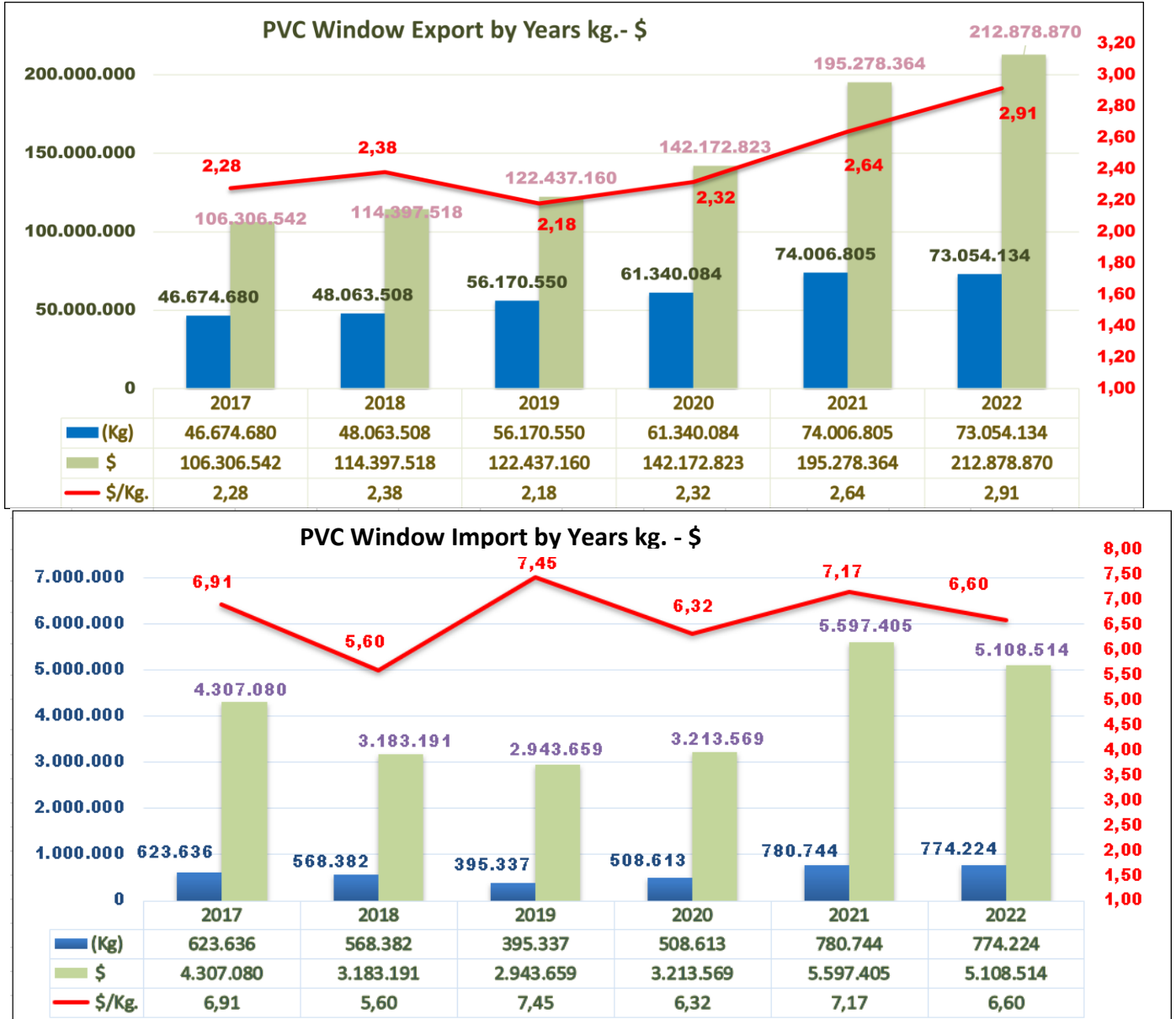
Considering the rising prices in the commodity market and the labor use effect in the post-pandemic period, it would be assumed that window replacement works would amount to 2,5% instead of 3%. This corresponds to a housing stock of $40.2 \times 2.5\% = 1,005,000$ residential units.

Turkish domestic market forecasts;

In 2022, windows were used in old, new, and non-residential buildings.

