sVTOL and eVTOL technologies in Romania: Assessing awareness, concerns, and adoption potential in smart urban mobility

Horia-Daniel ȘTEFĂNESCU,
National Defence University 'Carol I', Bucharest, Romania
horiastefanescu26@gmail.com

Ligia NICULAE,
University of Bucharest, Bucharest, Romania
ligia.niculae@gmail.com

Abstract
The advancement of smart urban mobility solutions such as Short Vertical Take-Off and Landing (sVTOL) and Electric Vertical Take-Off and Landing (eVTOL) technologies presents transformative opportunities for modern cities, as the concentration of the world's population continues to shift from rural areas to urban centers. However, the acceptance and openness of the general public toward these innovations are crucial for their successful implementation. As the European Union places a significant focus on smart cities and on urban air mobility, this paper investigates the perception and level of knowledge of Romanian citizens' of sVTOL and eVTOL technologies. Using a questionnaire-based survey, this study assesses the level of awareness, perceived benefits, and concerns associated with smart urban mobility technologies in Romania. The primary objective is to evaluate not only the level of knowledge on fundamental aspects of air mobility and emerging technologies but also to gauge the potential interest in adopting such technologies. The research was conducted online across Romania to capture diverse perspectives.The findings of this study reveal a general reluctance towards emerging air mobility technologies, primarily due to concerns about safety, the challenges of implementing such innovations in Romania, and their perceived limited impact. Additionally, sVTOL and eVTOL technologies are often viewed as more appropriate for search and rescue operations in hard-to-reach areas, rather than for widespread urban use. This study is part of broader research on the feasibility of sVTOL and eVTOL as viable components of Romania's future urban air mobility ecosystem, it provides valuable insights into the public's readiness to embrace these innovations and highlights areas where public perception may need to be addressed to foster adoption.

Keywords: smart cities, air mobility, urban innovation, disruptive technologies.

1. Introduction

Between November 1st to November 27th, 2024, the stock of Archer Aviation, Inc., and Joby Aviation, Inc. foresaw a price increase of 146.34% [1] and 56.86% [2]. The two are considered the main companies in charge of developing cutting-edge electric vertical take-off and landing aircraft. The advancement in their design and manufacture was doubled by the recent news on the Microsoft Flight Simulator 2024, which includes the Joby eVTOL [3], the construction of the first vertiport in Dubai [4], and purchase orders from Japan up to $500M, [5] proving the growing interest into developing (smart) urban air mobility as a transformative shift for congested urban environments. The recent technological developments prove the eVTOL revolution underlined by Mikhail Shubov [6] is already rapidly advancing and will become comparable with the automotive revolution [6].

Yet, alternative air transportation is not something new; inventors have paid attention to this field since the early 20th century when the concept of *plane cars* [7] started to emerge. Urbanization, seen as a key feature of human development, foresaw an intensified process

in the past decades and is still rising, proving the need to look at the current society through different lenses that will allow optimization of day-to-day life.

As the global population increasingly shifts towards the urban center, cities face new challenges like overcrowding, environmental degradation, traffic congestion, limited housing, and, last but not least, the need to pay closer attention to resource management. In front of these challenges, the concept of *smart city* appears triggering questions about cutting-edge technology (Artificial Intelligence), data analytics (Machine Learning), better connectivity (High-Altitude Pseudo Satellites), and sustainable infrastructure as a need to transform urban areas into a more efficient, and resilient spaces.

Hence the concept of smart cities is not new [8], but it started to gain a lot of attention since the Sustainable Development Goals were established by the United Nations in 2015. As a smart city is roughly put a re-analysis of what we knew and understood in terms of urbanization, transportation, and interconnectivity, the attention toward sustainable solutions is becoming a key feature. By far, smart cities are "a revolutionary approach to urban development and planning" [9]. Songdo [10] (South Korea) and Masdar City [11] (UAE) are examples of smart cities where everything is built from scratch with advanced technology. Yet, until now no clear analysis of the negative effects is associated with smart cities [12] even though all major cities pay attention to implementing new technologies that will facilitate easier access to all citizens - Singapore, Dubai, and Toronto are just a few cities that have embraced the vision of smart cities. Singapore, for example, intends to become the "world's first smart nation" [13] that will use all technological advancements to improve the quality of life [13]. In other words, there is a connection between smart city and smart citizens, as Deepak Kumar [14] underlined in his article. More to this, this connection becomes essential in a world characterized by complexity and where adaptability is a trigger for competitive advantage. Thus, the link between accepting the new technology and adapting to new conditions also triggers personal development as "in smart cities, careers need to be considered from a point of view that places a priority on dynamic fit" [15].

In parallel, and as part of smart cities, urban air mobility (UAM) extends this vision, offering innovative solutions to challenges regarding mobility and connectivity. By integrating aerial transportation systems like eVTOL and sVTOL, UAM addresses the demand for faster, cleaner, and more versatile transit. UAM plays a crucial role in reshaping urban landscapes and enhancing accessibility, which is why the link between smart cities and UAM is significant.

Given the above, and knowing that UAM is a more sustainable transportation system for both cargo and passengers in urban congested areas, we decided to conduct a research study on eVTOL and sVTOL technologies to assess their potential adoption in Romania. By looking at the top major cities in Romania, this study tries to bring into discussion the key elements of the adoption and operation of such technologies in this country. It is understood that due to the current limits imposed firstly by the whole UAM system, which still needs to be tested, and secondly due to the concept of eVTOL/sVTOL, such technology will not operate in the next years in this country. Yet, we were interested in analyzing the perception

and the level of knowledge that Romanians currently have on this emerging technology. Taking this into account, we decided to conduct a questionnaire-based research (between October 1st to October 20th, 2024) in 7 major cities in Romania – Bucharest, Iași, Timișoara, Constanța, Brașov, Craiova, and Cluj-Napoca.

