

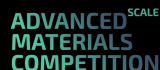
NANO SCI



#PROPTECH #CLEANTECH #CLIMATETECH

Transforming Building Efficiency: Decentralized Heat Recovery Ventilation with Integrated Air Purification

ECOLOGICAL ENERGY-REGENERATORS FOR MULTI-FAMILY APARTMENTS



Business Case – NanoSci's Technology for Decentralized Heat Recovery Ventilators (HRV's)

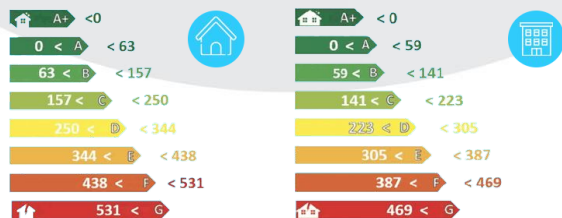
Business Environment:

We are facing the challenge of reducing energy consumption in buildings. In 2022, 238k apartments were commissioned in Poland, 482k in France, and 295k in Germany. About 70% of the 6.87 million residential buildings in Poland (including single-family and multi-family buildings) require modernization. As much as 16% of these, amounting to 1.1 million buildings (which include over 2 million apartments), are classified as "energy vampires," qualifying for the lowest energy classes (E,F,G)..

Problem

The energy efficiency of a building is determined by the PE (primary energy) parameter, expressed in kWh/m² per year. Since 2014, maximum PE in Poland has been 105, from 2017 EP=85, and from 2021 EP=65*. Developers in Poland face the difficult task of reducing the building's energy consumption as required by legislation while also under significant price pressure from buyers.

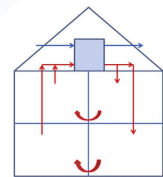
Planned Energy Classes for Buildings



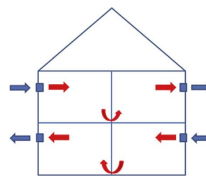
*<https://www.gov.pl/web/climate/energy-policy-of-poland-unt-2040-epp2040>

Solution

Heat recovery can reduce the primary energy demand of a building by up to 20%. The cost of centralized heat recovery is 250 PLN/m², and for decentralized systems, it is 135 PLN/m².



Centralized Heat Recovery



Decentralized Heat Recovery

Innovation of NanoSci

Using our patented technology, we have developed a device based on the most common design of decentralized heat recovery ventilators, adding an air purification function. For residents of large cities, this means cost of energy savings (approximately €150 for a 60 m² apartment per year) while also ensuring clean air in their apartments, less street noise, and constant access to oxygen. This is a radical innovation in HRV product lines worldwide.

What our clients are saying about the new EPDB directive

„Will the directive revolutionize thinking about real estate valuation by classifying buildings from A to G and emphasizing energy efficiency and emissions?”

“As a result of the implementation of this legislation, new buildings that comply with the directive will be significantly better products than those currently on the market – not only the old, unmodernized ones, but even those that are relatively young, from five to ten years ago, or even being completed now. New buildings will be valued much higher. This is a very similar scenario to what we experienced in the office building market. Ten to fifteen years ago in Poland, environmental certification was something new, and funds buying office buildings at that time paid attention to whether the building was certified or not, which affected its valuation. Today, a fund essentially disregards buildings without certification and looks at the level of certification. I think it will be similar with multifamily residential buildings. The market value of buildings that comply with EU legislation will be far higher than the rest”

Source: <https://www.rp.pl/>

Artur Leszczyński,
Director of Innovation at Skanska
Residential Development Poland



NANOSCI

Urgent Regulatory & Market Pressure on Residential Developers



1. Stricter Energy Efficiency Standards and Regulations (2024)

- **Zero Emissions Requirement:** The EU has adopted rules requiring all new buildings to be zero-emission by 2030, significantly raising the bar for energy performance.¹
- **Mandatory Energy Classes:** From January 2024, all buildings in the EU must meet new energy efficiency standards, classified from A (highest efficiency) to G (lowest efficiency)² as mandated by the Energy Performance of Buildings Directive (EU/2024/1275).³
- **The Energy Performance Certificates (EPCs) system** will be updated by 2026 as set by the revised directive. Higher EPC ratings will be achieved through the adoption of advanced technologies and sustainable building practices. Similar to energy classes for household appliances, EPCs help buyers make informed decisions and encourage developers to prioritize energy efficiency.