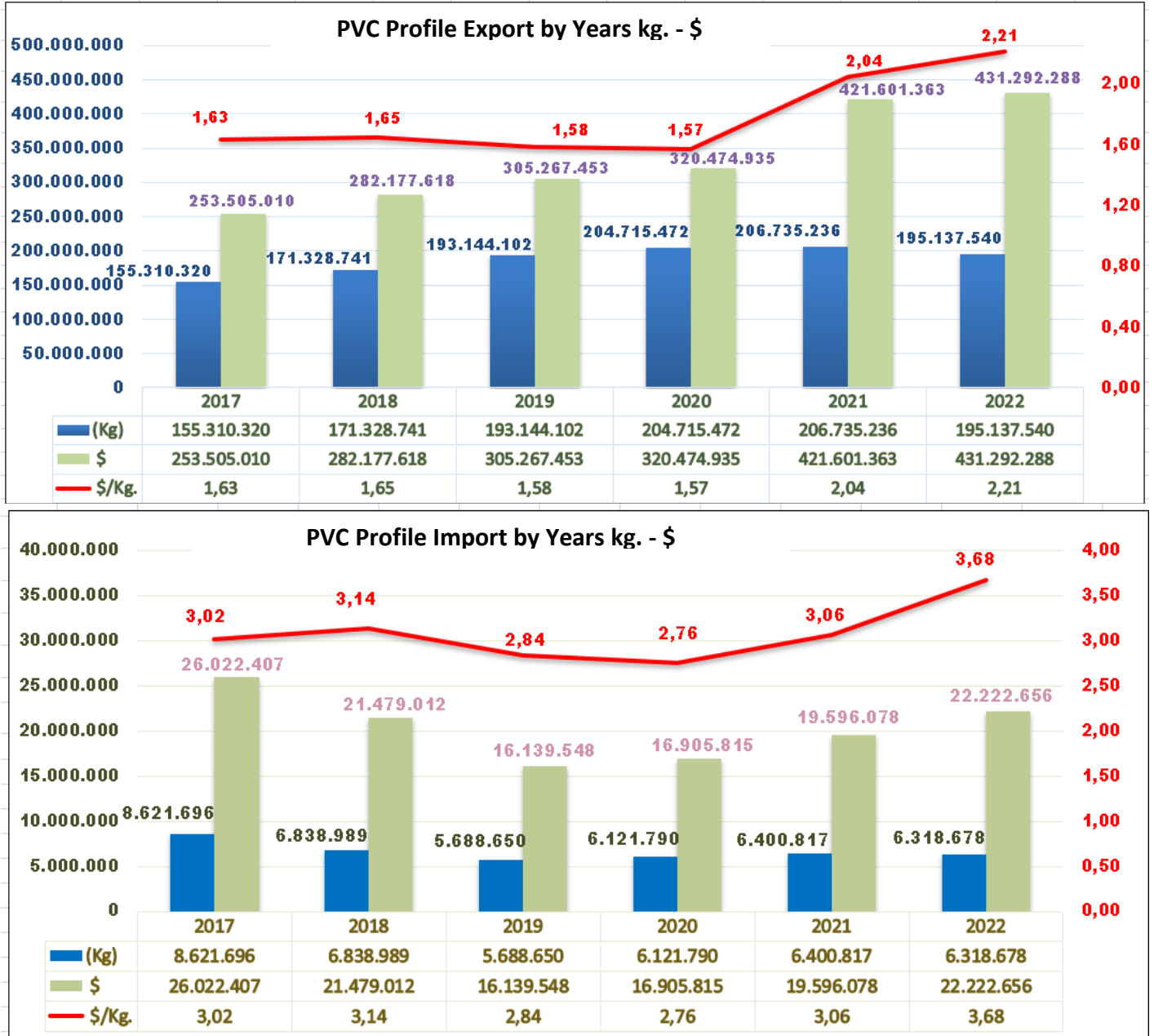
- PVC windows were produced for **1,555,321** residential units and equivalent residential units;
- The end-to-end area of these windows reached **23,329,815** sqm; and
- **209,968 tons** of domestic PVC profiles were used for window production.
- **774 Tons** of ready-made PVC windows were imported.
- **6,318 tons** of PVC window profiles were imported.
- We find that **202,875 tons** of domestic PVC profiles were produced when we subtract **7,093** tons of imported profiles and windows from **209,968 tons** of PVC profile used for window production in the domestic market.