Based on the analysis resulting from all the responses obtained through the questionnaire, we concluded that the level of knowledge about UAM and eVTOL/sVTOL is currently limited and that there is a rather reluctance towards emerging air mobility due to safety and its (considered) limited impact on traffic congestion.

2. Literature review

The search for alternative transport measures, especially for air transportation, became a subject of interest, which is why the concepts of air-taxis, and urban air mobility within urban environments started to gain more attention. Adam P. Cohen, Susan A. Shaheen, and Emily M. Farrar [7] underlined that the research into the UAM can be classified into six phases which started with the (1) flying car from the 1910s to 1950s, (2) UAM operations using helicopters from the 1950s to 1980s, (3) re-emergence of the on-demand services starting with 2010, (4) corridor services using VTOL in the 2020s, (5) hub and spoke services, and (6) point-to-point services [7]. Still, further steps need to be completed to have a fully finalized UAM service operational. The main challenges that eVTOL/sVTOL and UAM must navigate through are related to (1) certification and regulation, so the legislative framework, (2) the infrastructure, (3) the operational challenges, (4) the public acceptance of this technology as being a safe and reliable one compared with the *traditional* transportation methods, (5) the training of the pilots who will fly such new flying technologies, (6) the partnership between companies and national/local authorities, and last, but not least (7) the maintenance of the eVTOL/sVTOL at local a level, or local maintenance places like aviation factories.

Despite these challenges, until now several steps have already been overcome, as in recent years, despite the certification of this technology, closer attention was channeled toward legislation and the technical specifications for air taxis. The EU through the European Union Aviation Safety Agency (EASA) set the first rules for air taxis proving the importance of regulation of future urban air transportation. Despite the current trends in the European Union, Romania seems to be lacking interest in this field as, until today, there were no clear steps taken towards UAM and drawing a framework of proposals towards such mobility.

2.1. sVTOL and eVTOL: key characteristics

On June 10th, 1964, The New York Times published the news that an "experimental VTOL […], the Hummingbird, crashed and burned today, killing the pilot" [16]. The Hummingbird, a vertical take-off and landing aircraft designed by Lockheed Corporation in the 60's was one of the first VTOLs designed and unsuccessfully tested for military applications. According to Seth B. Anderson, in the 80's the V/SVTOL aircraft technology was studied for over 25 years [17] proving that the need to design an aircraft that does not need a traditional runway was desired, especially for military purposes. VTOL, in a broad definition, is an aircraft that typically achieves vertical lift using rotors or thrust vectoring

systems, the term being generally used to distinguish it from conventional fixed-wing aircraft that require a horizontal motion for lift-off and landing. Due to the technological developments, VTOL technology opened the door to further developments in aviation, and the recent models underscored that this new technology can be optimized for urban air mobility. As with any other technical developments, eVTOL, namely electric vertical take-off and landing, has emerged as a groundbreaking innovation [18] for advanced air mobility (AAM) where the eVTOL plays a significant role [18]. sVTOL, or the short vertical take-off and vertical landing aircraft differs from an eVTOL in terms of propulsion system, which uses a conventional jet engine, or a hybrid engine, while the eVTOL utilizes electric propulsion [19].

As air taxi refers to the short and medium distances intra-city and inter-city routes, eVTOL and sVTOL prove their efficiency in UAM [20]. Furthermore, knowing the current climate challenges and CO_2 emissions, these aircrafts become an eco-friendly option due to their low level of greenhouse gas emissions. As eVTOL uses electrical propulsion, the level of noise is reduced, making them a better option for urban areas compared with traditional helicopters. More, in the future will be cost-effective as estimates of price fares of $2.25 per mile to $11 per mile [21]. In terms of the sVTOL advantages, due to their configuration, these are versatile for connecting city hubs to outer regions. These can also support heavier payloads and can be used for cargo.

Table 1. Main Characteristics of Top eVTOL and sVTOL Designs and Manufacturers

Manufacturer	Model	Key features
Joby Aviation	Joby eVTOL	Noise level: ~65 dB at hover, ~40 dB during cruise; CO_2 emissions: Zero-emission; Range: ~150 miles /~ 241 km; Speed: 200 mph.; Design: Fixed-wing tilt-rotor for efficiency.
Archer Aviation	Midnight	Noise level: <45 dB during cruise, 65 dB during takeoff/landing CO_2 emissions: Zero-emission; fully electric Range: ~60 miles/~96 km; 20-25 miles/ 32-40 km with minimal charge; Speed: 150 mph Design: Tilt-rotor design optimized for short-range urban flights.
EHang	Ehang 216	Noise level: Moderate (~70 dB); CO_2 emissions: Zero-emission, fully electric; Range: ~22 miles/~35 km maximum range; Speed: 80 mph.; Design: Autonomous drone-like with dual rotors, compact for urban use.
Vertical Aerospace	VX4	Noise level: ~45 dB in cruise CO_2 emissions: Zero-emission, fully electric Range: ~100 miles/~160 km; Speed: 150 mph.; Design: Fixed-wing with four tilt-rotors for lift and efficiency.

Source: [22] [23] [24] [25] [26]

As Table No. 1 shows, the current specifications of eVTOL/sVTOL technology have several advantages and disadvantages. It is worth mentioning that despite being new and taking some time to implement, it also has to be underlined in comparison with traditional transportation.