2. Objectives of the New Regulations:

- **Reduction of Energy Consumption and CO2 Emissions:** Decreasing energy demand and limiting greenhouse gas emissions.⁴
- **Increasing the Number of High-Energy-Efficiency Buildings:** Promoting buildings with A and B energy classes.



3. High Compliance Costs:

- **Advanced Technology Integration:** Compliance requires investments in modern materials and construction technologies: integrating advanced HVAC systems, renewable energy sources, and smart technologies.
- **Increased Project Costs:** Higher design and construction costs in compliance with new standards.

Sources:

1 <https://www.esatoday.com>
2 <https://proizlacje.pl/>
3 <https://energy.ec.europa.eu>

4 <https://www.dexma.com/>
5 <https://www.knightfrank.com>
6 <https://eur-lex.europa.eu/eli/dir/2024/1275/oj>
7 <https://www.eea.europa.eu/>



4. Market and Competitive Pressures

- **Consumer Demand:** Growing demand for sustainable, high-efficiency buildings from environmentally conscious consumers pressures developers to meet higher standards quickly. Over 80% of new homebuyers consider energy efficiency an important factor.⁵
- **Higher Market Value of Properties:** Buildings with higher energy classes, as reflected in EPCs, are more attractive to buyers, as they demand reduced energy bills.
- **Regulatory Compliance:** Failure to comply with these stringent regulations can result in financial penalties and loss of market competitiveness, making timely and effective compliance crucial.



5. Health and Wellbeing Focus

- **Indoor Air Quality:** New regulations emphasize improving indoor air quality, which is critical for the health and wellbeing of occupants. This includes better ventilation and air purification systems⁶. This is crucial as air pollution is a major factor contributing to respiratory diseases in Europe⁷.

CONCLUSION

Residential developers face mounting challenges from stringent EU energy efficiency regulations, necessitating significant financial and technological investments. The revised Energy Performance of Buildings Directive (EU/2024/1275) and Energy Efficiency Directive (EU/2023/1791) set ambitious targets, including the requirement for all new buildings to be zero emissions by 2030. These directives underscore the urgent need for innovative solutions to achieve compliance, enhance indoor air quality, and maintain competitiveness in an increasingly demanding market.

The substantial investments required to meet these new standards highlight a critical opportunity for cost-friendly solutions that address both energy efficiency and regulatory compliance, positioning developers to succeed in a rapidly evolving real estate landscape.

A Costly Environmental Problem Here and Now

Low air quality in multi-family housing in cities:



Destroys health

- a year in Warsaw equals the effect of smoking 1200 cigarettes*;
- harmful gases (NO_x, SO_x), allergens, dust get into apartments



Depletes vitality

- excess CO₂ in apartments causes apathy, fatigue, poor sleep



Increases bills

- opening a window cools down the apartment, dries out the air

Why is this still not solved?



High costs of central heat recovery ventilation (EUR 5k per flat)

- supply air ducts require 30 cm below the ceiling (for 10 floors, that's a new 3m high level)



Barriers

- related to the ownership of ventilation ducts (developers do not want to be responsible for pollution in privately owned parts)



- window ventilators and home purifiers are only **makeshift solutions** (cold, polluted air still enters the apartments)

*Source <https://alarmsmogowy.pl/smog-w-warszawie/>

Solution: (almost) here and now:

DECENTRALIZED HEAT RECOVERY; IN-WALL-MOUNTED:
PHOTOCATALYTIC CERAMIC ENERGY REGENERATOR
SUPPLYING PURIFIED AND HEATED AIR IN REAL-TIME (PATENT-PENDING)



Thermal energy recovery

- huge energy savings
(app. € 150 for 60 m² apartment/year)



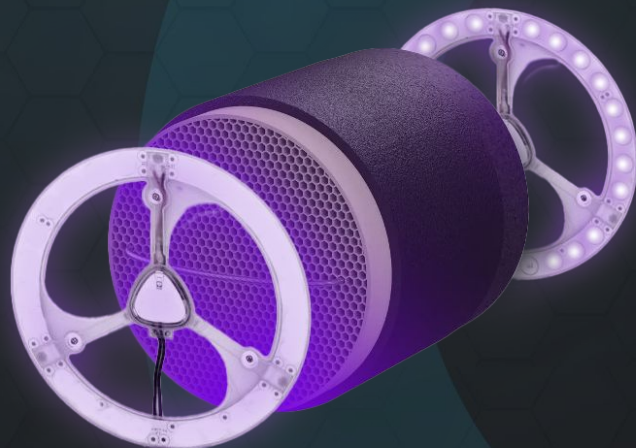
Fresh air in the apartment without opening the window: no smog, cold, or noise



