



# **OBJECTIVES & SCOPE**

The main scope of the project is the production of an innovative photocatalytic paint, which aims at improving the quality of the indoor environment while it will enable significant energy savings in buildings

### The project main objectives are:

- Optimization and Upscaling of a novel photocatalytic powder
- Semi-industrial production of innovative photocatalytic paints (VISIONS Photo-Paints)
- **Real scale application** of the VISIONS Photo-Paints in a set of existing **Demo-Houses** and in **public building (HNA)**.
- Establishment of a commercial company which aims to deliver the project outcomes into the masket

Key "After Life" action

#### Action B.3 Real Scale Applications (NCSRD)

**Subaction B3.1** Application of Photo-Paints in Demo-Houses prototype demonstrator (FORTH)











#### **Implementation Actions**

### Action B.3 Real Scale Applications (NCSRD)

**Subaction B3.1** Application of Photo-Paints in Demo-Houses prototype demonstrator (FORTH)

#### <u>1st approach</u>

- Both green (VISIONS paint) and conventional rooms were fed with equal amount of pollutants and were illuminated using the same lamp system.
- Continues monitoring of NOx and VOCs (toluene) in both rooms
- Estimation of pollutants degradation after 1 hours





## **Implementation Actions (Actions B)**

# Action B.3 Real Scale Applications (NCSRD)

**Subaction B3.1** Application of Photo-Paints in Demo-Houses prototype demonstrator (FORTH)

<u>2nd approach</u>

- Green" (VISIONS paint) room was fed with air pollutants (NO, toluene) without illumination
- After stabilizing the pollutant concentration in the room, the elimination of pollutants was calculated after 1 hour without illumination.
- The test was repeated with illumination
- The difference in the elimination rates represents the photocatalytic degradation of the pollutants

In both approaches the system is static and the HVAC system works without providing <u>fresh air</u>



# Results





	% NO Removal	Fd (µg/m²s)	Vd (cm/s)
NOx Removal Conventional	24.6	0.046	0.006
NOx PhotoRemoval (VIS)	<mark>61.7</mark>	<mark>0.096</mark>	<mark>0.028</mark>
NOx PhotoRemoval (VIS+Ext			
Light)	70.1	0.125	0.034
Toluene PhotoRemoval (VIS)	<mark>5.79</mark>	<mark>0.011</mark>	<mark>0.001</mark>

PPD (%) = (Cin –Cfin / Cin )× 100 r<sub>NO</sub> ( $\mu$ g/m2s) =(Cin –Cfin)× V / A×t  $Vd_{=}r_{NO}$  /  $C_{in}$  NO

V=30 m<sup>3,</sup> A=40 m<sup>2</sup>





#### Results







## Subaction B3.2 Application of the most promising Photo-Paint in real life conditions. The case of Hellenic Naval Academy (HNA) Buildings

















1st approach

- Yearly basis monitoring before and after the application of VISIONS PhotoPaint (2020-2021)
- Comparison of IAQ during the different periods (2022-2023)

#### 2<sup>nd</sup> approach

- Both green (VISIONS paint) and conventional rooms will be monitoring for NOx and VOCs simultaneously
- The difference in the elimination rates in the 2 rooms represents the photocatalytic degradation of the pollutants





NO ppb	May 2021	May 2023	
Average	<mark>5.90</mark>	<mark>9.60</mark>	
Max	144	215	
Min	0.21	0.05	
STDV	15.8	23.5	



A limitation of this approach is the variations of outdoor air quality and meteorological conditions during the different sampling periods (2021 – 2023).

Covid - 19 effect!





	Photocatalytic (Green) classrooms	Conventional classrooms		
G	Δ111	Δ112		
1st	Δ217	Δ218		
1st	Δ200	Δ212		
2nd	Δ306	Δ308		
2nd	Δ302	Δ303		





Up to June 2023	Up to Nov 2023	Up to Dec 2023	Total VISIONS surface paint m <sup>2</sup> by the end of the project
3339 m <sup>2</sup> (1669 m <sup>2</sup> VISIONS PhotoPaint and 1669m <sup>2</sup> conventional)	3339 m <sup>2</sup> VISIONS Photo paint	<mark>1669</mark> m² corridors	5318 m²







		NO					
Floor	Room	% Difference		rNO (µg/m2s)		Vd (cm/s)	
		all values	values > 30	all values	values > 30	all values	values > 30
Groundfloor	Δ111 - Δ112	36.8	43.1	0.02	0.09	0.06	0.10
1st	Δ217 - Δ218	29.7	47.1	0.01	0.06	0.04	0.07
	Δ200 - Δ212	23.8	46.7	0.004	0.07	0.03	0.08
2nd	Δ306 - Δ308	31.3	47.8	0.01	0.13	0.05	0.08
	Δ302 - Δ303	21.1	45.7	0.01	0.07	0.03	0.08
	Average	28.5	46.1	0.01	0.08	0.04	0.08





# http://lifevisions.gr/

LIFE VISIONS Facebook page The project Facebook page is available as LifeVisions. (@LifeVisionsGR) LIFE VISIONS Twitter account

The project Twitter account is available as <u>LifeVisionsGR</u>, (@gr\_visions)



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