Table 2. Comparison between traditional transportation and eVTOL

Mode of Transport	Cost	CO_2 Emissions	Key Advantages	Key Dissadvantages
eVTOL	Initially high, low operational	Zero	Fast, bypasses traffic, ideal for urban and regional transport	High infrastructure costs (vertiports), high fare cost (initially), noise level
Train	Moderate per ticket	Low per passanger	Mass transit, reliable over long distances	Expensive infrastructure, fixed routes
Bus (Diesel)	Low per passanger	120-150 g CO_2 / km	Affordable for users, flexible routes	High emissions, traffic dependency
Electric Bus	Moderate initial, low operational	20-30 g CO_2 / km	Suitable for dense urban areas	High battery cost, charging infrastructure required
Electric Car	High initial	Aprox. 50 g CO_2 / km	Zero emissions, suitable for personal use	High battery production, charginf infrastructure
Car (Gasoline)	Moderate initial	120-180 g CO_2 / km	Widely available, suitable for personal use	High emissions, not scalable in urban centers
Subway Treain	High infrastructure	5-10 g CO_2 / km	Efficient for urban transport, avoids traffic, high capacity	Expensible infrastructure and maintenance, limited flexibility
Tram	High for infrastructure	5-15 g CO_2 / km	Clean energy potential, efficient in urban areas	Fixed routes, significant urban planning, high infrastructe costs

Source: The data was collected from public documents [27] [28] [29] [30] [31]

In light of the climate change policies, eVTOL and sVTOL prove their supremacy as the emissions are zero, or close to zero if the sVTOL is powered by a hybrid engine. Buses and personal cars are the most common modes of transportation, a fact also proven by our research conducted in the major cities of Romania, and which are not eco-friendly as their CO_2 emissions is above 120 g CO_2/km.

2.2. Romanian eVTOL skynet project

Despite the fact, that there is limited knowledge on this disruptive technology at a general public level, and thus a close to zero Romanian policy on eVTOL/sVTOL, in Romania steps were made towards designing an eVTOL. Based on the research conducted, Romania has made strides in this emerging field of eVTOL, as only one company, namely Skynet Project SRL proposed a design of eVTOL. The company based in Cluj-Napoca was founded in 2017, and proposed until now two designs for eVTOL – Project Genesys X-1 and Project Genesys X-2.

a) b)

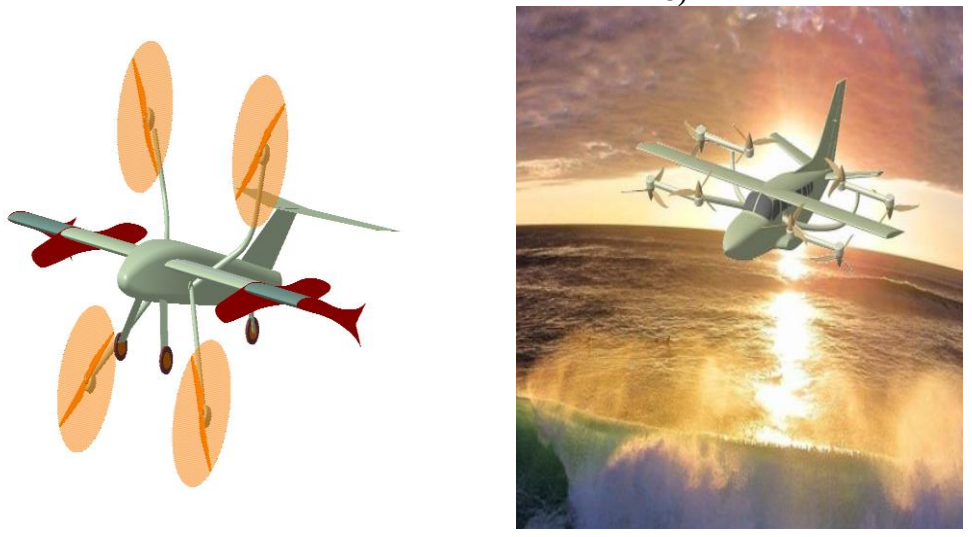


Fig. 1. (a) Genesys X-1; (b) Genesys X-2.
Source: Skynet Project SRL [32] [33]

According to their design, Genesys X-1 is an air cargo eVTOL with four propellers, four electric motors, and can carry a heavy payload over a distance of 100 km [33], while Genesys X-2 has two variants of power source – either fully electric or hybrid, and is designed for passenger transportation [32].

Based on the public records, the company developing the design and specifications of these eVTOLs only created the concept and not the full manufacturing process. Besides this company, no other company was identified in the R&D of eVTOLs, showing that either the field is not yet studied in Romania, or there is limited interest in this technology.

3. The EU legislation *v.* the Romanian legislation: A void to be filled

The EU proves its openness towards the eVTOL aircraft, as the integration of this technology is of real interest. Through the EASA and the European Commission, the EU is paying a lot of attention to the regulatory framework to address not only the legislative aspect, but also safety, sustainability, and urban planning in relation to eVTOL/sVTOLs. In other words, the EU, through EASA was the first to address the legislation of the UAM and eVTOL. Based on the Sustainable and Smart Mobility Strategy [34], the EU

acknowledged the importance of this technology, knowing that through the European Green Deal, [35] the EU wants to cut off 90% of its emissions by 2050.

Under this context, the EU has pioneered global efforts to ensure the safe and sustainable integration of this technology, knowing that most of Europe's greenhouse gas emissions are generated by transportation [36]. The key features of the regulatory development looks at (1) operational standards that align with the EU aviation safety protocols. Furthermore, (2) the EASA's framework is in connection with the European Commission's smart cities initiative. Given this, EASA conducted in 2021 a study into the acceptance of UAM operations [37] showing that 83% of the respondents had a positive attitude towards UAM, and 49% for air taxis. [38]

Further into this, in April 2024 the EU released regulations for the eVTOLs (EU 2024/1111) that will enter/come into force starting May 1st, 2025. [39] This regulation is the most comprehensive one to date and "exclusively targets manned eVTOL aircraft, providing interpretations, supplements, and amendments to all existing regulations concerning airworthiness, operations, and pilot licensing for such eVTOLs" [40]. According to EASA, eVTOL has to comply with certain specifications like (1) piloted VTOLS with 1-2 pilots, (2) more motors and rotors to ensure safety in case of failure, (3) a maximum 9 of nine passengers, (4) safety belts are mandatory, including life jackets and additional safety equipment following the route of the flight, (5) light manufacturing materials, and (6) windows [41].