End of excess CO₂ problems in apartments: better focus, mood and sleep

The residential developer gains:

- improved energy efficiency of the building
- reduction of ventilation costs
- enhanced reputation for sustainability



So obvious & yet **so novel!**

Heat exchanger with patented NanoSci Photocatalytic Engine® technology, providing:

- Device sanitization
- Air pollution removal

Increased energy efficiency:

- Learning algorithms responsible for controlling the fan and photocatalytic engine
- Algorithms utilize:
 - Data from the ventilator's sensors
 - Data aggregated in the cloud from all installed units

No-brainer status **provided by:**



Wireless synchronization of device operation

and customization of operating parameters to suit the specifics of each location



Discreet, stylish design

- Neutral appearance of the air vent, which can be painted to match wall colour
- Aesthetic external vent cover on the building facade (no streaking problems) or a grille hidden in the window recess



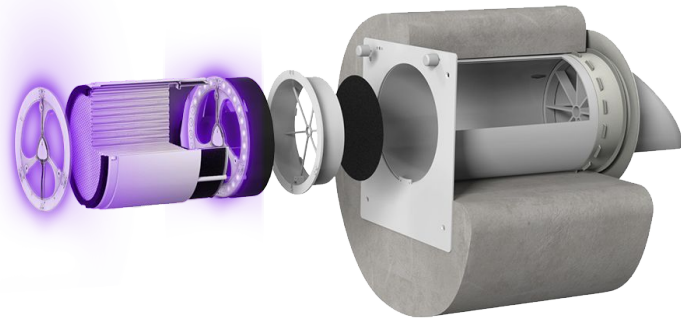
User-friendly mobile app for:

- Managing device operation
- Ordering filters (additional source of ARR)
- Diagnosing and troubleshooting

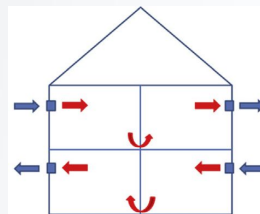


Easy installation and maintenance

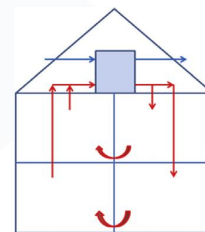
taking into account the construction and use specifics in multi-family buildings.



Heat Recovery Ventilation (HRV) comparison



DECENTRALISED (DV)