6-Year PVC ready-made window export and import data;



In 2022, **36,527** tons of ready-made windows were manufactured and exported, in **net** terms, by profile manufacturers and dealers, out of a gross **73,054** tons of profile, whereas **774** tons of ready-made windows were imported.

6-Year PVC Profile Exports and Imports;



In 2022, profile manufacturers exported **195,138** tons of PVC profiles, whereas **6,318** tons of PVC profiles were imported.

2022 Annual Total PVC Profile Production;

202,875 Tons of PVC Profile production, window production - Domestic Market
36,527 tons of PVC Profile production, ready-made window - Foreign Market (Export), and in total;
239,402 Tons of PVC Window profile production (Domestic and Foreign Market)
195,138 Tons of PVC Window Profile Production - Export
 It is known that **434,540 tons of PVC Profiles** were officially produced in Year **2022**.

Usage Quantities of door - leaf espagnolettes, handles, etc. in PVC Windows in 2022

In the domestic market;

Windows were produced from **209,968 tons** of domestic PVC profiles.

10.109,586 Pieces of (Leaf-Door) Espagnolettes-Handles

In the foreign market;

Windows were produced from **36,527 tons** of domestic PVC profiles.

= **1,758,707 Pieces** of (Leaf-Door) Espagnolettes-Handles.

In total; 11.868,293 Pieces of (Leaf-Door) Espagnolettes-Handles

Glass Usage Quantities in PVC Windows in 2022;

PVC windows were produced for **1,555,321 residential units** and equivalent residential units;

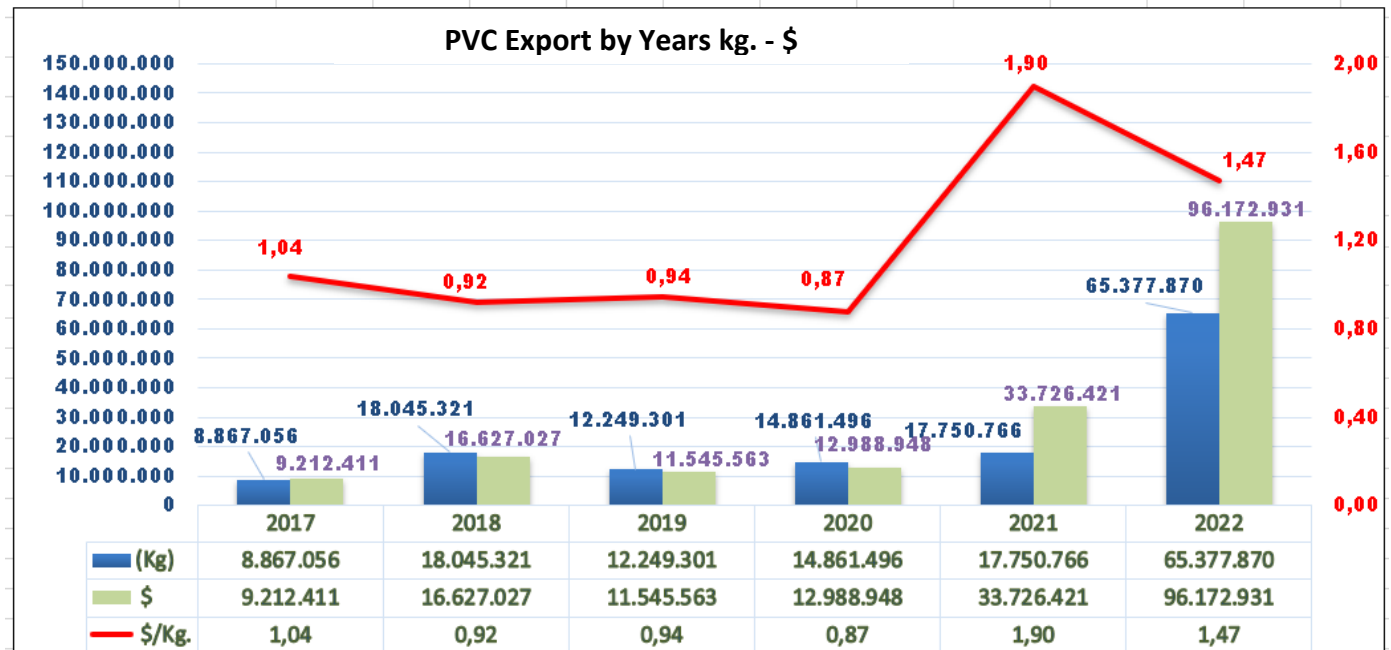
The end-to-end area of these windows is **23,329,815 sqm**.