As the infrastructure is key for UAM, EASA even looked at vertiports as these need to be placed in such a way that their take-off and landing is safe and secure. In other words, EASA made the initial steps into regulating also the vertiports in order to ensure that the trajectory will be clear and safe. Based on their analysis, the solution is a *funnel*-shaped vertiport.

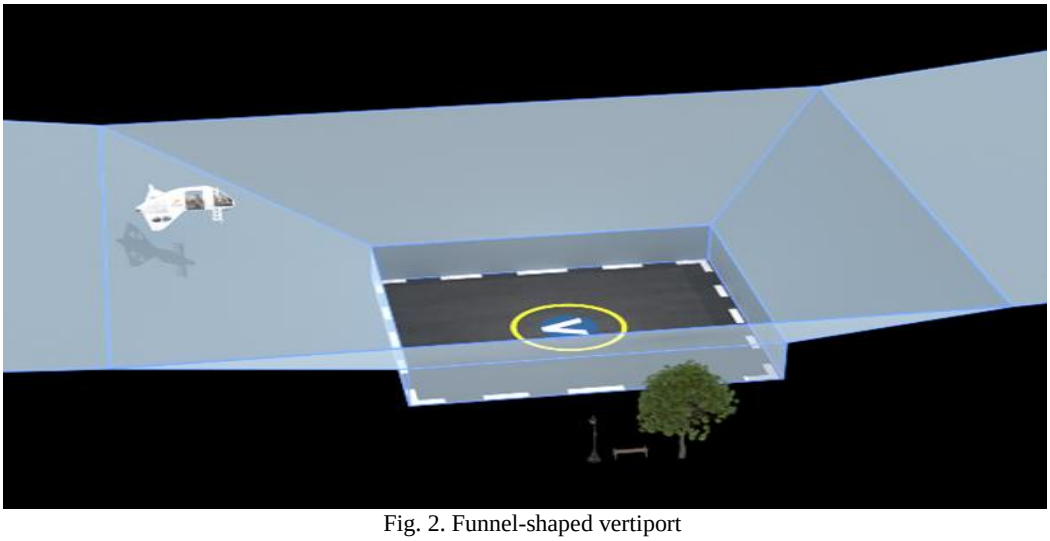


Fig. 2. Funnel-shaped vertiport
Source: EASA, Vertiports in the Urban Environment [42]

This prototype of a vertiport is the starting point for urban planners. This vertiport is designed in such a way as to ensure that the level of noise is reduced, complying with noise abatement regulations, and also that it will ensure the required level of safety [43]. At the same time, this is not the only *accepted* vertiport model; companies manufacturing eVTOL/sVTOL are also developing vertiports. Lilium is such a company that designed a model for an affordable transit option.

Fig. 3. Different vertiport designs
Source: Lilium [44]

As it can be seen, the regulations of the EU are quite advanced, but the main question is where does Romania stand in terms of regulations and projects toward UAM and eVTOL/sVTOL? Up to this date, Romania has not developed a fully autonomous national UAM policy. While some elements show an interest in this technology, Romania stands in line to adopt the EU's regulation. In other words, despite the openness toward adopting this technology, there are still numerous challenges that need to be addressed, one of them being public awareness. Without any question of doubt, public acceptance of UAM and of eVTOL/sVTOL, infrastructure, safety assurance, and last, but not least, a clear legislative framework are essential towards a successful implantation of UAM.

A first step into UAM was made in 2023 when the General Council of the Municipality of Bucharest decided to approve the Protocol of collaboration between the Municipality of Bucharest with "Elie Carafoli" National Institute for Aerospace Research and Development (INCAS) towards UAM [45]. As of today, only conferences and presentations on the UAM were held by INCAS.

Given this, as it can be seen, minor steps were taken by Romania towards UAM and eVTOL/sVTOL, the main issue being the lack of regulations for implementing this new technology.

At the same time, currently, in Romania, there are a few air taxi options, although the current market for such transportation is in its early stages compared with other regions. Helicopter services are available, but the cost for such an option is quite high, mostly used for private, corporate, or VIP transport. Such services are being operated by private companies like Heli Taxi [46] (3-8 passengers), Aero Taxi [47] (which seems to be the same company as Heli Taxi), and Regional Air Services (operating since 1998) [48]. Other companies also tried to enter the Romanian air taxi market, but they failed to become operational, or their license was revoked.

4. Methodology and research design

Having the context as presented in the previous pages, and understanding that we are now living in a globalized and complex society where technology is important, we decided to conduct research into UAM, and eVTOL/SVTOL in Romania, as currently, there is rather limited local academic research into this subject. The main purpose of this research was to identify the level of knowledge, openness, and also limitations towards UAM and eVTOL/SVTOL. From basic online research on UAM, air taxis, eVTOL/sVTOL, it can also be observed that little is written and promoted by the Romanian mainstream media. Given the above, in this research, we decided to take into consideration (1) the preferred mode of transport, (2) the frequency of air treveling, and last but not least (3) the level of knowledge on UAM and the (4) the openness towards sVTOL and eVTOL.

By analyzing the responses to the questionnaire, the main scope was to gain at least a minimum level of understanding of the concept of UAM and, hence the smart cities project. In the past several years, there has been a trend of conspiracy theories about 15-minute cities and general population control. These conspiracy theories on population control were very popular on social media platforms such as TikTok and Telegram, as well as on several Facebook private groups.

