

# HIGH-RISE

## Northern Exposure

June 13, Hotel Presidentti  
Helsinki, Finland



Thank you to our supporters



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June 13, Hotel Presidentti  
Helsinki, Finland



SOM

Eckersley  
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BERKELEY LAB  
Bringing Science Solutions to the World



PILKINGTON

NSG  
GROUP

SCHOTT  
glass made of ideas

STATICUS



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Glass  
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## The event is supported by the following organisations:

Glass Innovation Institute	<a href="http://www.gii.fi">www.gii.fi</a>
Suomen Tasolasiyhdistys ry	<a href="http://www.tasolasiyhdistys.fi">www.tasolasiyhdistys.fi</a>
Glass Performance Days	<a href="http://gpd.fi">gpd.fi</a>
Kiinko	<a href="http://www.kiinko.fi">www.kiinko.fi</a>

# Program:

# Thank you to our speakers

08:00	<b>REGISTRATION - Welcome coffee</b>	13:40	René Beinke LPKF SOLARQUIPMENT GMBH New ways to print architectural glass using laser technology
08:45	Opening & Welcome Jorma Vitkala GLASS INNOVATION INSTITUTE/VITKALA ASSOCIATION OY	14:05	Allan Gibson KURARAY EUROPE GMBH The thermal effect on the acoustic attenuation of laminated glass
09:00	Anne-Christine Roulet HYDRO BUILDING SYSTEMS LTD Beyond sustainable building envelopes	14:30	Martin Brown SCHOTT UK Fire-resistant glass in high rise
9:25	Aulikki Sonntag STATICUS SCHWEIZ AG Long term engagement in building façades	<b>14:55 - 15:30 COFFEE/TEA BREAK</b>	
9:50	Keynote Speaker James O'Callaghan ECKERSLEY O'CALLAGHAN Getting glass to work harder - high- and low-rise advancements	15:30	Agnes Koltay KOLTAY FAÇADES Practical tips for façade design
<b>10.30 - 11.05 COFFEE/TEA BREAK</b>		15:55	Jens Schneider GLASS COMPETENCE CENTER TU DARMSTADT/ FUTURE RECTOR TU WIEN/AUSTRIA Glazing mistakes and solutions
11:05	Sebastian Barth MERCK GROUP New design options for photovoltaics	16:20	Invited Speaker Steve Selkowitz LAWRENCE BERKELEY NATIONAL LABORATORY Glass and Facades: Challenges and opportunities in a carbon-constrained world
11:30	Rory Back NSG EUROPEAN TECHNICAL CENTRE LATHOM Advanced bird-safe glazing design	<b>17:00 CLOSING</b>	
11:55	Keynote Speaker Christoph Timm SOM NEW YORK Decarbonizing the built environment how SOM is decarbonizing the built environment a holistic approach to decarbonization		
<b>12:35 - 13:40 LUNCH BREAK</b>			



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# Global Building Glass Trends

Jorma Vitkala  
Vitkala Association Oy  
Chairman, Glass Innovation Institute (GII)  
GPD Chairman 1992 – 2020  
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# MARKET AND TREND



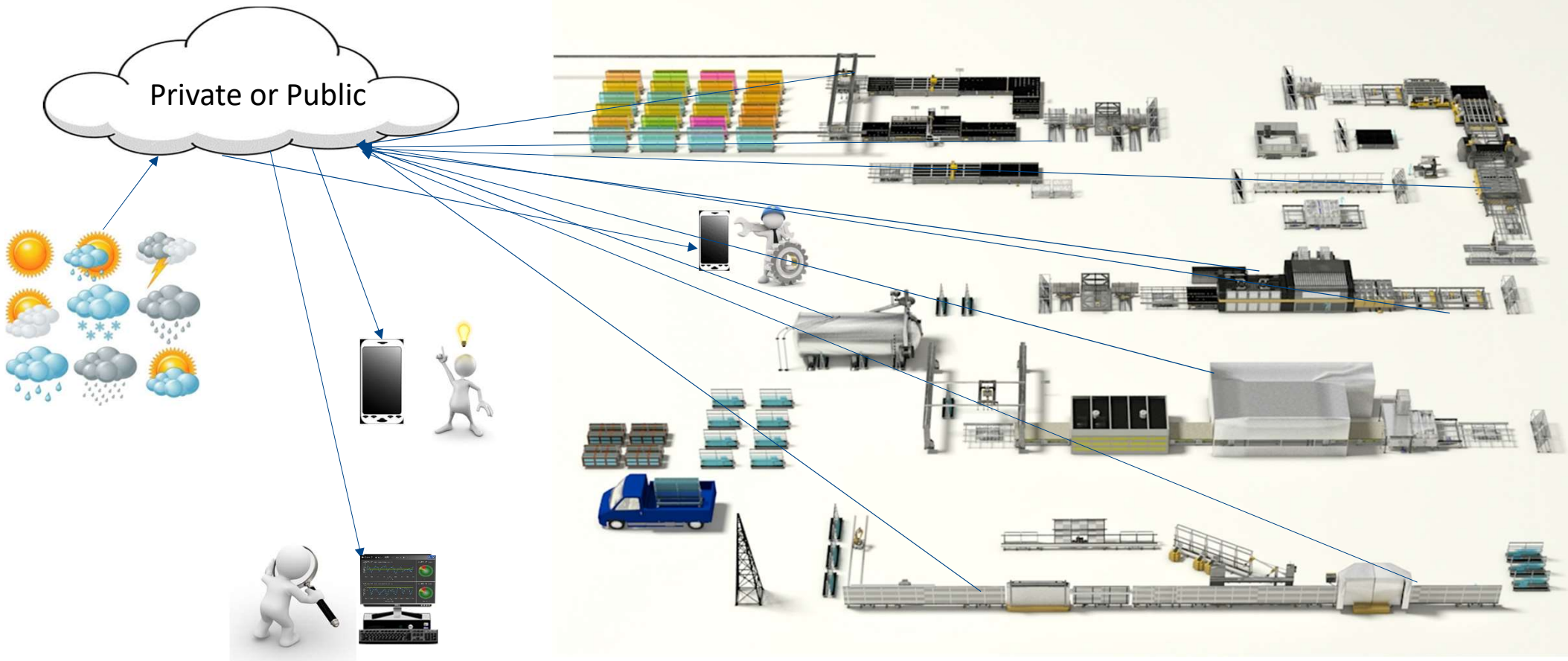
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# Data is the future

- 2030 we have 100 times more data
- Data is the new currency
- Algorithms are the new decision makers



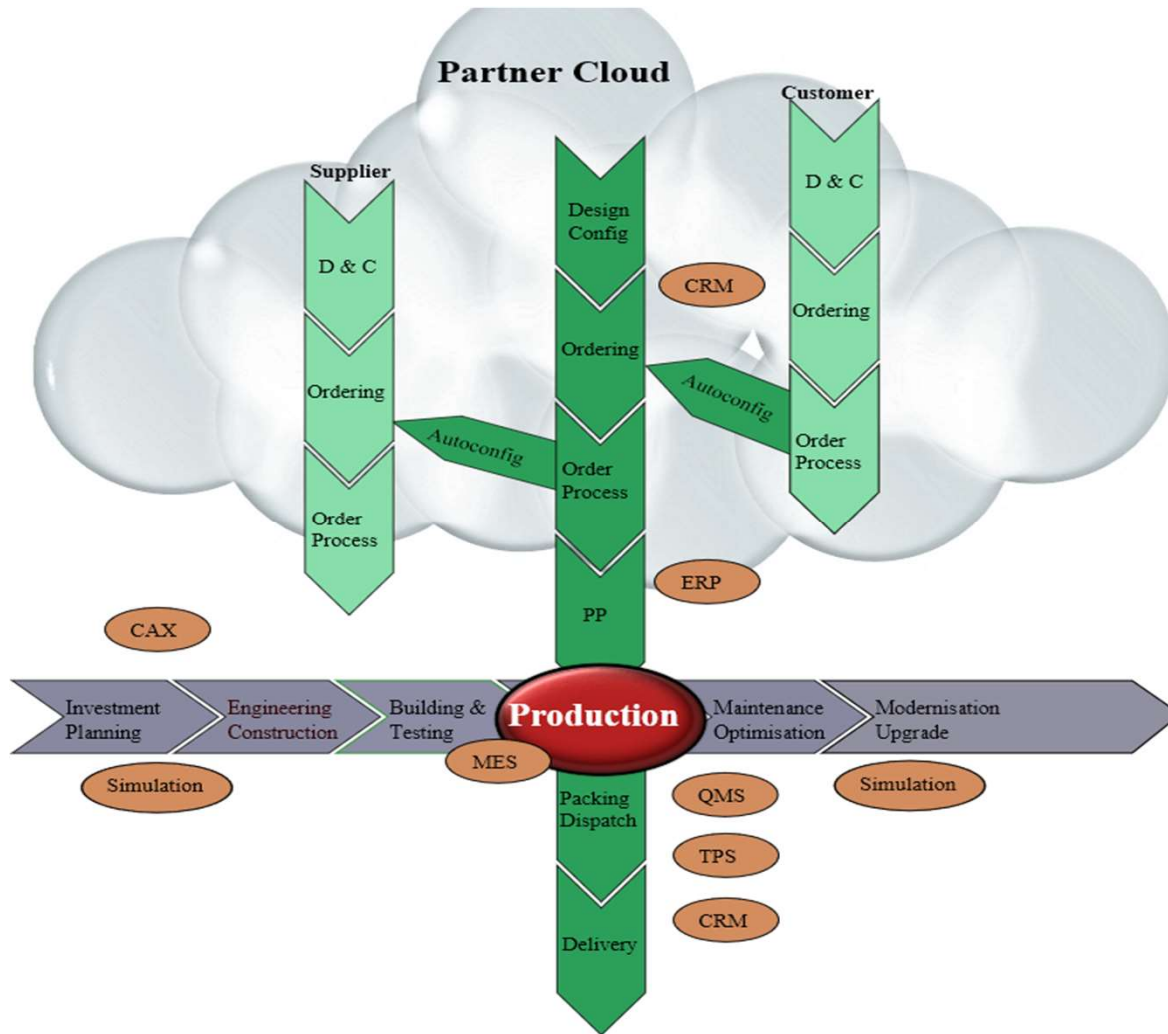
# Drowned in data? Ownership? Security?