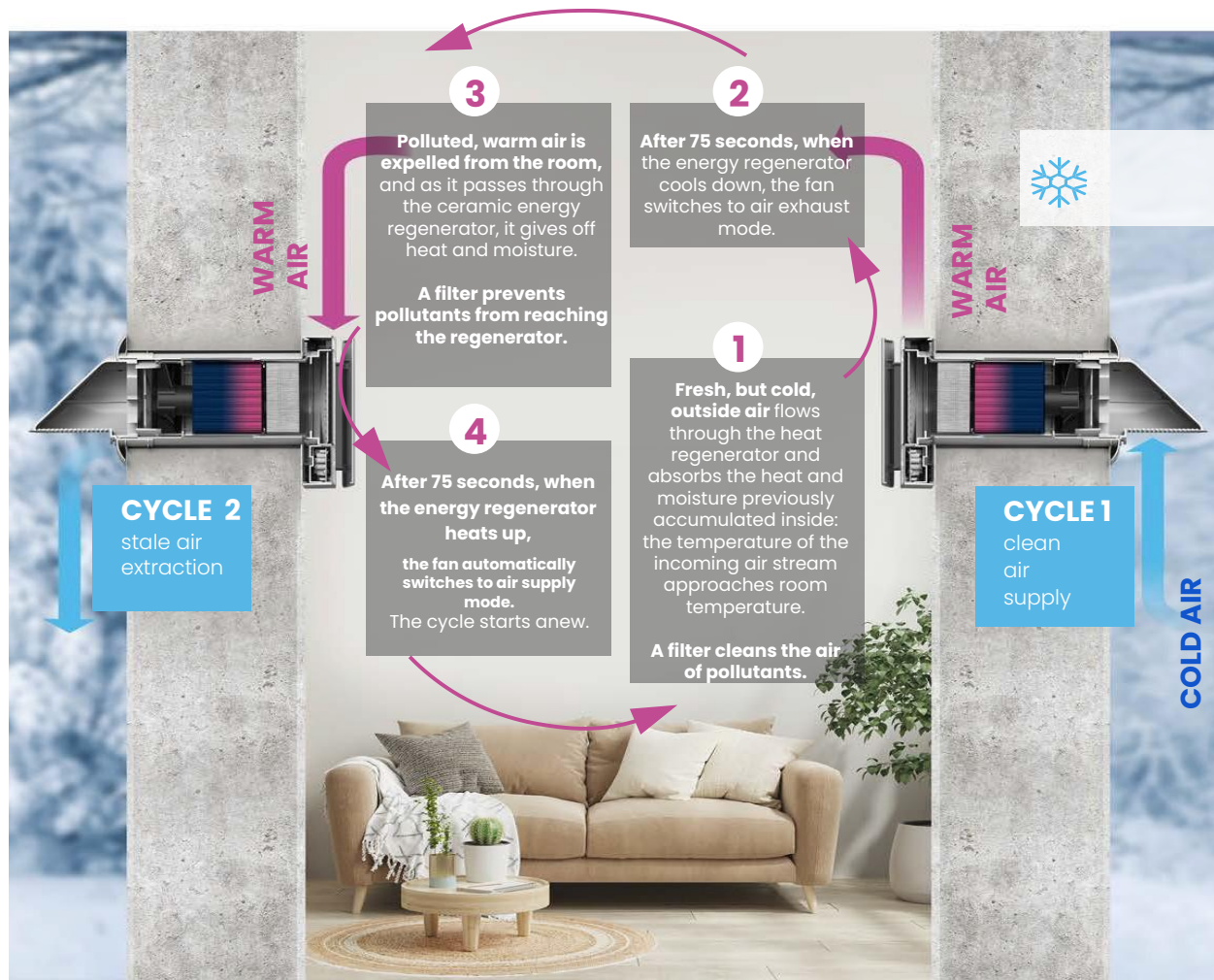


CENTRALISED (CV)

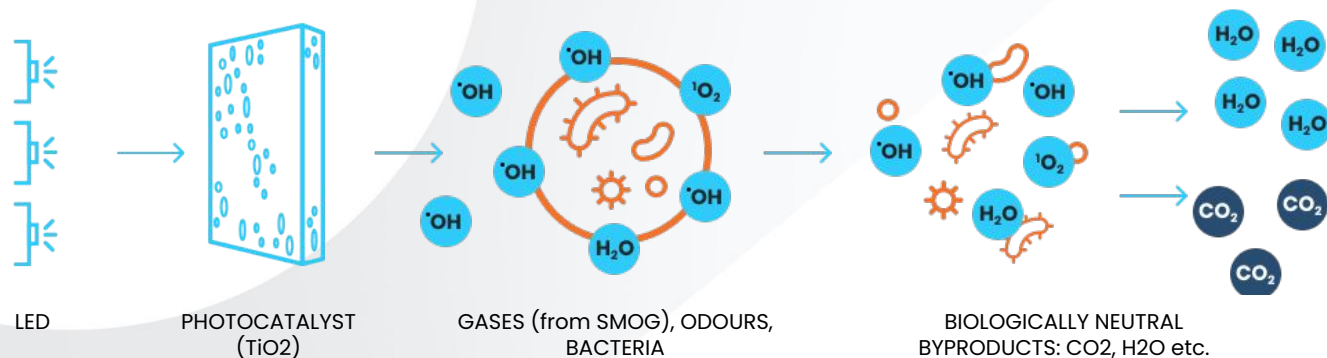
ENERGY CONSUMPTION (FAN)	0.22Wh/m ³ (+/-0.1)	0.475Wh/m ³ (+/-0.37)
MAXIMUM HEAT RECOVERY EFFICIENCY	90%	98%
MEASURED HEAT RECOVERY EFFICIENCY	70% (+/-17%)	65% (+/-23%)
SYSTEM COST (NET)	135 zł/ m ²	255 zł/m ²
COST DIFFERENCE	- 47%	+ 88%

Source: Field tests of centralized and decentralized ventilation units in residential buildings – Specific fan power, heat recovery efficiency, shortcuts and volume flow unbalances [Alexander Merzkirch, Stefan Maas, Frank Scholzen, Daniele Waldmann, University of Luxembourg, Rue Coudenhove-Kalergi 6, Luxembourg]*

System of air circulation and purification



Photocatalysis: single tech to prevent air pollution crisis



What is the application of photocatalysis?