Furthermore, knowing that the advent of advanced aerial mobility technologies such as sVTOL and eVTOL has sparked significant interest across industries due to their potential to revolutionize urban transportation - an aspect that can also be observed in the evolution of the stock value of the companies developing these platforms -, reduce carbon emissions, and alleviate traffic congestion, we were interested in observing if Romanian population may accept such technologies, as they are poised to redefine the future of aviation.

Understanding that their feasibility, public acceptance, and technical challenges is essential to facilitating the integration into future transportation systems, we decided to conduct a study on seven major cities in Romania. This research employs an online data collection method, using the snowball effect to reach a wider audience.

4.1. Population overview

The cities targeted in this research are the top major cities in Romania. The arguments for selecting these cities are based on the assumption that they have a higher chance of development and, thus a higher chance of introducing such technologies for the optimization of transportation. Furthermore, their geographical position also covers large areas, thus can help the transport to nearby cities/areas. Based on this and correlated with

the data provided by the Romanian National Institute of Statistics, the following cities were selected:

Table 3. Selection of Cities

City	Population in 2021
Bucharest	1,716,983
Cluj-Napoca	286,598
Iasi	271,692
Constanta	263,707
Timisoara	250,849
Brasov	237,589
Craiova	234,140
Total	**3,261,558**

Source: INS [49]

As can be seen from Table No. 1, the population across these seven cities represents almost 18% of the total population of Romania. As the population is distributed unevenly across these cities, the sampling process must be constructed in such a way as to ensure that each city's population is proportionally represented. By doing this, we can provide an accurate reflection of the overall population and the openness towards the UAM.

4.2. Sampling methodology

In order to determine the sample size, several factors were taken into consideration to ensure that the final sample is representative for the purpose of the research. The first step was to find the exact number of citizens in each of the selected cities. After this data was collected, we decided to use (1) simple random sampling and then (2) stratified sampling.

When *calculating the sample size*, we took into consideration:

- the level of risk of 5% ($\alpha = 5\%$)
- proportional variable is used, p=50%, q=50%
- the level of acceptable margin of error around the sample mean when drawing the confidence level being of 5% (d=5%)
- the standard deviation is estimated to 50% (σ=50%)
- t = 1.96

Based on this, to determine the sample size we applied the following formula:

$$n_0 = \frac{t^2 * p * q}{d^2} \quad (1)$$

$$n_0 = \frac{(1.96)^2 * 0.5 * 0.5}{(0.05)^2} = 384.16 \quad (2)$$

Taking into consideration the uneven distribution of the population across the cities, stratified sampling will be employed to ensure that each city is proportionally represented in the sample. As stratified sampling involves dividing the population into strata (in this case, the cities) and then selecting a proportional number of respondents from each stratum. The formula to determine the number of respondents required from each city is:

$$n_i = \frac{N_i}{N} * n_0 \quad (3)$$

Where:

- n_i *= sample size for city*
- N_i *= population of city*
- N *= total population (3,261,558 million)*
- n_0 *= total sample size (384)*

Based on the above formula, the sample size for each city was calculated and resulted the sample size for each city. The results were rounded to the nearest whole number, resulting in:

Table 4. Sample Size

City	Population in 2021	Proportion of the total population	Sample Size
Bucharest	1,716,983	0.527	202
Cluj-Napoca	286,598	0.088	34
Iasi	271,692	0.083	32
Constanta	263,707	0.081	31
Timisoara	250,849	0.077	30
Brasov	237,589	0.073	28
Craiova	234,140	0.072	27
Total	**3,261,558**		**384**

Knowing that non-response is an inevitable part of any survey-based research, we anticipated a non-response rate of 20%, so, the adjusted sample size was calculated as:

$$n_{adjusted} = \frac{n}{1-Non-Response\ Rate} \quad (4)$$

For a 20% non-response rate:

$$n_{adjusted} = \frac{384}{1-0.20} = 480 \quad (5)$$

This adjustment increases the total sample size to **480 respondents** to ensure enough data is collected after accounting for non-respondents. Proportionally, this adjustment will increase the sample size for each city as follows:

Table 5. Final Sample Size (with non-response)

City	Population in 2021	Initial Sample Size	Final Sample Size
Bucharest	1,716,983	202	252
Cluj-Napoca	286,598	34	42
Iasi	271,692	32	40
Constanta	263,707	31	39
Timisoara	250,849	30	38
Brasov	237,589	28	35
Craiova	234,140	27	34
Total	**3,261,558**	**384**	**480**

Based on the sampling methodology the final sample size is 480. After the distribution of the questionnaire, the final number of respondents was **408**, as it will be seen in the following sections of this paper.

4.3. Questionnaire design

In order to assess the level of awareness, concerns, and openness of Romanians towards UAM, we decided to apply a 16-question questionnaire. Due to the limits imposed, especially due to resources, this questionnaire was snowballed on social media platforms, especially on Facebook groups for the selected cities, and also sent via WhatsApp platform.

When designing the questionnaire, we took into consideration several variables like (1) the preferred mode of transport, (2) the frequency of air treveling, (3) the level of knowledge on UAM, the (4) openness towards sVTOL and eVTOL, and the (5) prospects on considering that UAM is a viable option in Romania.

Starting from the work of Ian Brace [50], the questions were closed, as these are "popular with researchers […] as the responder only has to check the appropriate box and the data are automatically recorded and stored" [50]. Except for 3 questions that had multiple selection possibilities, all the other questions had the option of selecting only one answer. Furthermore, all the questions were mandatory to be answered.

Due to the subject of this research, we have provided additional information on the eVTOL and sVTOL technology so that the respondents become aware of these technologies in case their level of knowledge was limited.

4.4. Data protection of the respondents and of their answers

An important attention was given to the security aspect of the collected answers and personal information provided by the respondents. When filling out the questionnaire, we have advised the respondents that their answers will be used only for independent academic research and that no personal information like e-mail address is collected. Furthermore, we have opted for a platform that allows encrypted password-protected responses.

