3M Science. Applied to Life.™

White paper on 3M™ Building Window Film solutions

for the EU Building Renovation Wave

2050 Climate Target

The world is facing unprecedented climate challenges and already prior to COVID 19 the EU 28 had put forward a green transition plan.

With the market disruption as a result of the pandemic, there has been an even stronger push to revitalize the economy by accelerating the green transition. This so-called **EU Green Deal** intends to create a win-win situation, both for the economies (create jobs) and for the green good (cut emissions). The EU has the ambitious target of being the first climate neutral continent in the world. However, the original interim target of **reducing CO_2 with 40% by 2030** will not be sufficient to get us there in 2050 and that's why, as part of the Green Deal, the target has now increased to

reduce GHGs (Greenhouse Gas Emissions) with

55% GHGs

versus the reference year of 1990

which is when the second climate conference was held in Geneva, Switzerland.

Reduce Emissions and improve Energy Efficiency

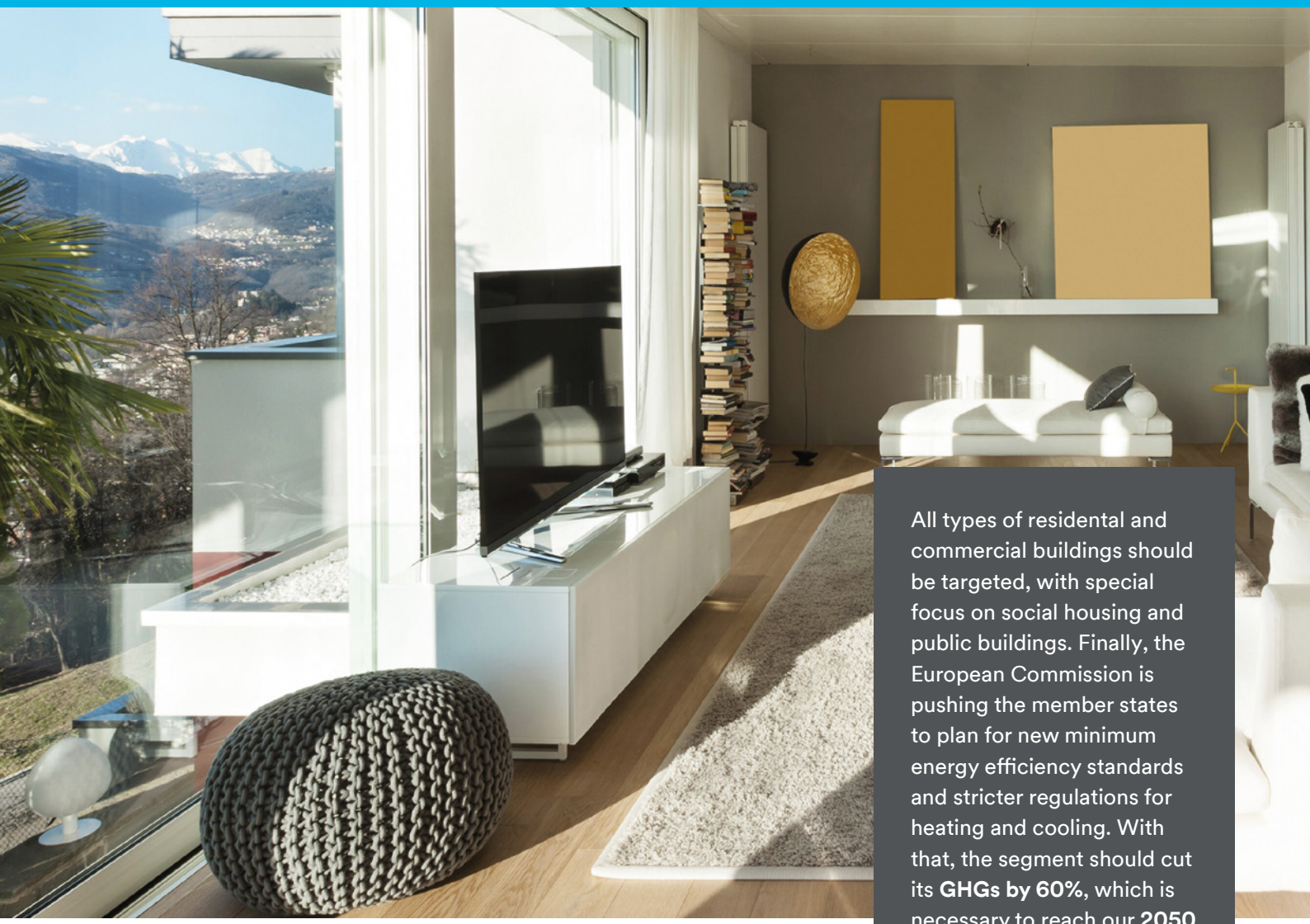
End of March 2020, so already at the very beginning of the pandemic, the European Council published its recommended stimulus package, which got approved by the Commission later that year. The strategy to make the necessary fundamental changes of a new industrial revolution is built on green transition and digital transformation. It goes along with a huge financial injection and requires measures that are capable of delivering immediately. This stimulus consists of multiple initiatives, such as Circularity, Green Infrastructure, Renewable Energy, Farming, ... but the largest package of projects relates to Energy Efficiency and this includes the Building Renovation Wave, i.e. investments to improve the energy performance of buildings.