Photocatalysis is successfully used to remove from the air:

- **Gases** (e.g. smog components such as sulfur dioxide, nitrogen oxides and carbon monoxide)
- **Volatile organic and inorganic compounds**
- **Unpleasant odors** (e.g. cigarette smoke)
- **Pathogens** (viruses, bacteria and/or fungal spores)



Additional advantages:

- does not require the use of filters (financial and procedural savings)
- low power costs (120W for 150 m³)
- durability of continuous operation (min. 5 years)

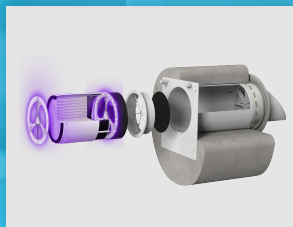
Patents that cover the entire value chain



2 PATENTS FOR
PHOTOCATALYTIC
CERAMIC LAYERS



PATENTED,
TiO₂ NANOTUBES
SHEET



PATENT-PENDING
PHOTOCATALYTIC
IN-WALL HEAT
RECOVERY
VENTILATION
(PCAT-HRV)

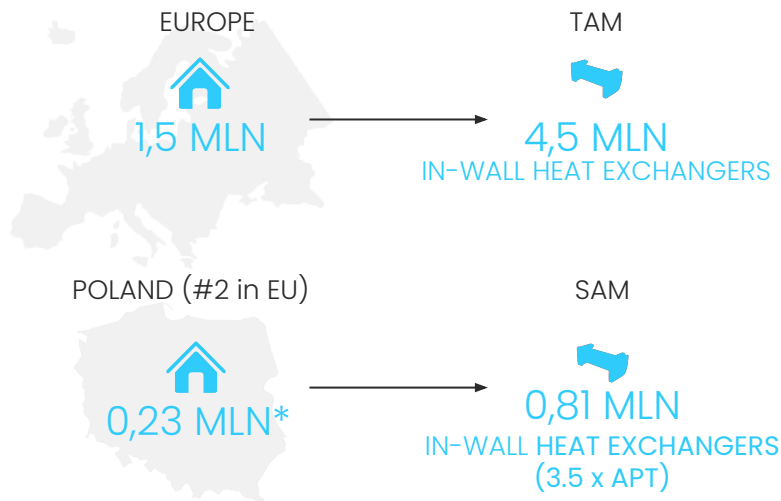


Our patents protect us from both sides of technology implementation by ourselves and our customers:

- **Raw material** (photocatalytic ceramic layers, the heart of the technology)
- **End-device** (photocatalytic hrv; we are supported by acquired 'freedom to operate')

Heated market waiting to be supported

NEW APARTMENTS BUILT (2022)



SALES TARGET FOR 2026

EXCHANGERS FOR **5K APARTMENTS IN PL** (<2% OF SAM)

REVENUE 2026

€8,1 MLN (€465 X 3.5 PCS. X 5000 FLATS)