5. Data analysis on the respondents' profile

The questionnaire was open for responses between October 1st to October 20th, 2024, with the highest response rate on October 16th, 2024.

Table 6. Final Responses

City	Initial Sample Size	Final Sample Size	% of Responses	No. of Responses
Bucharest	202	252	51,47%	210
Cluj-Napoca	34	42	8,82%	36
Iasi	32	40	8,33%	34
Constanta	31	39	7,35%	30
Timisoara	30	38	7,11%	29
Brasov	28	35	6,86%	28
Craiova	27	34	4,67%	19
Other Cities			5,39%	22
Total	**384**	**480**	**100%**	**408**

The total number of questionnaires filled was 408, which is in line with the initial sample size of 384 and the final sample size of 480. It also has to be mentioned that we left the possibility for respondents from other parts/cities of Romania to answer, allowing them to select the option of *other cities.* The number of respondents from other cities was 22, yet still creating a final response rate within the limits between the initial sample and the final sample.

A minus that can be observed and which can be used as an argument against the validity of this research is due to the number of responses from Constanța, Timișoara, and Craiova where there were fewer responses than our initial sample size. Yet, as these differences are not major, we considered that the results of the questionnaire are valid and representative for this independent research.

5.1. The profile of the respondents

Of the 408 respondents, 45,1% were females and 54,9% were males. The highest age percentage was between 35 and 44 (24,5%), and only 1% was above 65. In general, the main respondents were between 25 and 64 years old.

In terms of education, the main percentage was of postgraduates (49%), and the lowest was only junior high graduates (1%). Regarding the 1%, we can mention that all respondents were from Cluj Napoca, and this cannot be correlated with the percentage of respondents under 18 but with the respondents over 65. We have to underline that the percentage of junior high graduates corresponds with the respondents over 65, namely 11.1%.

Regarding their current occupation, 66,7% are employees, 11,8% are business owners/entrepreneurs, 9,8% are students, 9,8% are retired, and 2% mentioned *other*.

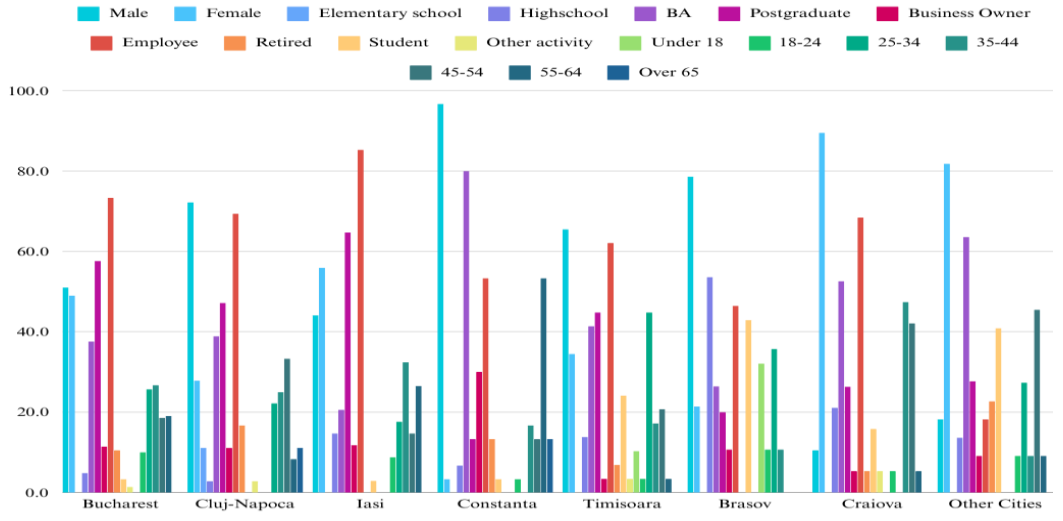


Chart. 1. Detailed profile of the responders

6. Results and interpretation

The main goal of this research was to assess the openness of Romanian people, especially from the selected cities, regarding smart urban mobility, namely UAM, eVTOL and sVTOL, while at the same time trying to understand the main position towards these technologies, knowing that this subject pretty much lacks in mainstream media and the social media is subject to fake news, altered reality, and conspiracy theories.

The first question asked the respondents was about the main transportation method for daily commutes.

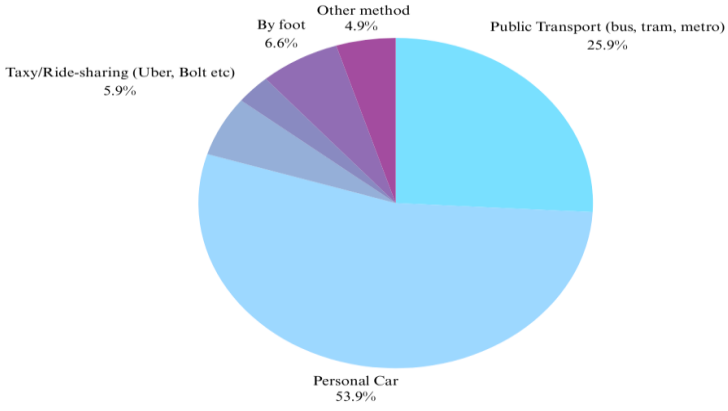


Chart. 2. Question no. 1

As it can be seen, most of the respondents, 54,2%, answered that they used their personal car. The highest percentage is in Timișoara, where 65,5% of respondents answered that they use their cars. On the other hand, in Cluj Napoca, 47,2% have answered that they use public transportation. At the same time, when putting together the car and ride-sharing, we can easily observe that more than 60% of the respondents use this transportation daily.