Source: European Commission Renovation Wave for Europe, 2020

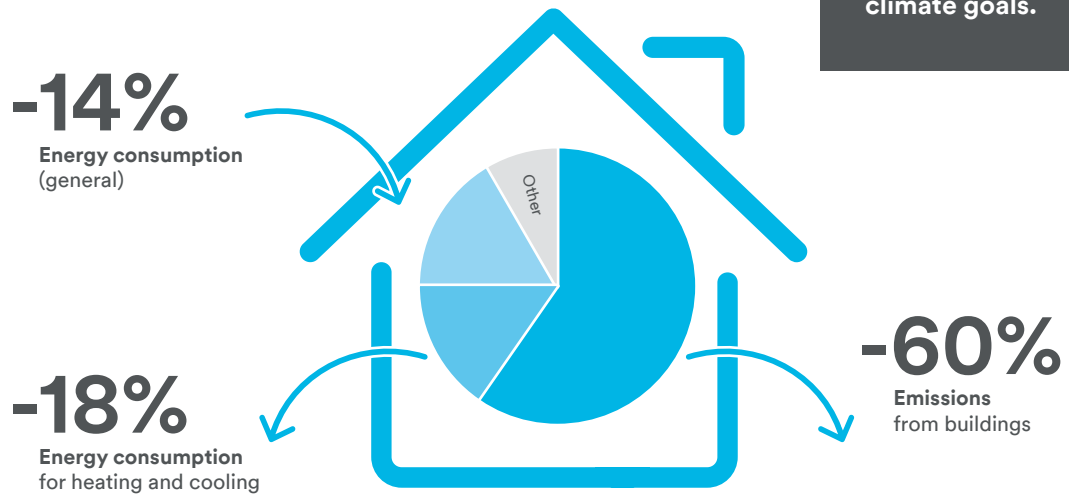
The reason why buildings are this important is very simple. On global level, energy consumption in buildings represents as much as **17.5% of the total GHG emissions.** In the EU-28, the figures are even much more impactful: **buildings consume 40%** of the total energy and with **36% of the total GHGs emissions**, it is the segment with the biggest emissions. Additionally, 75% of the current buildings was constructed before there was even any energy performance legislation in place and 80% of the current stock will still be there in 30 years from now. But today the energy requirement of new buildings is around 50 percent lower than of buildings that were built 20 years ago. The need is clear: measuring and pro-actively reducing energy has never been so vital, both in construction and in maintenance. As renovation is labor-intensive and serves as domino to several upstream sectors and SMEs, it is the intention to create another 160.000 jobs. Also, it does not require long periods to come to maturity and it of course offers better living conditions and lower energy costs to citizens. The objective of this stimulus is to at least double the number of renovations from 1 to 2% in the next ten years, which is a minimum 35 million buildings.

160.000 jobs

35 mln buildings



All types of residental and commercial buildings should be targeted, with special focus on social housing and public buildings. Finally, the European Commission is pushing the member states to plan for new minimum energy efficiency standards and stricter regulations for heating and cooling. With that, the segment should cut its **GHGs by 60%**, which is necessary to reach our **2050 climate goals.**



Source: European Commission Renovation Wave for Europe, 2020

Three focal points

The measures captured in the program focus on three areas:

- Decarbonisation of heating and cooling
- Combating energy poverty
- Taking measures for buildings with the lowest energy efficiency