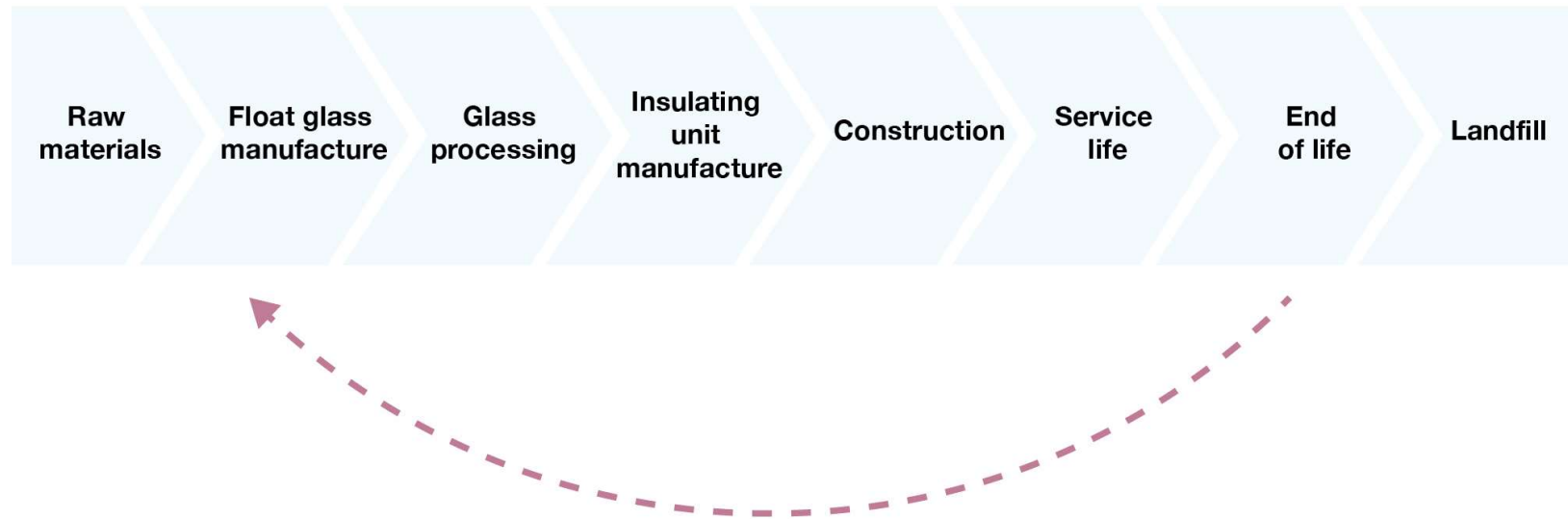


# The Future of Software in Glass Processing

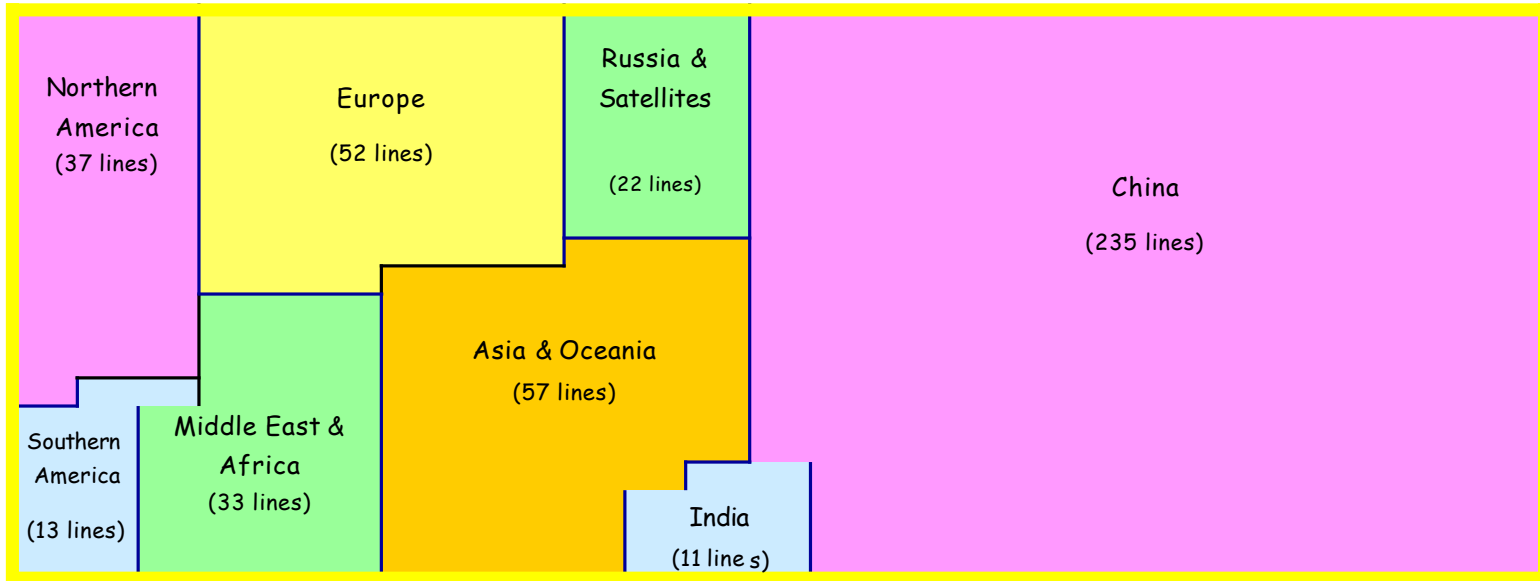
Vision



# Circular economy in glass industry

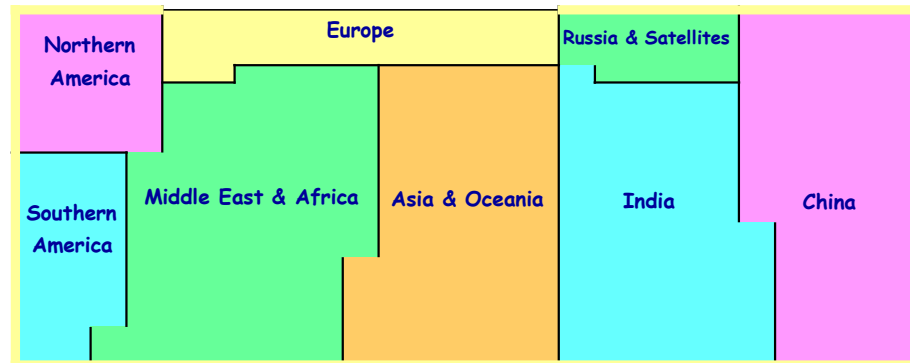


# Float lines (in operation) in the world



**(460 lines)**  
**Early 2019**

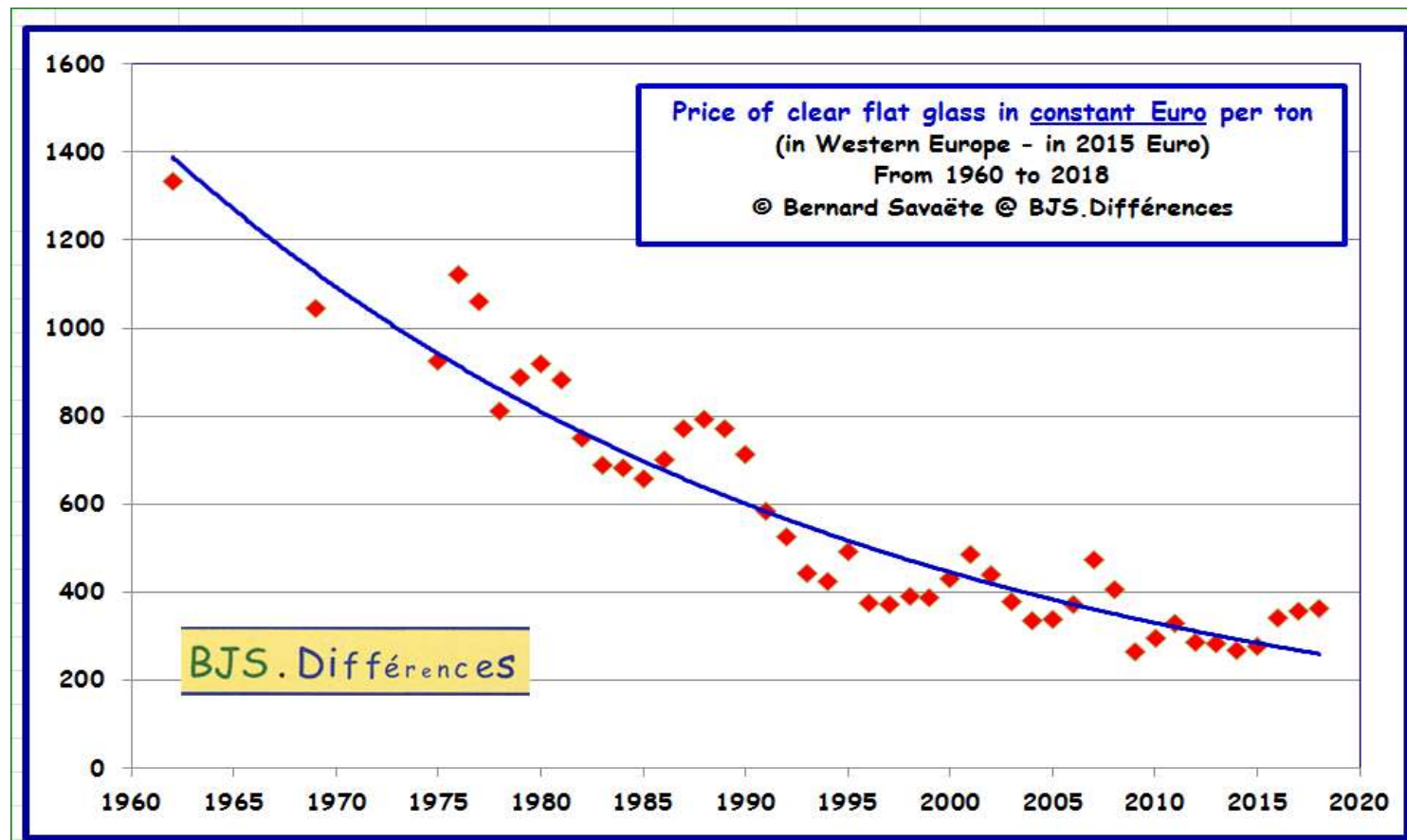
**Versus world  
population**



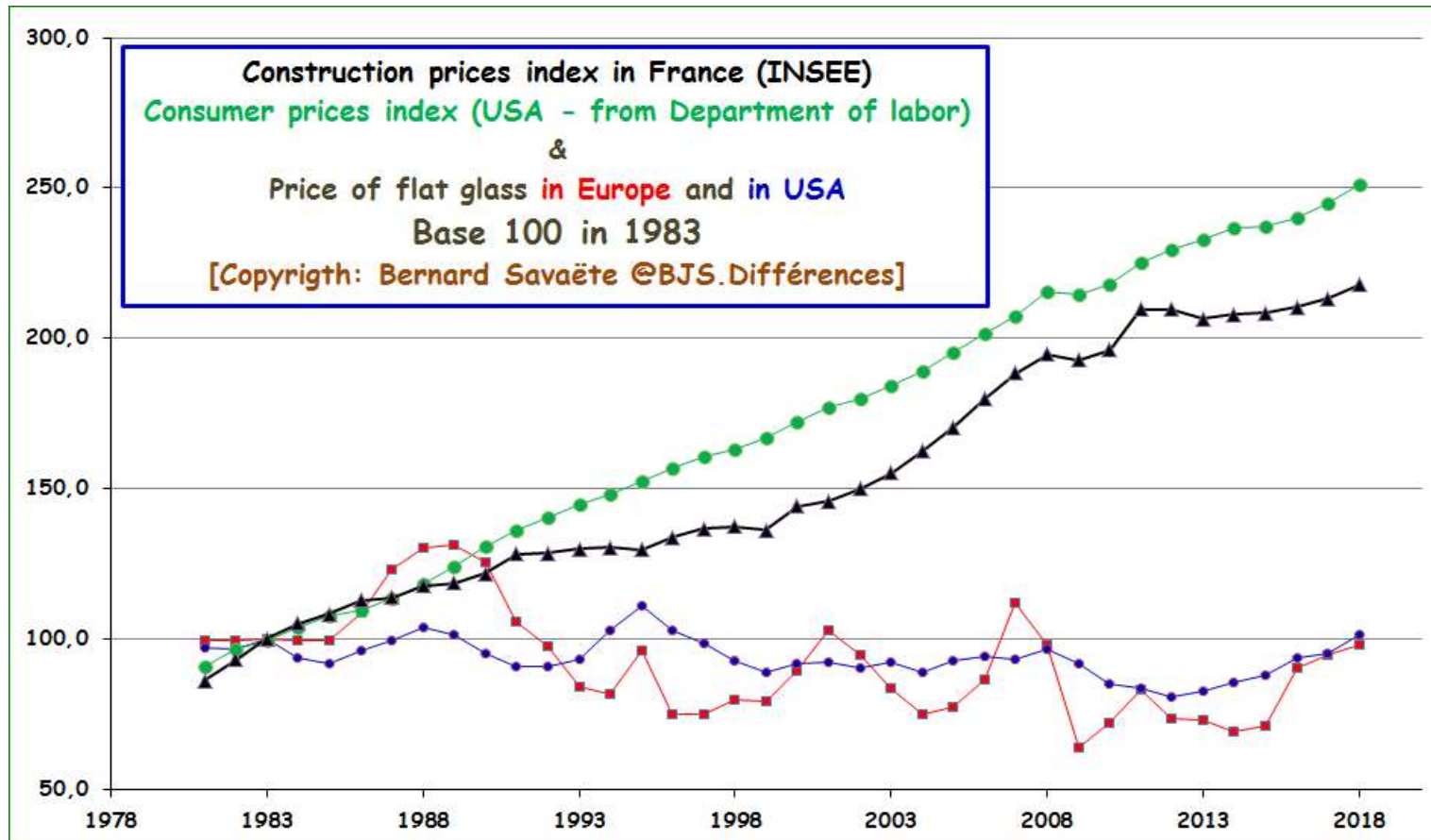
# Float glass selling prices in Europe



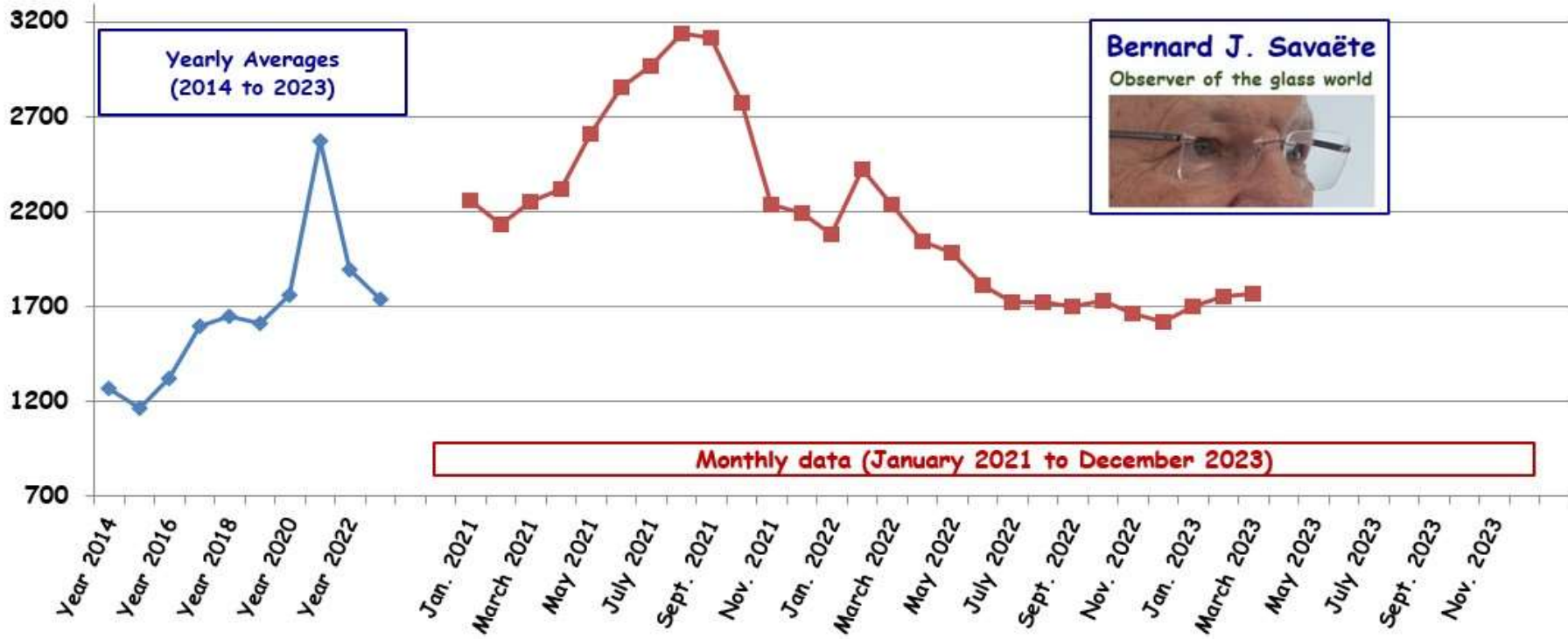
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# Float prices versus other prices indexes