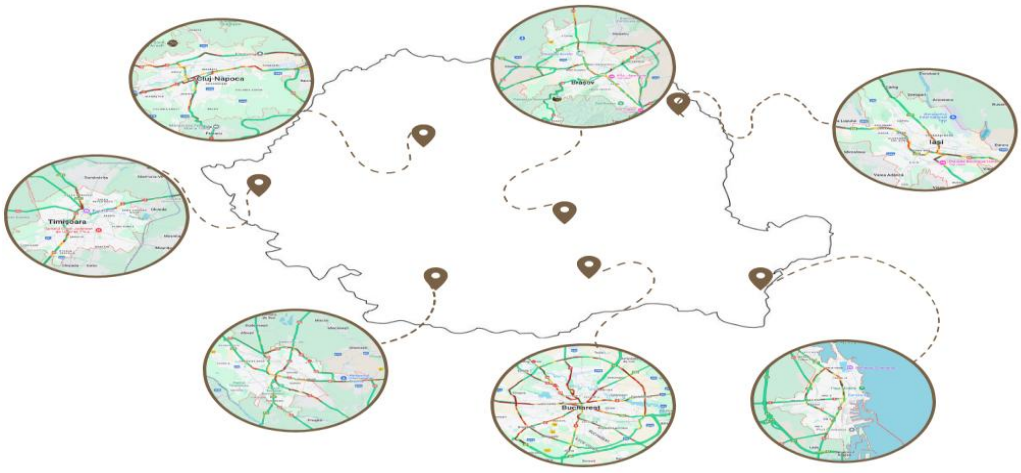


Fig. 4. Live traffic – cities included in the research.
Source: The traffic photos were taken from Google Traffic – on Friday, November 29th, 2024 hours: 16:23 to 16:36

This response is easily linked with the second question of our questionnaire, where we asked about the time spent in traffic where the respondents selected between 1 to 2 hours in traffic. Looking at live traffic from these cities over the past weeks and also on November 29th, 2024 (hours monitored 16:00 to 17:00), it can easily be observed that the traffic in the selected cities is slow, with more time spent in traffic during the morning time (7:30 to 9:45) and after 16:00 to even 19:30 (especially in Bucharest).

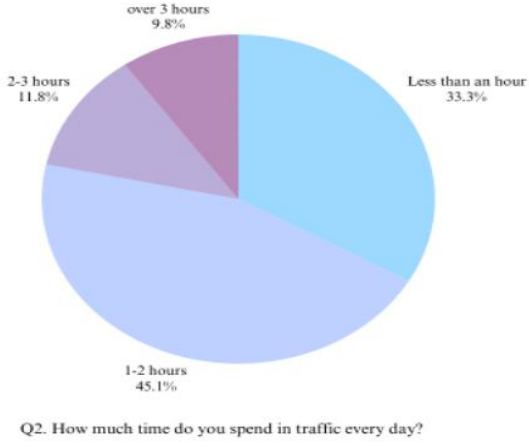


Chart. 3. Question no. 2

When asked about travel by plane, most of the respondents travel 2 to 3 times per year (37,3%), while 15,7% never travel by plane.

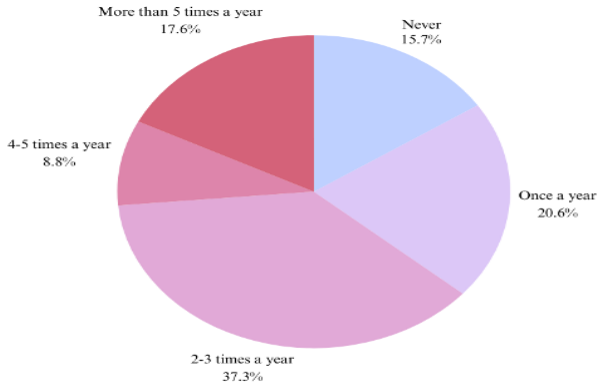


Chart. 4. Question no. 3

In terms of the 17,6% that travel more than 5 times per year, most of the respondents are located in Bucharest (41,7%), followed by Cluj Napoca with 16,7%. In terms of the location of respondents who never travel by plane, these are also from Bucharest (5,1%) followed by Brașov (14,1%), and Timișoara (6,3%).

The reasons for using the plane for travel (question no. 4) are mainly for vacation (73.9% of the options selected), family visits (49,1% as the second option), and emergencies (21,3%). Only 2% selected *business trips* as a third option for plane traveling. More to this, 4,9% mentioned that they do not travel by plane.

For 64,7% of the respondents travel time is very important, while for only 2% is not important at all.

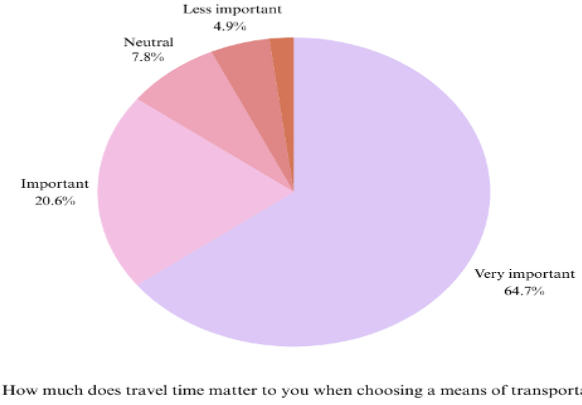


Chart. 5. Question no. 5

The percentage is similar in all the cities included in the research, as for 71% of the respondents from Bucharest is very important, while only in Brașov is less important (42,9%). The percentages presented above go in line with the next question (question no. 6) where safety is the most important aspect when choosing a transport method (39,9%). The second and third options selected by the respondents were comfort and travel time. In other words, the respondents are more inclined towards using their car also as a safety argument.

Starting with question no. 7 the respondents were asked about the main subject of this research, namely the UAM, eVTOL, and sVTOL. Firstly, the respondents needed to select the air transport method they were mostly familiar with. 88,2% mentioned that they are mostly familiar with the airplane, while no one selected eVTOL and sVTOL.