POTENTIAL PILOT PARTNERS

NOHO
INVESTMENT

SKANSKA

MURAPOL

Number of apartments completed in Poland over the years

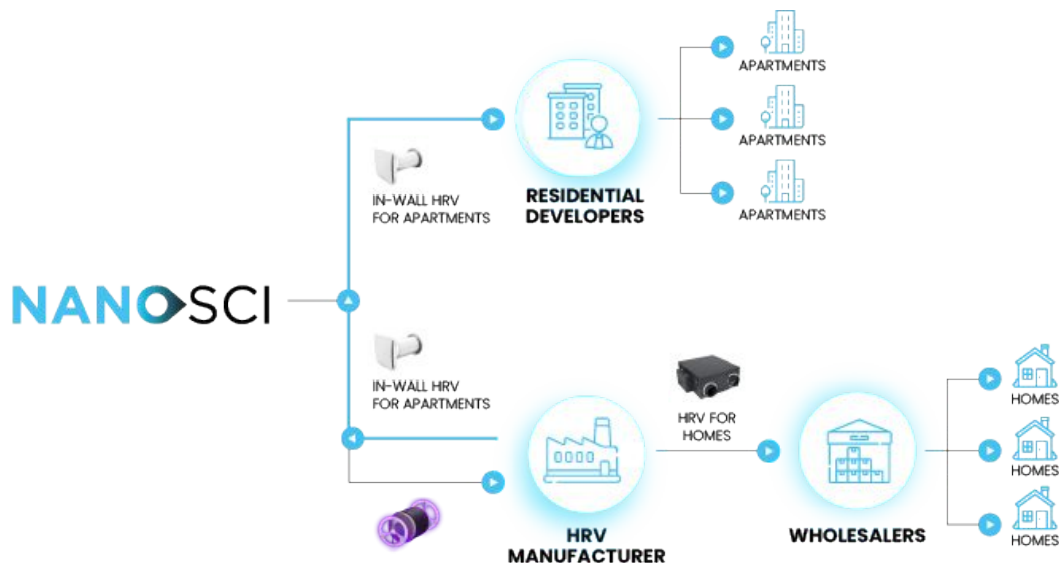


* Source:

<https://stat.gov.pl/obszary-tematyczne/przemysl-budownictwo-srodki-trwale/budownictwo/budownictwo-w-2022-roku,13,17.html>

NANOSCI

Business model: earning both from the product and from the raw material



Beachhead markets: manufacturers of HRV units who want to use our technology to upgrade their products and win the global HRV market. Their distribution model is mostly B2B wholesale, and the final products are targeted for use by customers in their homes.

Scale-up market: Sales of Nanosci HRV devices to real estate developers in Poland and then across Europe. Currently, Polish residential developers do not invest in any (de)centralized heat recovery ventilation systems due to the reasons mentioned earlier.

End-game: Establishing a new worldwide standard in HRV devices using our technology: both in-wall and regular HRV/ERV systems. The NanoSci™ logo will be on every device sold by various manufacturers, similar to Intel Inside™ or GORE-TEX™.

First customers



The Founding Task Force

ACKNOWLEDGED SCIENTISTS, HACKERS & ENTREPRENEURS

R&D

STRATEGY & FUNDRAISING

TECHNOLOGY EFFICIENCY

ELECTRONICS & SOFTWARE

SALES & MARKETING



prof. dr hab. inż.
Adriana Zaleska-Medynska
**CTO | DIRECTOR OF DANIEL
FAHRENHEIT ASSOCIATION OF
UNIVERSITIES IN GDAŃSK**



Adam Kądziała
CEO



dr inż. Paweł Mazierski
TECHNOLOGIST



Bartosz Sroka
APPLICATION ENGINEER



Radek Mischczak
COO







**OUR FOUNDING TEAM IS STRENGTHENED BY THE TEAM
OF 5 SCIENTISTS WORKING IN OUR LABORATORY IN GDAŃSK.**

Alternative methods of air purification.... are useless

OUR PATENT-PENDING PHOTOCATALYTIC ENGINE FOR HRV OFFERS AN UNBEATABLE COST/QUALITY RATIO COMPARED TO CURRENTLY AVAILABLE AIR PURIFICATION TECHNOLOGIES.

MOREOVER, THOSE TECHNOLOGIES ARE NOT APPLICABLE DUE TO THEIR SIZE AND PRESSURE DROP IN IN-WALL HRV DEVICES.

THUS, WE ARE INTRODUCING A COMPLETELY NEW, DISRUPTIVE LINE OF IN-WALL DEVICES WITH AN AIR-PURIFICATION COMPONENT. BOTH THE MATERIAL AND ITS APPLICATION IN HRV'S ARE PROTECTED BY OUR PATENTS.

	 NANOSCI PHOTOCATALYTIC ENGINE	 UVC	 HEPA	 ACTIVE CARBON
AIR DISINFECTION	●	●	●	●
REMOVAL OF GASEOUS POLLUTANTS	●	●	●	●
REMOVAL OF PARTICULATE POLLUTANTS	●	●	●	●
ENERGY EFFICIENCY	●	●	●	●
LIFETIME / REPLACEMENT NECESSITY	●	●	●	●
EASE OF APPLICATION	●	●	●	●
COST OF DEVICES	●	●	●	●

Competitors-turned-clients: HRV manufacturers

POLISH DISTRIBUTION



EUROPEAN MANUFACTURERS



CHINESE EXPORTERS



NONE OF THESE COMPANIES, **NOT EVEN THE MOST INNOVATIVE LIKE GETAIR, HAVE COME UP WITH AN EFFECTIVE WAY TO PURIFY AIR.**

AIR FILTERS (LIKE HEPA) HAVE TOO MUCH PRESSURE LOSS TO BE USED IN IN-WALL HRV SYSTEMS.