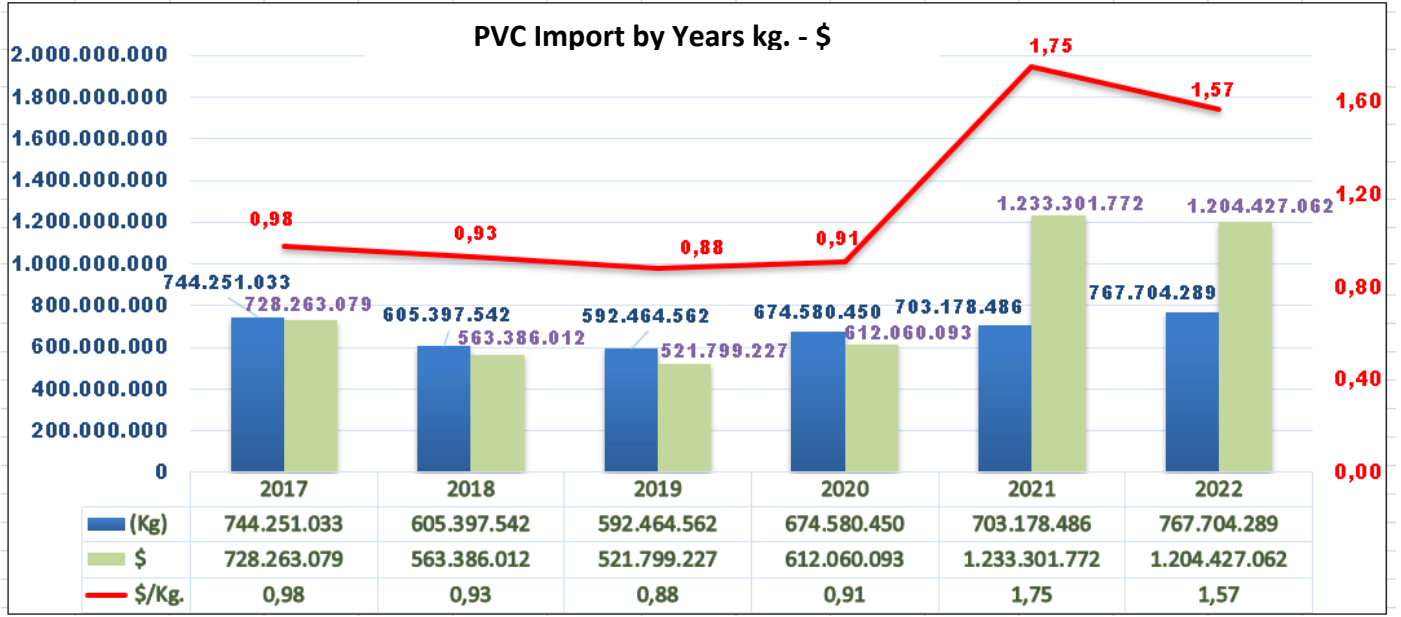
23,329,815 x 1.75 m2= 40,827,176 sqm Single pane

2022 PVC Raw Material Export and Import Data;

It is estimated that, in 2022, of the **767,704 Tons** of the PVC imported, 57%, i.e. **437,591 Tons**, were used in the production of PVC Window Profiles, whereas the rest was used for the production of products such as construction infrastructure, etc. While part of the PVC required for profile production was supplied from the domestic PVC producers, the majority of it was imported.

PVC Raw Material Export and Import Data;





The data contained in this report were calculated using the data sourced from PÜKAD members and the institutions listed in the reference section. The numerous system manufacturers operating in the PVC industry are expected to contribute to this study. The report will be more realistic, particularly if the aluminum window industry provides inputs with data and opinions. It is believed that the revision of this report every year and the elimination of its deficiencies will contribute to the industry and the report will give a more realistic picture with the participation of the aluminum window sector in our association. Part of the information contained herein reflect our estimates.

References:

- TURKSTAT statistical data
- Republic of Türkiye, Ministry of Development – Eleventh Development Plan (2019 – 2023) Housing Policies - Expertise Commission Report - Ankara 2018
- 2021 Presidential Annual Program
- 2022 Presidential Annual Program
- Special studies of PÜKAD member organizations
- We would like to extend our thanks to the organizations listed above who have contributed to the production of this study on our industry.