## Prices of clear Float Glass (5 mm) in China - RMB per metric ton (source # 2)



**Bernard J. Savaète**

Observer of the glass world



## 2017 Estimated Sectoral Distribution of Flat Glass Applications

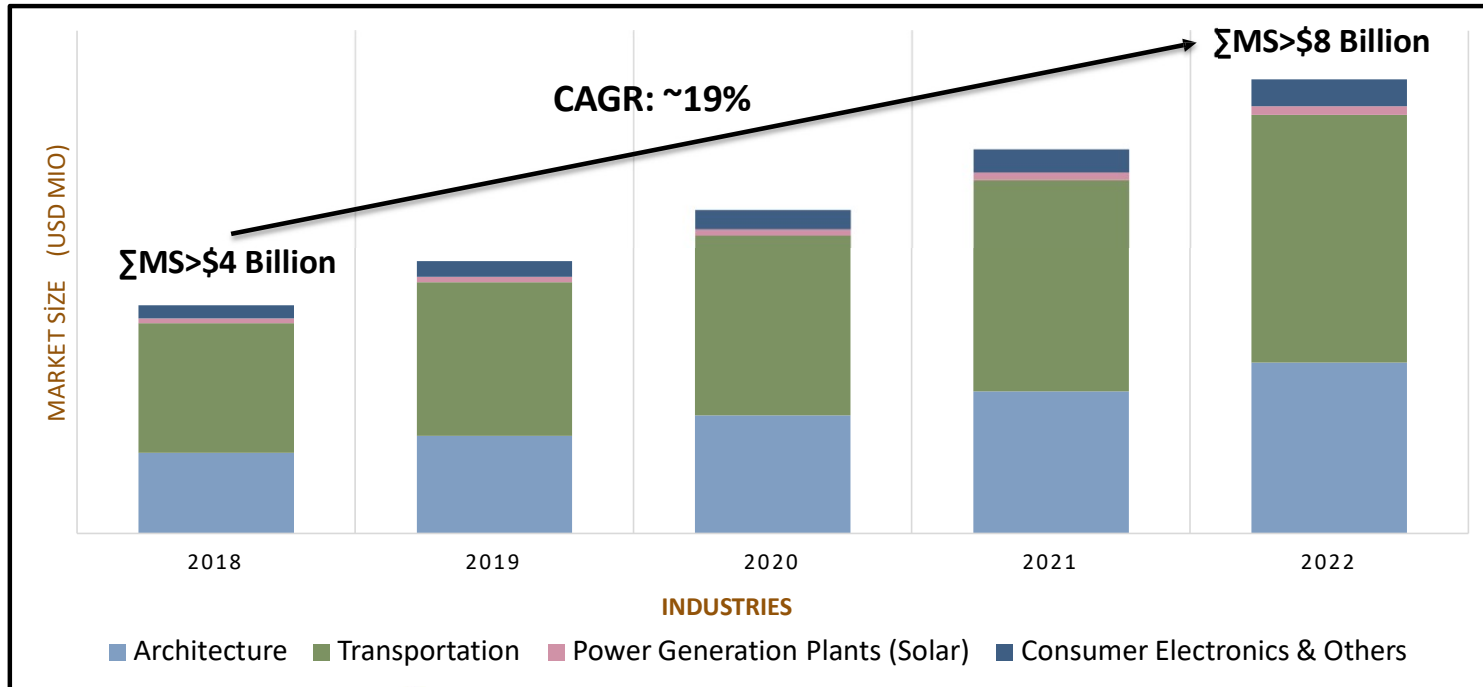
**Demand: ~82 million tons** (*dominated by China 51%*)

2016 Estimated Sectoral Distribution of Flat Glass Applications (%)			
Construction	~82%	<i>New Buildings Façade</i>	40
		<i>New Building Interior</i>	20
		<i>Refurbishment</i>	40
Automotive	~11%	<i>Original equipment manufacturers (OEMs)</i>	80
		<i>Replacements</i>	20
Other applications	~7%	White goods+ Furniture+ Technical glass +displays + electronics equipment + solar glass+...	