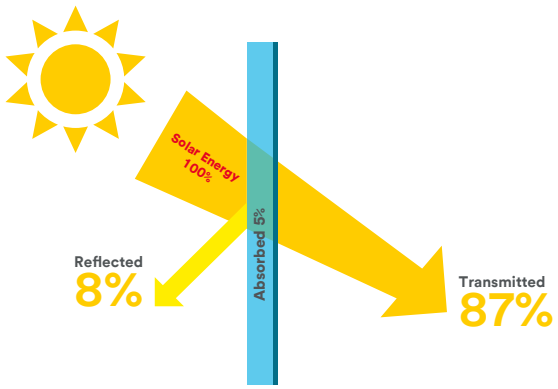
With our Solutions, you can focus your energy on Saving Energy

Windows, a segment where we have long history with our **3M™ Window Films**, typically account for a major portion of cooling loads in a building. We were issued the first patent for our **Sun Control Window Film in 1966** and never stopped innovating ever since. In 1998, we invented the first multilayer construction and in 2006, our technology reached new levels with the introduction of the first spectrally selective reflecting film. Based on nano-technology, our window films add benefits to existing building glazing and provide multiple solutions. Not only do they reject heat, conserve energy and reduce CO_2 emissions, they also help to improve indoor comfort through better temperature control at unlimited natural daylight. Additionally they also protect people and property. They are widely used in residential, hospitals, education, transportation infrastructure and – obviously - commercial and public buildings. Globally, more than **5 million buildings have 3M™ Window Films Installed**. World class films for world class buildings.

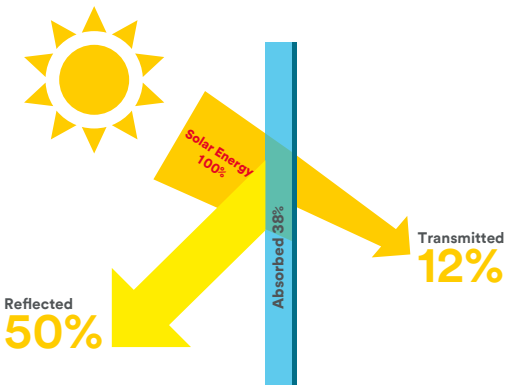
5 mln
buildings have 3M™ Window Films Installed

All these products have been developed, tested and re-tested according to European and international standards as appropriate, including **EN 410** (determination of luminous and solar characteristics of glazing), **EN12898** (determination of the emissivity), **EN 15752-1** and **EN 15755-1** (durability and performance testing of polymeric films and polymeric filmed glass). Finally, knowing that a good product is nothing without the right application, the **3M™ MCS™** (Matched Component System) Warranty makes the difference. We have a network of trained partners, who ensure that the film will be installed to our standards and to your full satisfaction.

Unprotected glass



Glass with appropriate window film



Source: 3M Internal Test Reports

Reduce the heat inside your building

Reduce the need for air conditioning (prolong HVAC life)

Reduce your energy bill

Improve occupant comfort

Improve productivity

Increase profit

Reduce buildings CO2 footprint

EPD® Registered Solutions

An **EPD (Environmental Product Declaration)** is a verified document that reports environmental data in accordance with the international standard **ISO 14025**. The Environmental data are based on a LCA (Life Cycle Assessment), which must be conducted in line with the criteria as specified in the relevant PCR. There are several building rating systems, that evaluate the performance of a building and its impact on the environment and which comprise a predefined set of criteria related to the design, construction and operations of green buildings. When working with EPD Registered products, building owners can earn credits for the following building rating systems: **BREEAM®**, **HQE™** and **LEED®**.

BREEAM® (UK Building Research Establishment Environmental Assessment Method) is a rating and certifying scheme, which includes categories such as health and wellbeing, good thermal comfort and daylight levels. **HQE™ FR AFNOR** (Haute Qualité Environnementale) is the French certification awarded to the construction and management of buildings as well as urban planning projects and it promotes best practices, sustainable quality in building projects and offers expert guidance throughout the lifetime of the project. **LEED®** (US Green Building Council) is a program that was developed to transform the way buildings and communities are designed, built and operated, enabling a responsible, healthy and prosperous environment that improves the quality of life.

EPD®

These products have a certified Environmental Product Declaration (EPD) giving information about the environmental performance and contents, which have been controlled and verified according to the requirements of the International EPD® System.

Registration numbers
S-P-00992
S-P-00993
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More information is available at:
www.environdec.com

We offer a broad range of **Solar Control Window Films**, of which our premium solution, the **3M™ Prestige Window Films are EPD registered**. This means that we have optimized impacts of this product and can share its full life cycle environmental footprint, starting from its manufacturing all the way up the ultimate use phase. This EPD, which is available at **www.Environdec.com**, has been calculated for a reference building in **45 cities** in **29 countries** (each per their specific electricity grid mix) in the EU, Middle East, Africa, Asia and the United States. This reference building is a 4-storey office building with 1,858 m² conditioned space and 725 m² clear dual panes to which the 3 different **3M™ Prestige Window Films (PR70, PR70X or PR40X)** are applied for a period of 10 or 15 years, which is their respective warranted lifespan. Data for all of these cities are available in the EPD and an example is shown below for the city of Rome. The environmental performance has been translated respectively into *energy savings*, *environmental impact* and *nett benefit*.