THEREFORE, THEY ARE A PERFECT FIT TO IMPLEMENT OUR NEW STANDARD OF AIR PURIFICATION HRVS IN THEIR PRODUCT LINES.
WITH THE NANOSCI-INSIDE MODEL, WE COVER THE ENTIRE MARKET OF HRV MANUFACTURERS.

Roadmap pt. 1: results achieved so far

	2023												2024												2025												2026				
Key results / activities	IX	X	XI	XII	I	II	III	IV	V	VI	VII	VII I	IX	X	XI	XII	I	II	III	IV	V	VI	VII	VII I	IX	X	XI	XII	I	II	III	IV									
	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25									
PRODUCT DISCOVERY																																									
Literature analysis		●	●	●	●	●																																			
Market research of decentralized recuperators in Europe				●	●	●	●	●	●																																
Freedom to operate analysis					●	●																																			
Development of preliminary business model						●	●	●																																	
Effectiveness test of ceramic core coating								●																																	
Development of the first prototype (POC)							●																																		
Submitting patent application (EPO)									●																																
Testing of preliminary business model						●	●	●	●	●	●	●																													
SKANSKA: PILOT IMPLEMENTATION																																									
Securing an internal project sponsor				●	●	●	●	●																																	
Presentation of the project to decision-makers at Skanska headquarters								●																																	
Preparation of preliminary project outline							●	●																																	
Preparation of project Q&A documentation							●	●	●																																
Obtaining project implementation approval								●																																	
Signing the letter of intent							●																																		
Energy efficiency analysis of the solution by an external entity designated by Skanska (JW-A)									●	●																															

Roadmap pt. 2: Skanska Pilot next moves

Key results / activities	2023				2024												2025												2026			
	IX	X	XI	XII	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	I	II	III	IV
	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Technical compliance analysis by an external entity designated by Skanska (Profen)																																
Finalizing the project scope and budget																																
Signing the project implementation agreement																																
Organization of a product discovery workshop with Skanska																																
Design of project media/PR communication																																
Development of Skanska’s value proposition for the end customer (workshop organization)																																
Organization of focus group studies with the end customer																																
Organization of survey research with the end customer																																
Development of functional requirements for the product																																
Obtaining production cost estimates for hardware (including preparation)																																
Creation of a mobile application for product operation																																
Installation of pilot units in 3 Skanska residential units																																
Product adaptation based on pilot data																																
Signing the supply agreement																																
Execution of the first delivery																																
Execution of PR campaign, testimonials, etc.																																

Roadmap pt. 3: Scaling sales to other clients

[illegible]

Financial forecast

PRODUCT PRICING

- HRV UNIT € 460
- FILTERS FOR HRV € 14 / set (per quarter)
- PHOTOCATALYTIC CUBES € 14-16 (order dependent)

MARGIN ON SALES

- HRV UNIT 65%-70%
- FILTERS FOR HRV 20%
- PHOTOCATALYTIC CUBES 34-71%

SCALABILITY POTENTIAL

- creating decentralised ventilation market for multi-family residential buildings in Poland (sales at developers)
- developer returns with orders for new investments.
- reselling particle filters set (14€/ 3 months) as a source of ARR

UPSIDE SALES

developers outside Poland (not included in forecast; target: 1% of EU)

UPCASE

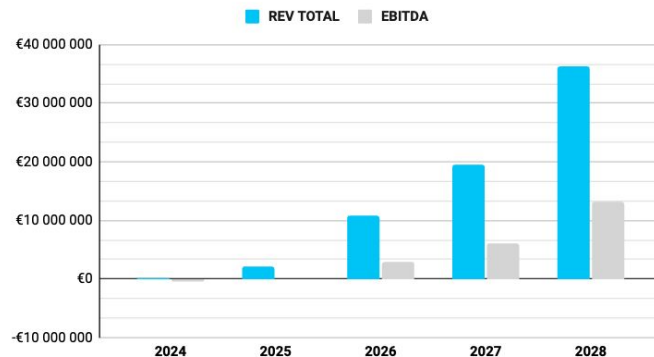
selling photocatalytic cubes / license for material to other manufacturers of HRV's (targeted at residential housing / apartments worldwide)