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## Smart Multifunctional Glass Surfaces/Coatings



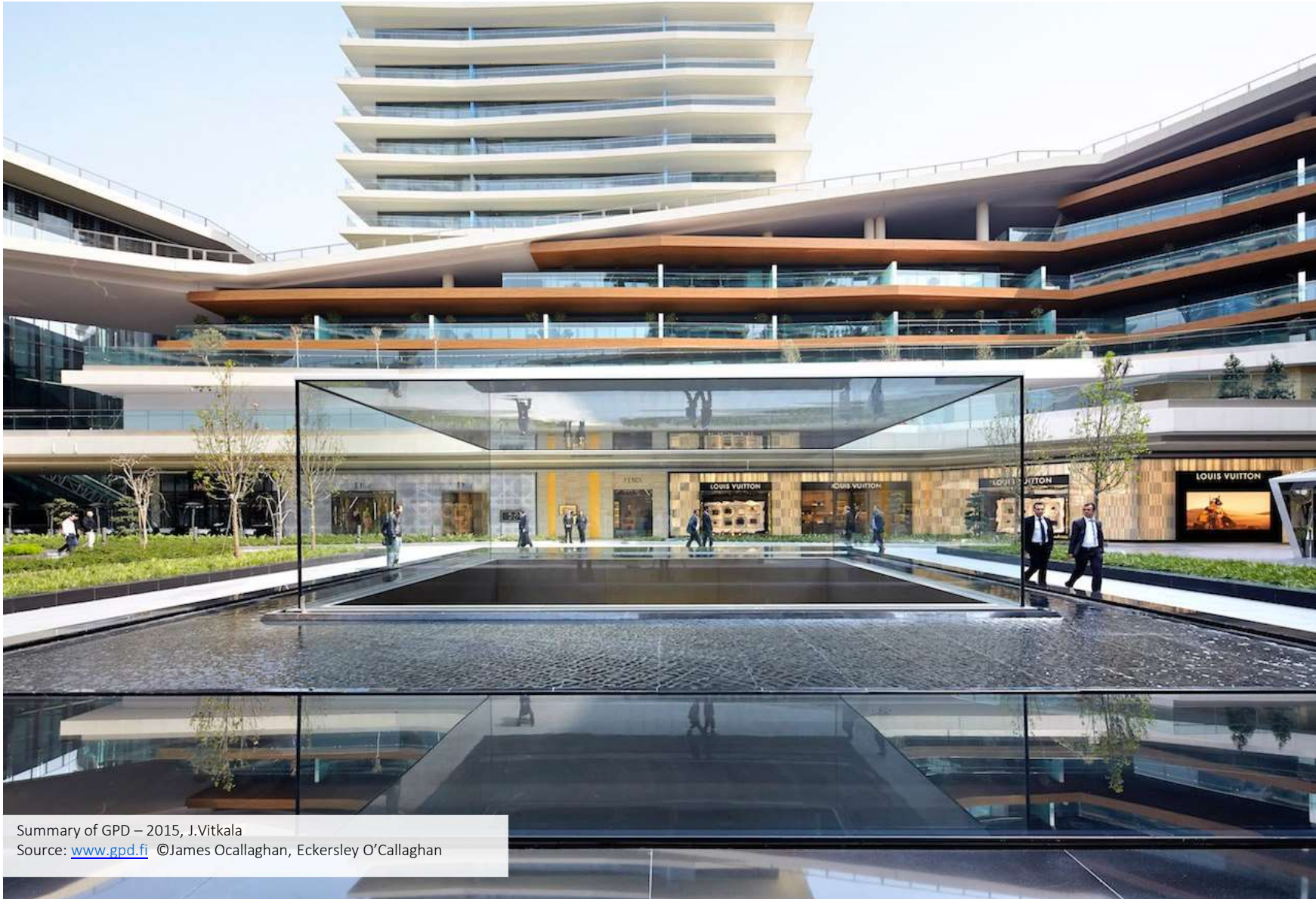
The industries dominating «Smart Multifunctional Glass Surfaces/Coatings Market»;

- construction (**CAGR:~21%**)
- transport (**CAGR:~18%**)





Summary of GPD – 2015, J.Vitkala  
Source: [www.gpd.fi](http://www.gpd.fi) ©James Ocallaghan, Eckersley  
O'Callaghan



Summary of GPD – 2015, J.Vitkala  
Source: [www.gpd.fi](http://www.gpd.fi) ©James Ocallaghan, Eckersley O'Callaghan

# Extra large sliding door



# New Shapes

High Performance (coated) Bent Tempered Glass

# Bending of Glass



## Bending of Glass

Bending glass has a long tradition in architecture. Glass is a unique building material which combines visual transparency, robustness towards the elements, high material strength and flexible fabrication. It can be bent, curved & warped by different technologies such as ...



- Cold Bending by Force
- Warm Bending by Lamination
- Hot Bending by gravity Slumping
- Temper Bending by online Tempering

# COLD-BENDING | THE OPUS, DUBAI

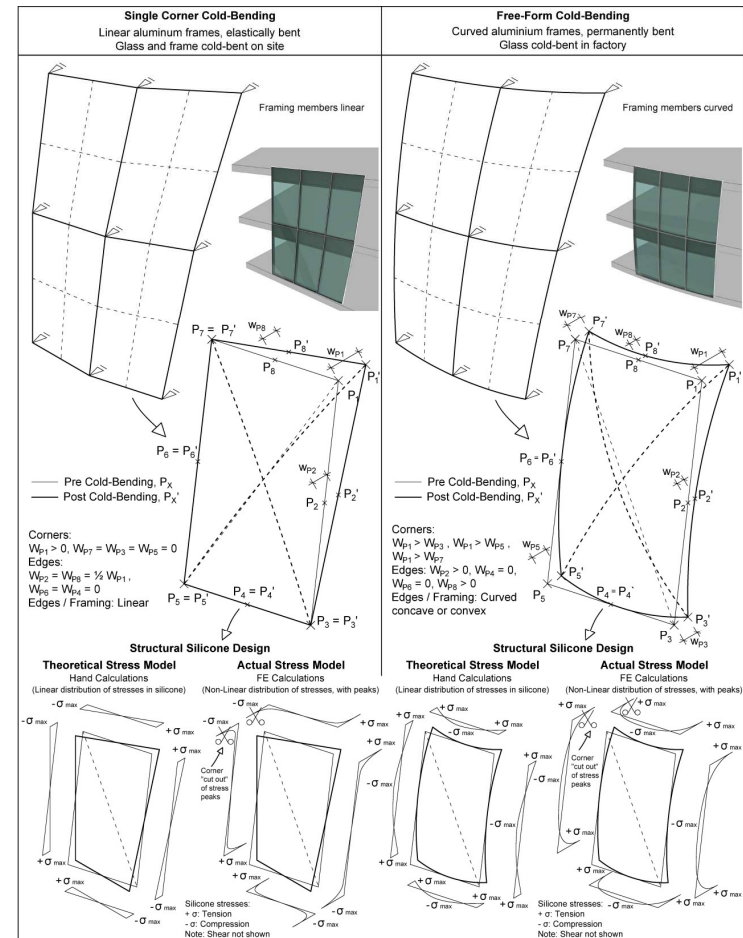
## FREE-FORM COLD-BENDING

The Opus, Dubai:

- Derives from the architect Zaha Hadid, sinking a hot poker into a cube of ice to create an irregular, curved void in the middle



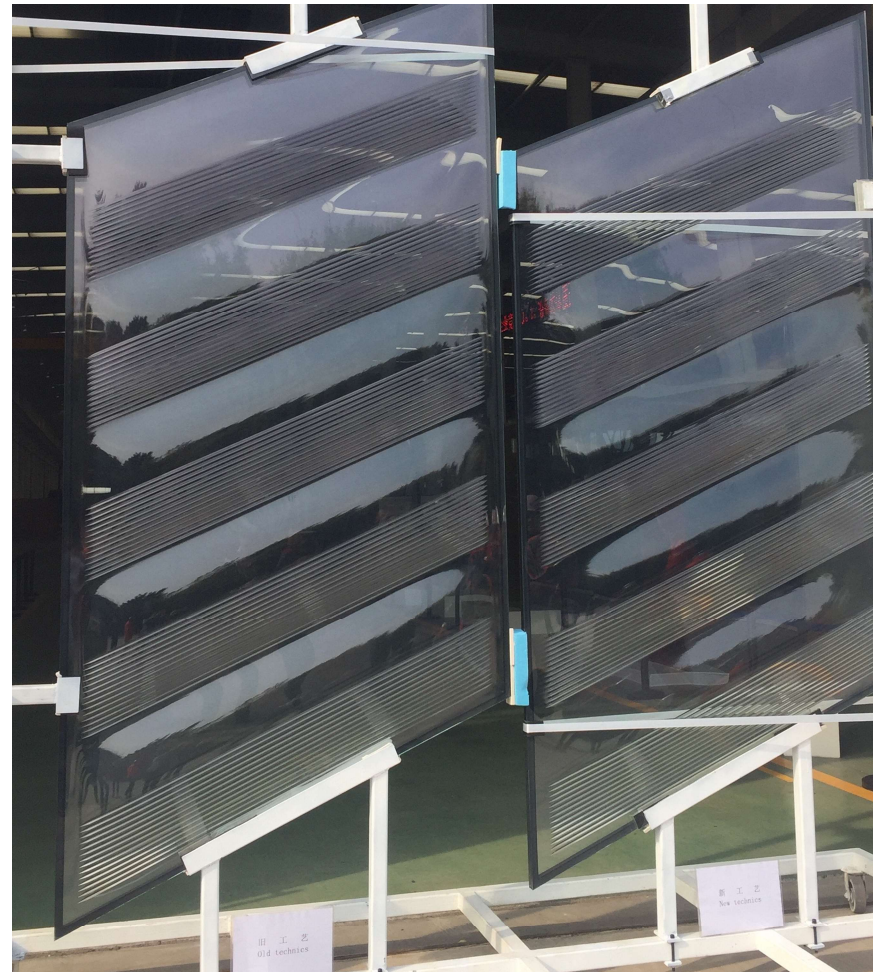
Comparison single corner cold-bending vs. free form cold-bending, incl. structural silicone stress models  
Benjamin Beer / Ramboll