Energy savings compare the energy usage for cooling during summer and heating required in winter for buildings, with and without our film. The *environmental impact* includes all raw materials, full manufacturing, packaging, transport, distribution, product conversion and application to the building and product in use. The *nett benefit* assesses the **GWP (Global Warming Potential)** and water depletion effect of the application of window film on a building's energy usage. This is positive if the environmental impact avoided during the use stage is greater than the product's embodied impact.

Figures that speak for themselves

Reduce energy use by as much as

205
kWh/m² of windows

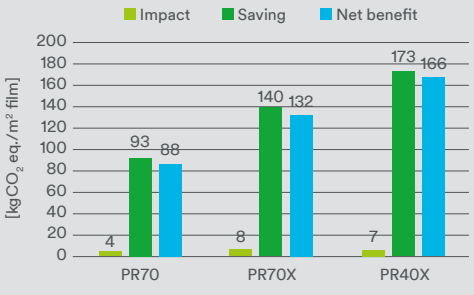
82,29
kg of CO_2 savings

13,07
m³ of water savings

The conclusion is that upgrading with 3M™ Prestige Sun Control Films can help reduce energy use by as much as **205 kWh/m²** of windows, which per the EU-28 average corresponds to **82,29 kg of CO_2 savings** and **13,07 m³ of water savings**. In the Rome example, the potential savings for the 3 types of our Prestige Series vary after 10 years from **93kg to 173kg of CO_2 eq./m²** and the nett benefit savings from **88 to 166kg of CO_2 eq./m²**. The GWP break-even point is reached once the nett benefit savings compensate for the CO_2 emissions that result from the manufacturing, distribution and conversion of the product. In the case of the Rome building, the Carbon Footprint is gained back after around 6 months. You can find the same data for the water depletion potential. Differences between the cities are due to local weather conditions and the country electricity grid mix. Differences between the buildings within a country depend on their size, location, orientation, total floor surface, window surface, type of glass, ...

EU | Italy | Rome

Global warming potential



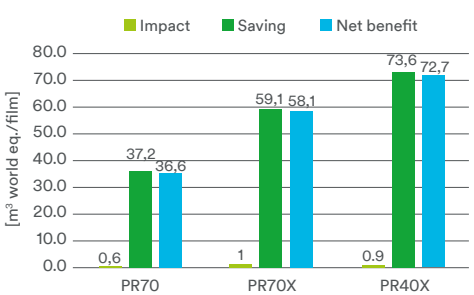
Highest benefit: **PR40X**

166 kg CO_2 eq./m² film after 10 years

= 120t CO_2 eq./reference building
~ **driving 1.2 million km** with average car
~ 30 times around the world

Payback time **0.4 years**

Water depletion potential



Highest benefit: **PR40X**

72.7 m³ eq./m² film after 10 years

= 52 719 m³ eq./reference building
~ volume of **21 Olympic pools**
~ taking a 10' shower 879 000 times

~ Payback time **0.1 years**

Source: 3M LCA Prestige Series

Want to know about the Climate Contributions that your building can make?

Apart from the general EPD, we have also developed a Building Window Film Energy Saving and Climate Modelling Tool, which, apart from the potential kWh savings, also assesses the estimated climate GWP and water depletion effects for each specific building. This service is free of charge and you can ask for such report at https://www.3m.co.uk/3M/en_GB/window-films-uk/

Reject up to
99.9%
UV Rays

Reject up to
97%
IR Energy

Reject up to
79%
of the sun's heat

Heat load reduction up to
5%
and reduction of temperature imbalances

Possibility to avoid (expensive) refitting of an air conditioning system

Improved building energy performance

Building energy savings. Significant reduction in HVAC costs

Helps CO2 reduction

Maintains existing glass (historic buildings)

Metal-free, prevents interference of mobile phone reception

Eliminates the chance of corrosion of the film

Occupant comfort

High light transmission and clear vision

Fade and glare protection

Privacy and aesthetics

Sources:
- *European Commission Renovation Wave for Europe, 2020*
- *www.Environdec.com*
- *3M Internal Test Reports*