KEY TARGETS

- securing residential apartments market in Poland by providing new market standard of ventilation, next: CEE
- becoming main supplier of photocatalytic material (cubes) for other manufacturers in EU



DECENTRALISED HRV	2024	2025	2026	2027	2028
CUSTOMERS	0	1	11	10	20
APARTMENTS		500	5 000	8 300	15 800
UNITS SOLD	0	2 252	17 500	29 050	55 300
FILTERS SOLD	0	2 252	19 752	48 802	104 102
- REV: units sold	€0	€1 035 402	€8 045 977	€13 356 322	€25 425 287
- REV: replaceable filters (ARR)	€0	€124 248	€871 812	€2 154 019	€4 594 847
GROSS MARGIN HRV	€0	€724 782	€5 632 184	€9 349 425	€17 797 701
	0	63%	63%	60%	59%
PHOTOCATALYTIC CUBES					
CUSTOMERS	3	6	5	11	20
OUTPUT: CUBES MANUFACTURED	6 950	63 300	128 000	276 000	436 000
REV: CUBES	€111 839	€954 828	€1 829 885	€3 958 621	€6 280 460
GROSS MARGIN CUBES	€38 669	€378 372	€851 402	€2 609 821	€4 346 299
	€0	€0	€0	€1	€1
OPEX TOTAL	€528 114	€1 083 205	€3 463 977	€5 898 762	€8 919 002
REV TOTAL	€111 839	€2 114 478	€10 747 674	€19 468 962	€36 300 594
EBITDA	-€489 446	€19 949	€3 019 609	€6 060 484	€13 224 998
EBITDA margin %	-438%	1%	28%	31%	36%

FINANCIAL FORECAST: REV & EBITDA



The fuel for innovation

WE ARE LOOKING FOR A DEDICATED PARTNER **TO SUPPORT US ON OUR QUEST TO BE A LEADING TECHNOLOGICAL PROVIDER** OF PHOTOCATALYTIC MATERIALS & HRV'S DEVICES WORLDWIDE.

ROUND	SELF FUNDED JAN 2019	PRE-SEED ROUND #1 OCT 2021	PRE-SEED ROUND #2 DEC 2023	SEED ROUND NOV 2024 (PENDING)
FUNDING TYPE	€50K GRANT	€250K VC	€ 550K VC	€1,2 MLN VC
FOUNDERS CAP	100%	87%	77%	65%
GOAL	POP	MATERIAL MVP	NEW PRODUCTS DEVELOPMENT	HRV PRODUCT LAUNCH & SALES
KEY DELIVERABLES	<div><ul style="list-style-type: none">- gathering the necessary team of scientists- acquiring necessary licences and patents- first commercial successful implementation: pilot with Solaris Bus and Coach (delivery of air purifiers for bus driver's cabins)</div>	<div><ul style="list-style-type: none">- fine-tuning of the technology- improving scalability of production- designing own laboratory- final confirmation on effectiveness against COVID-19 in the air- product (layers) starts being commercialized- new patent pending: Hydrogen generation in photocatalytic reaction- establishing cooperation with manufacturing companies</div> <div></div>	<div><p>Prototype Development: Finalize a functional HRV prototype with NanoSci Photocatalytic Engine®.</p><p>Market Analysis: Conduct market research and develop a strategic entry plan.</p><p>Supply Chain Setup: Establish manufacturing partnerships and streamline supply logistics.</p></div> <div></div>	<div><ul style="list-style-type: none">• HRV pilots setup• HRV product launch• Scaling sales of materials to at least 6 regular customers (REV € 1 MLN in 2025)• Securing first contracts for HRV's for 2025+• IP Strategy: Implement measures to protect patents and trademarks.</div>

Join those supporting Polish science and business in saving the planet.

SEED ROUND | NOV 2024

ROUND SIZE € 1,2 MLN VC

PRE-MONEY € 6 MLN

TICKETS € 500 K+

KEY DELIVERABLES

- HRV product launch
- HRV pilots setup
- scaling sales of materials



NANOSCI

NANOSCI SP. Z O.O. UL. ŻURAWIA 43, 00-680
WARSAW | POLAND

KRS: 0000862082,
VAT-UE: PL8982260533



Adam Kądziela | CEO

AK@NANOSCI.PL
+48 506 120 883



Radek Mischczak | COO

RM@NANOSCI.PL
+48 502 642 894