## 3D Curved Glass and Chemical Tempered Glass

When you look at this glass, you will find on each piece of glass a prismatic area and a clear area

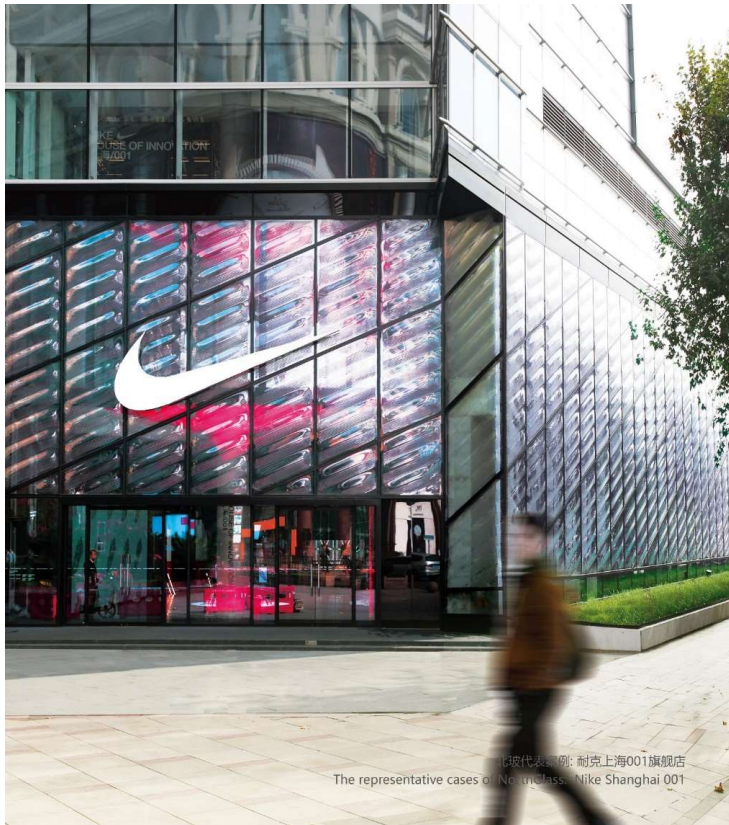
- not any defection over the surface
- arch height about 45mm
- irregular shape
- not any defection at edge



Global Glass Trends – 2019, J. Vitkala

Source: [www.gpd.fi](http://www.gpd.fi) – © Helmut Hohenstein, Dr. Hohenstein Consultancy

# Nike Flagship Store Shanghai



**Glass: 1500 x 3600 mm<sup>2</sup>**

**8 mm low iron slump bending glass + 2.28  
SGP + 8 mm Low Iron Slump Bending Glass  
+ 20 mm Air space + 8 mm Low Iron high  
light transmission coating Low E**

**Bend height 50 mm**

**Tempering stress 600 MPa**



# Indoor comfort

Kakslauttanen Arctic Resort,  
Saariselkä, Finland

## **Solution**

- *Electrically heated insulated glass*
- *Heating on inner and outer glass*



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# STRUCTURAL DESIGN



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Summary of GPD – 2017, J. Vitkala

Source: [www.gpd.fi](http://www.gpd.fi) ©Tim Macfarlane, GL&SS



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# ENERGY PERFORMANCE

# European Union Energy Legislation

- EU **Energy and Climate Policy** framework
  - Reduction in greenhouse gas emissions by at least 40% by 2030 (compared with 1990)
- Revision of EU **Energy Performance of Buildings Directive** (EPBD)
  - Provisions relating to nearly zero energy buildings (nZEB) retained
  - 1<sup>st</sup> January 2019: All new public buildings should be nZEB
  - 1<sup>st</sup> January 2021: All new buildings should be nZEB
  - Renewables are likely to be required to achieve nZEB
  - Member States required to transpose new elements of EPBD into national law by 10<sup>th</sup> March 2020
  - Decarbonisation of building stock by 2050
- EU **Energy Efficiency** Directive (amended)
  - Minimum 32.5% energy savings in EU by 2030 (non-binding)
  - EU countries to achieve new energy savings of 0.8% each year of final energy consumption for the 2021-2030 period
  - Amendments transposed into national law by 25<sup>th</sup> June 2020
- EU **Renewable Energy** Directive (recast)
  - Minimum 32% energy from renewable sources in EU by 2030 (binding target)
  - New elements transposed into national law by 30<sup>th</sup> June 2021

# Clean Planet for all and Building Stock Observatory

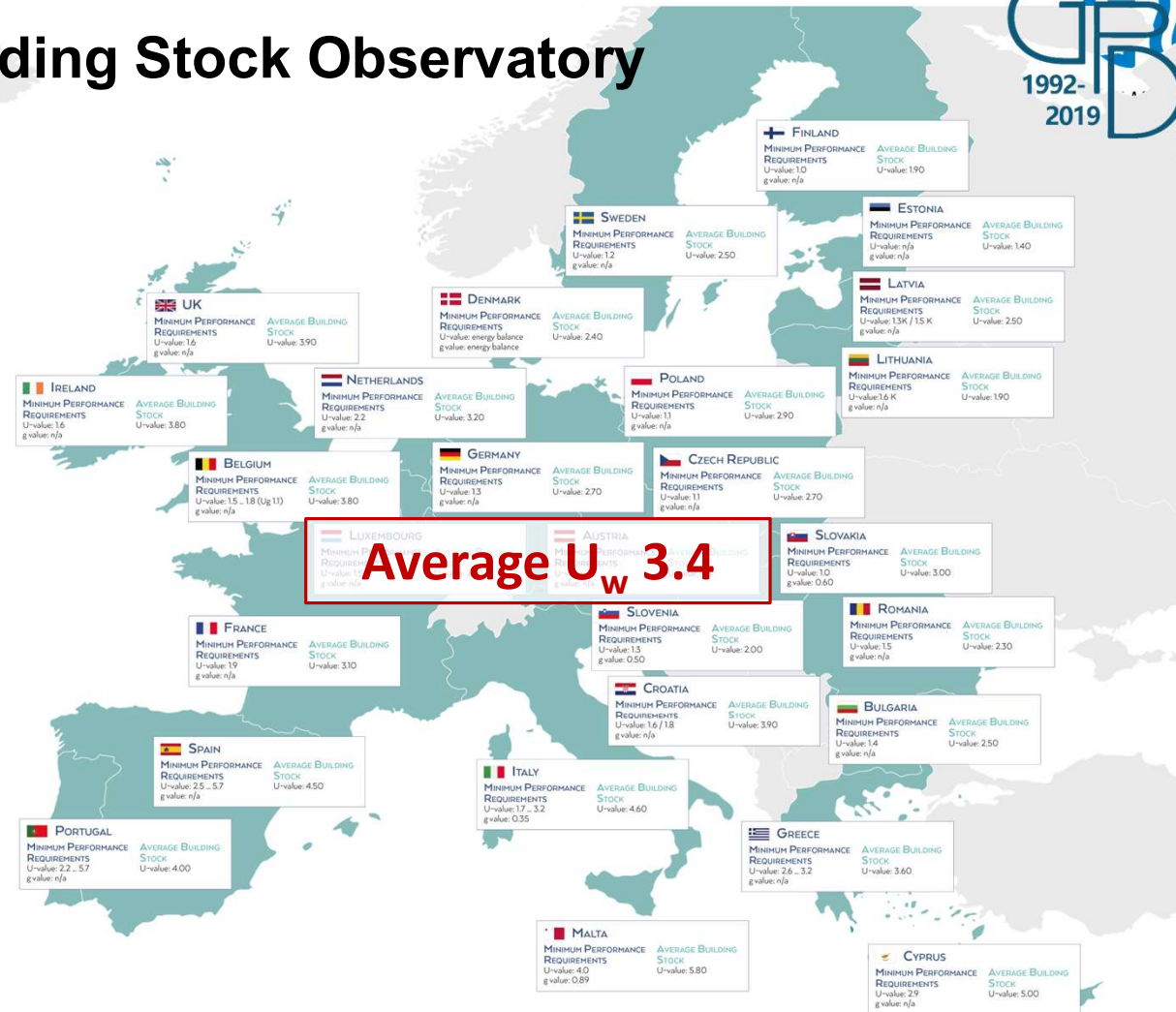


EUROPEAN COMMISSION

Brussels, 28 November 2018

IN-DEPTH ANALYSIS IN SUPPORT OF THE COMMISSION COMMUNICATION COM(2018) 773

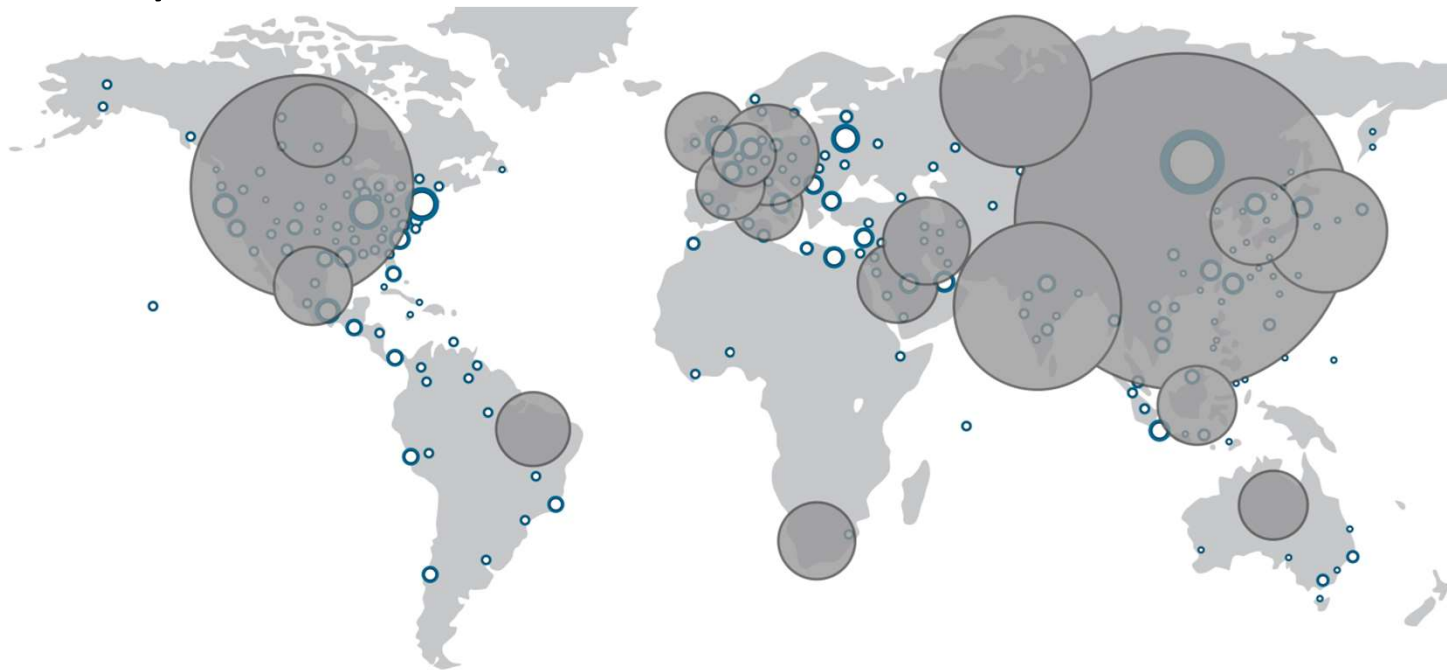
A Clean Planet for all  
A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy



**Average  $U_w$  3.4**

# Global Carbon Emissions

- Per Country



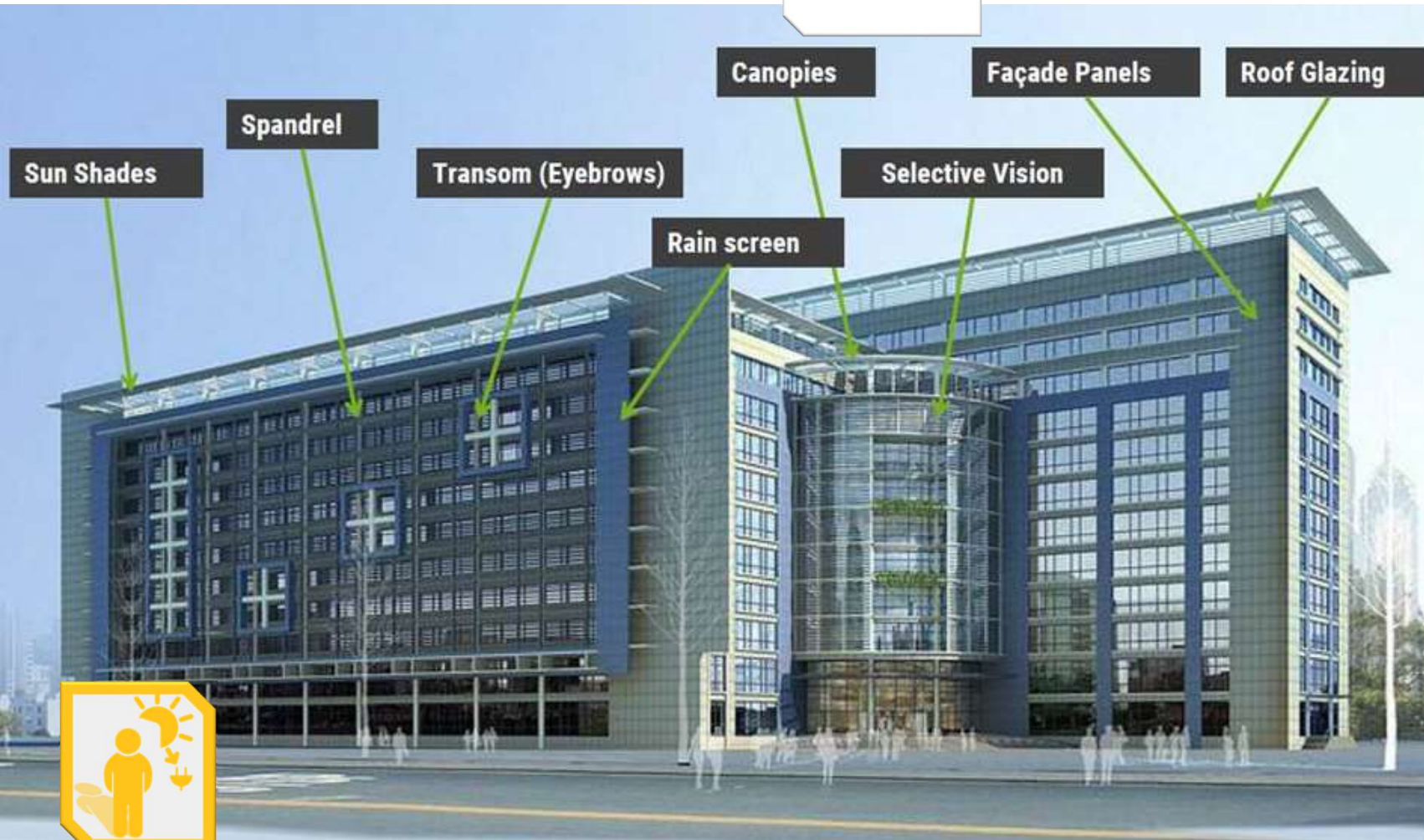


# Future BIPV

# BIPV

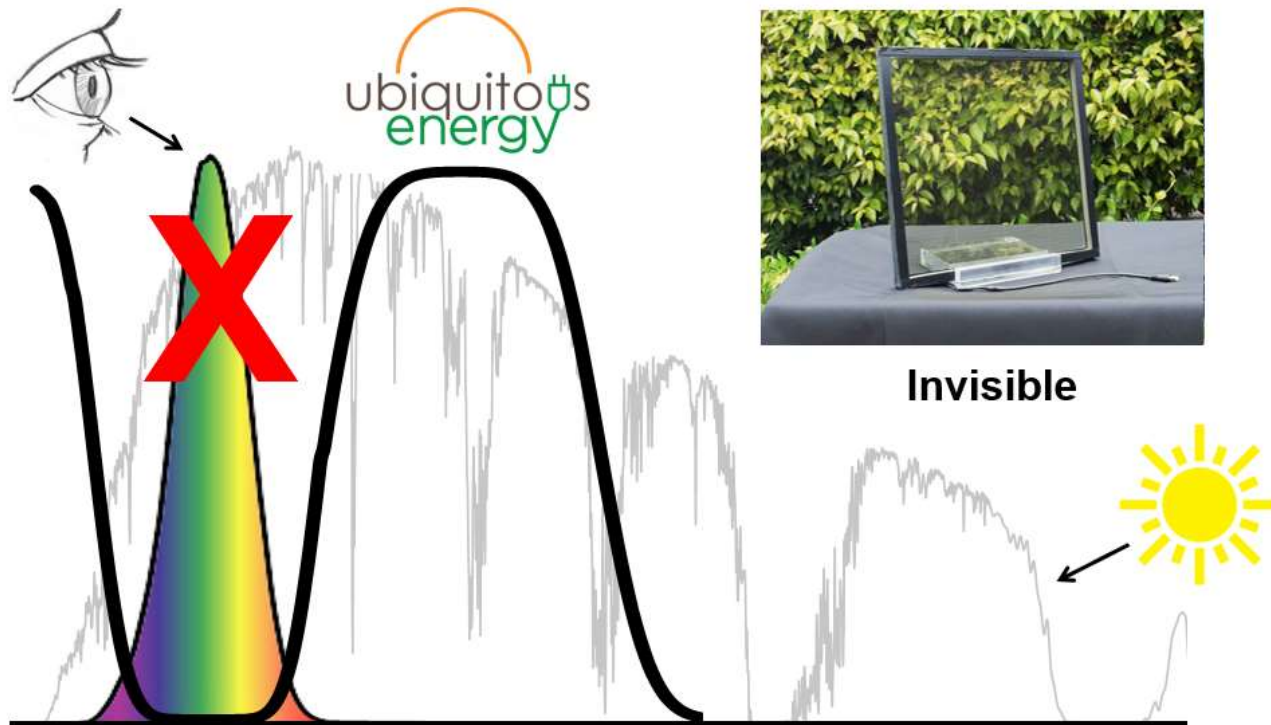


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Global Glass Trends – 2019, J. Vitkala  
Source: [www.gpd.fi](http://www.gpd.fi) – © Rory Back, NSG Pilkington Glass

# Truly Transparent Solar



GPD Finland, June 28, 2019

# Coloring via interference pigments at a glance



- Combining the **low power loss** of dielectric coatings with the **flexibility** of a printing process
- **Tailor made, bright colors** and customized solar module sizes possible
- High flexibility and **reproducibility** of colors
- Solar module **efficiency is retained at 80-95%** depending on the color
- Application of the ceramic paste is possible via screen printing, R2R or spray coating on glass (industrial standard processes)
- ColorQuant™ is applied as a thin ceramic layer (**~35 μm**) before the glass hardening step to ensure **best in class reliability and stability**

# Insulating glass for high-performance façade



$R_w$  VALUE UP TO  
**44-52** DB



$U_g$ -VALUE UP TO  
**0.6** W/(m<sup>2</sup>K)

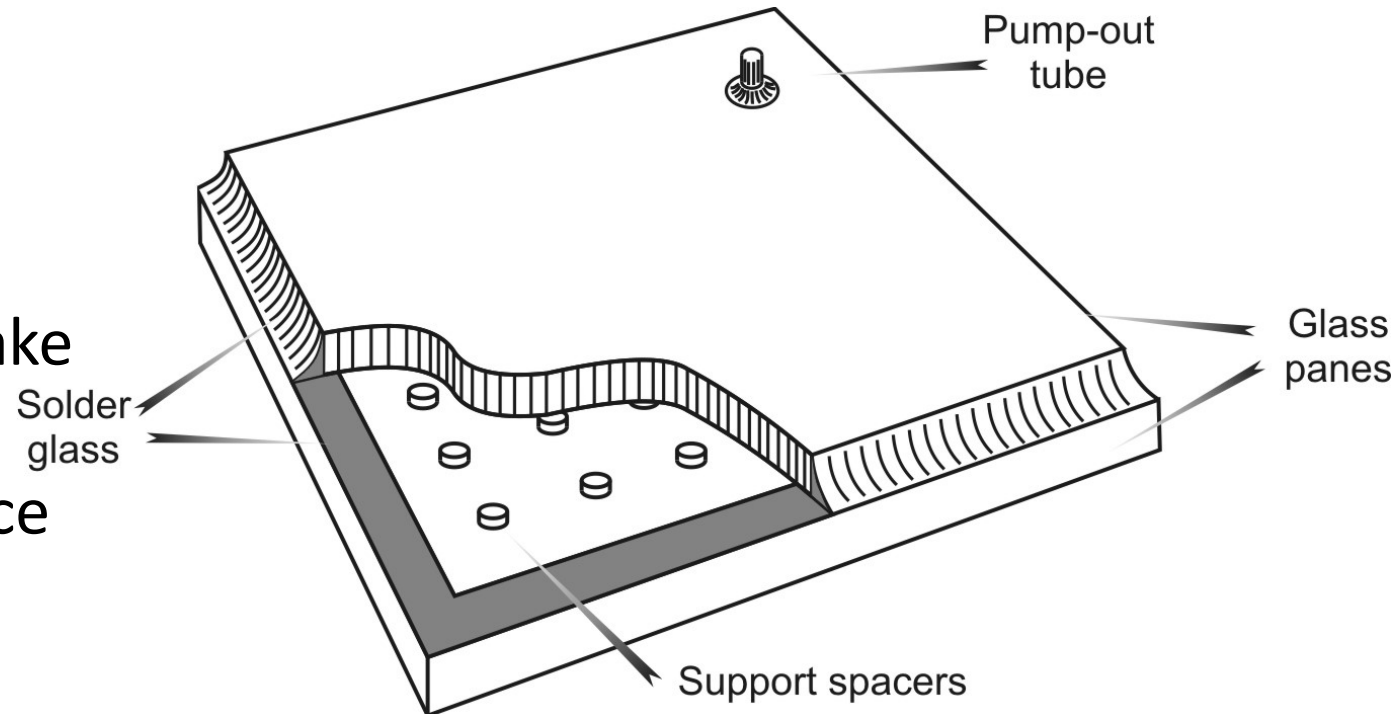


g-VALUE LESS THAN  
**8** %



## In 1990 the University of Sydney Vacuum Insulated Glazing product is born

- Glass sheets stepped at edges for solder glass
- Metal pillars
- Low E coating
- No getter
- Low temperature bake out ( $\approx 200^{\circ}\text{C}$ )
- In-vacuum/In-furnace tip-off of pump out tube





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# Smart Window Technology

There are 3 main categories:

- Switchable Glass
- Thermochromic
- Photochromic



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## Dynamic glass



Mission: make aesthetically pleasing dynamic glass affordable for the masses that is channel friendly





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**Characteristic  
exterior and  
interior view**

Mick Eekhout, Octatube

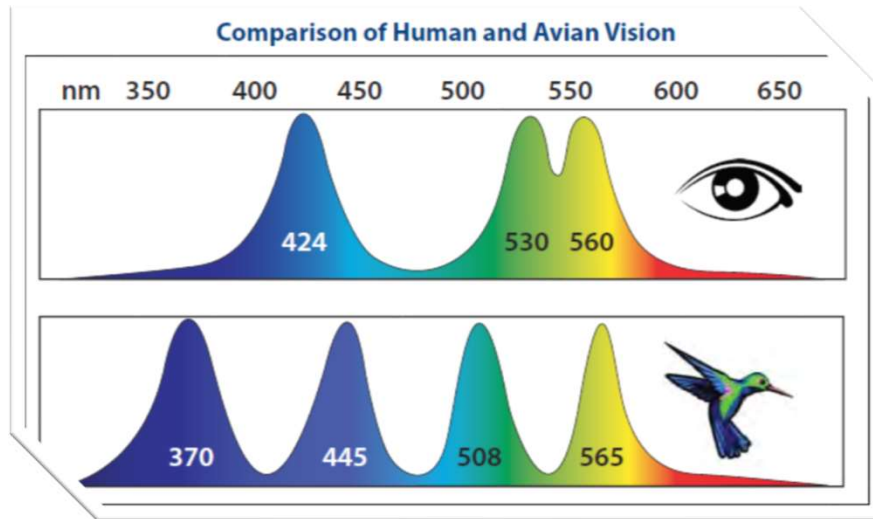
# Dutchess County Residence



Summary of GPD – 2017, J. Vitkala

Source: [www.gpd.fi](http://www.gpd.fi) © Daniel Vos, Heintges & Associates

# Bird Safe Glass



# Transparent display



# 3D facade

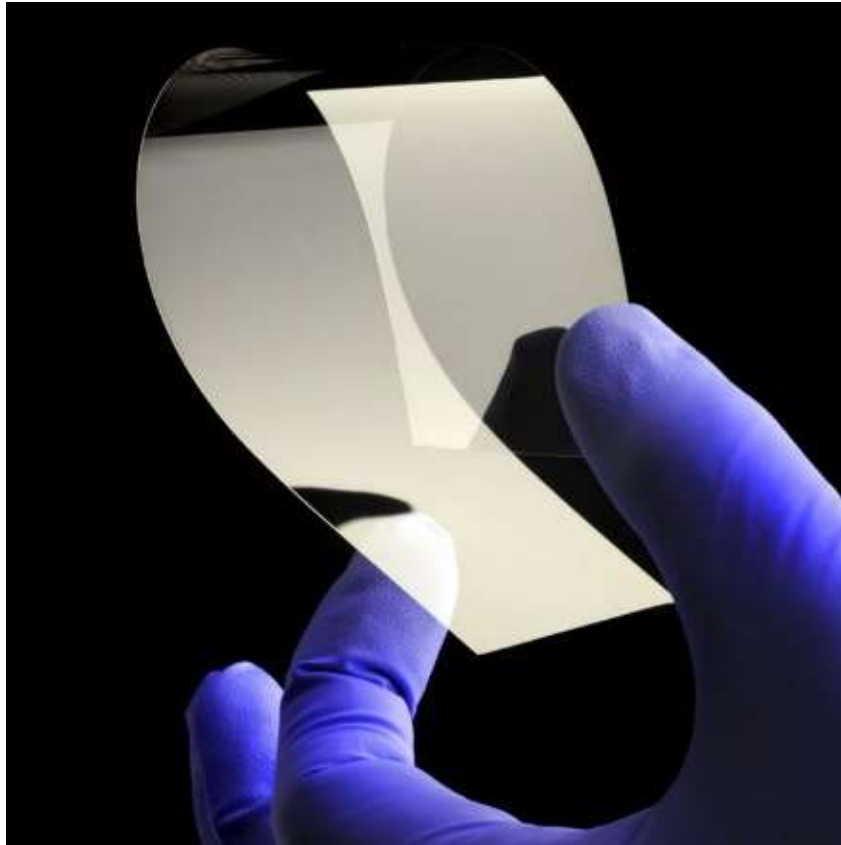


Source: [www.gpd.fi](http://www.gpd.fi) @Yongwu Duan

# ULTRA-THIN GLASS

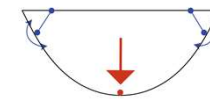
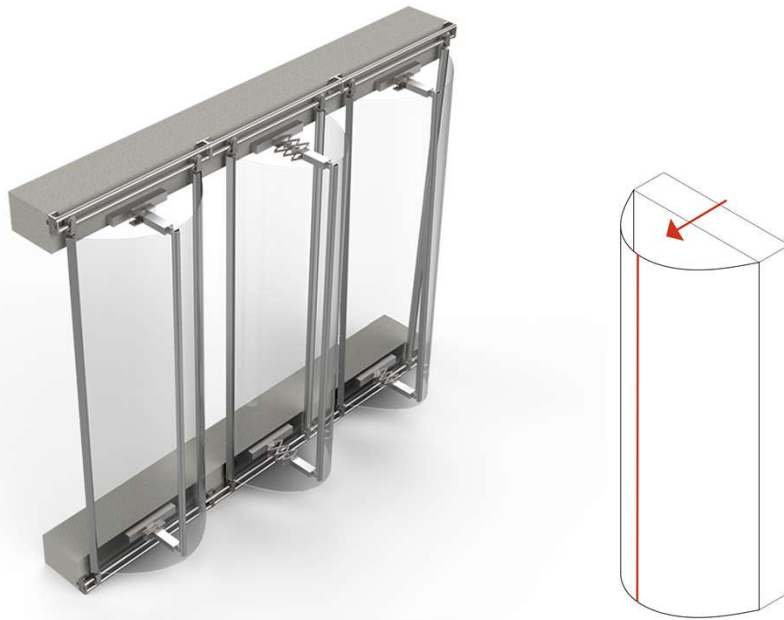


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# Adaptive Thin Glass Facades Mechanical Actuation

- Ribeiro Silveira, Klein & Louter



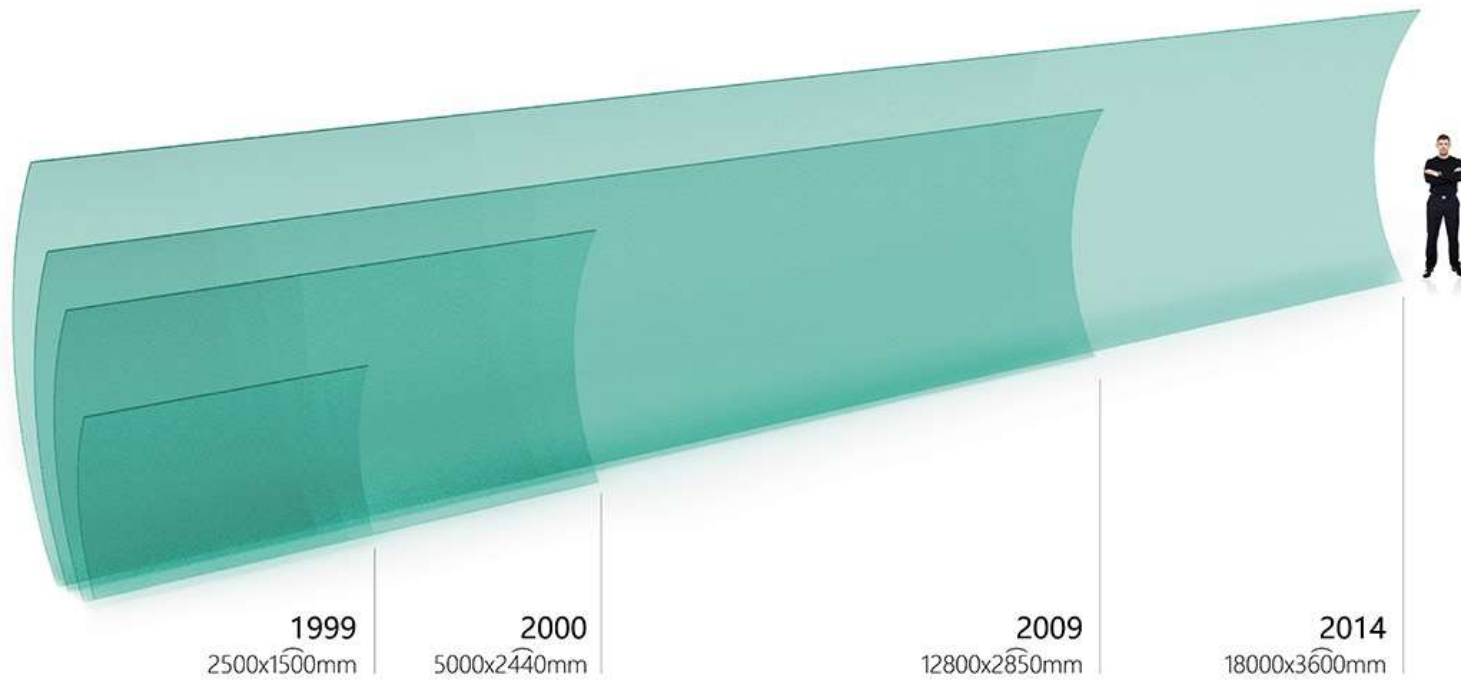


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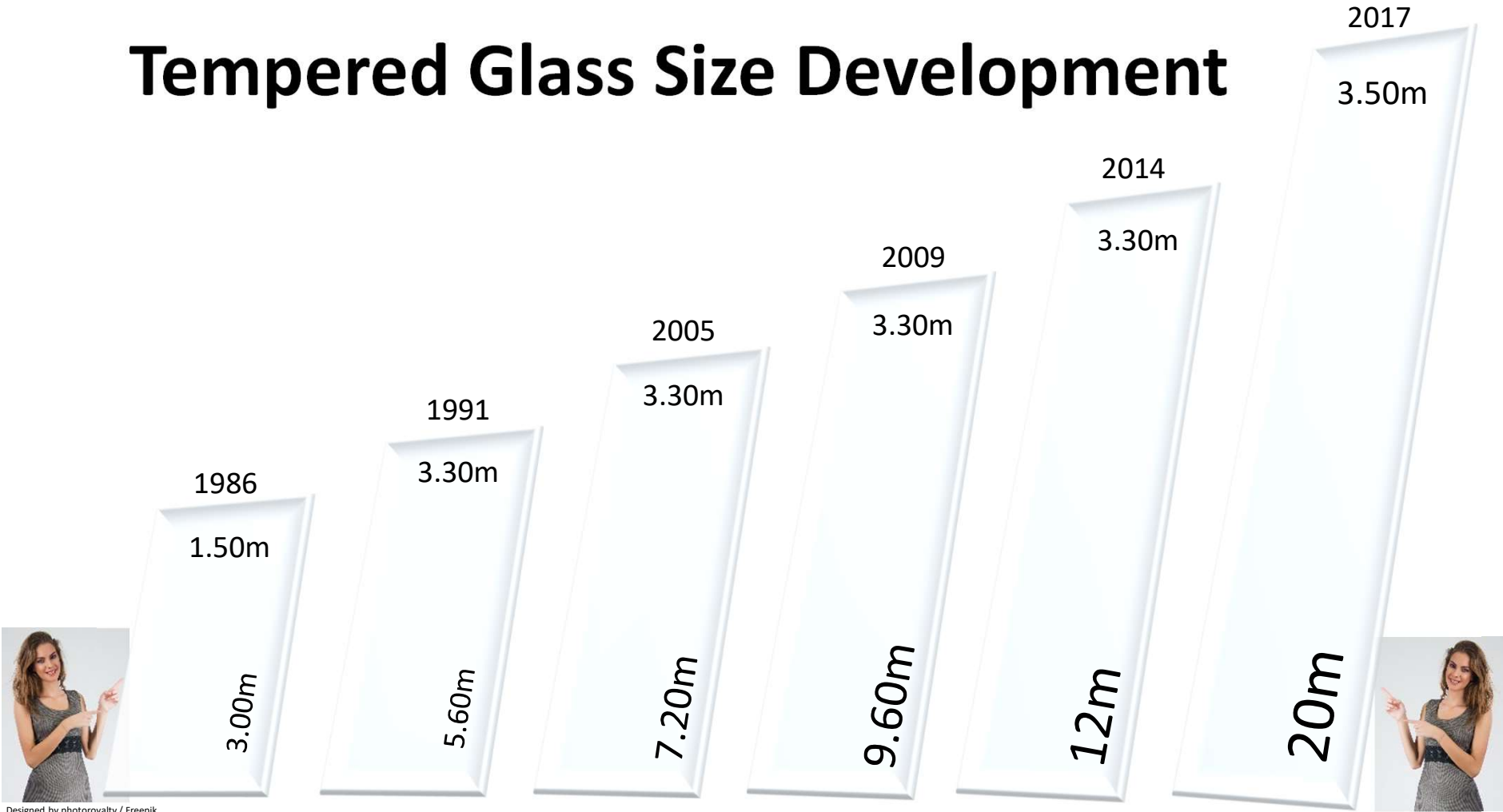
- Today's Glass sizes



## Development of curved glass over the last 20 years



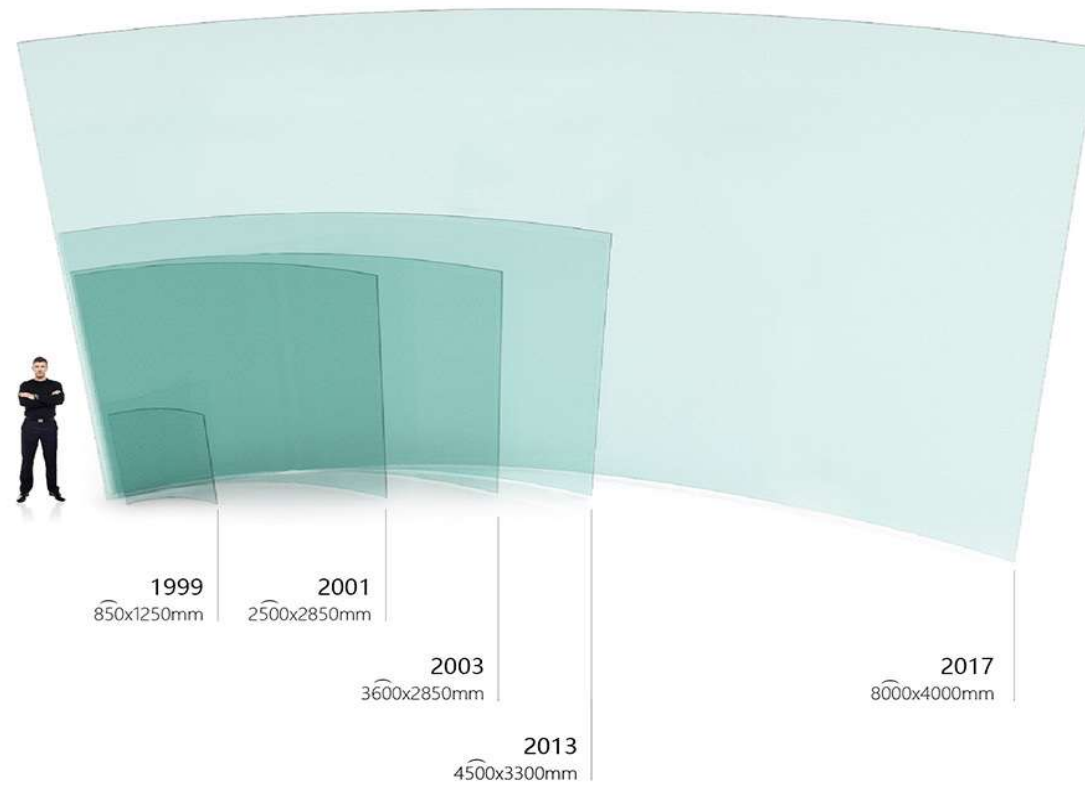
# Tempered Glass Size Development



Designed by photoroyalty / Freepik

Jorma Vitkala, GPD

## Development of curved glass over the last 20 years



# My thoughts about future

- Most of the new innovations come from outside the glass industry
  - Sharing knowledge/different alliances between industries are needed
  - Developing key cooperation between all stakeholders.
  - Involving start-up companies/accelerate the development of the glass
- ➔ The glass has the potential to grow into the most versatile building material

Professional training - Consultancy network - International cooperation

“THE OLD FOX understands the traps”



- The Club, the leading knowledge-sharing network, grants the privileged access to a tremendous pool of valuable educational resources for the whole glass value chain by connecting senior glass experts and designers with young professionals, start-ups and universities.

# Thank you!

- Jorma Vitkala
- Vitkala Association Oy
- *“From knowledge network to know-how”*
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- +358 40 5532042
- Join my LinkedIn group  
with 19,000 members