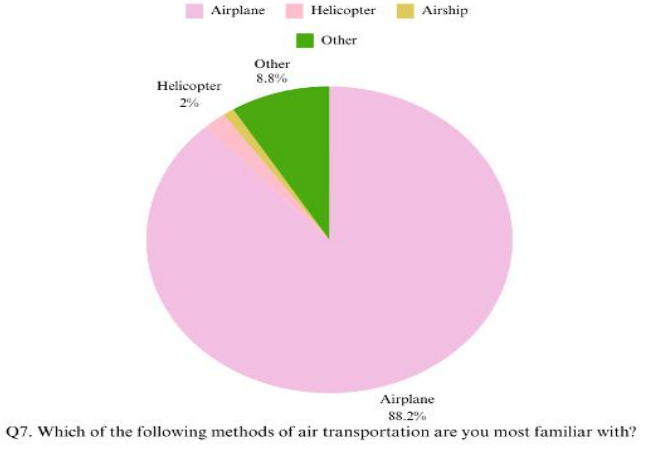
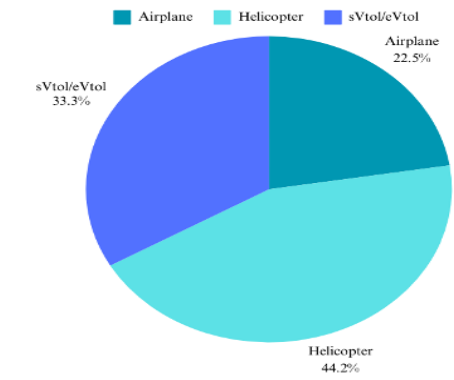


Chart. 6. Question no. 7

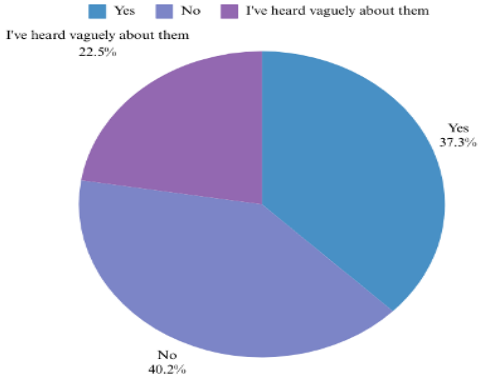
This can also be understandable as the most unsafe method of transportation is considered the helicopter with 44,2%, followed by the eVTOL and sVTOL (33,3%). We can assume that the 33,3% who selected eVTOL and sVTOL as the most unsafe might have opted for this due to a lack of knowledge of this technology, regardless that we have included a slide with the presentation on the key features of eVTOL and sVTOL.



Q8. What do you think is the most unsafe method of transportation?

Chart. 7. Question no. 8

22.5% vaguely heard about the sVTOL/eVTOL technologies, while 40,2% had not heard until the moment of this questionnaire about this technology.



Q9. Have you heard of sVTOL and eVTOL (aerial vertical takeoff and landing) technologies?

Chart. 8. Question no. 9

An interesting analysis of the responses to question no. 9 is related to the answer *vaguely*. It can be observed that the respondents are mostly postgraduates and between 35 and 54 years old, as per Table No. 7. Furthermore, more than 50% of the respondents are currently employees.

Table 7. Description to Question No. 9 – Answer "I have heard vaguely about them"

Answer Vaguely	Bucharest	Cluj-Napoca	Iași	Constanța	Timișoara	Brașov	Craiova	Other Cities
Gender								
Male	54,3%	62,5%%	42,9%	100%	85,7%			
Female	45,7%	37,5%	57,1%		14,3%		100%	100%
Age								
Under 18								
18-24								
25-34	26,1%	37,5%	7,1%		54,1%			
35-44	39,1%	50%	42,9%	100%	28,6%			
45-54	21,7%	12,5%	7,1%		7,1%		50%	50%
55-64	13,1%		42,9%		7,1%		50%	50%
Over 65								
Level of education								
Junior high								
Highschool			28,6%					50%
BA	41,3%	37,5	14,3%	100%	35,7%		50%	50%
Post graduate studies	58,7%	62,5	57,1%		64,3%		50%	
Occupation								
Student								
Employee	73,9%	87,5	78,6%	100%	85,8%		50%	
Business owner	26,1%	12,5	21,4%					
Retired					7,1%			50%
Other					7,1%		50%	50%

This trend continues also when looking at the respondents who have answered that they do not know about this technology. In the case of the answer "no", we can observe that most of the respondents are of age between 35 to 45.

Table 8. Description to Question no. 9 – Answer "NO"

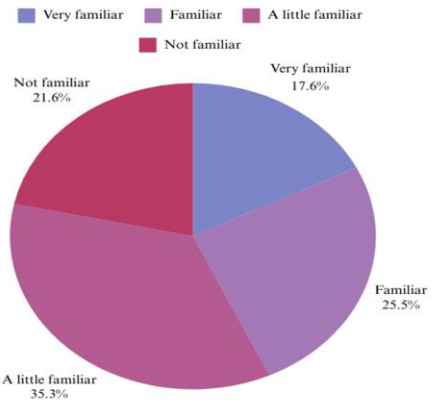
Answer NO	Bucharest	Cluj-Napoca	Iași	Constanța	Timișoara	Brașov	Craiova	Other Cities
Gender								
Male	34,6%	73,3%	18,2%	50%	58,3%	80%	15.4%	22,2%
Female	65,4%	26,7%	81,8%	50%	41,7%	20%	84.6%	77,8%
Age								
Under 18					25%	60%		
18-24	23,1%		18,2%	50%	8,3%	20%	7,7%	11,1%
25-34	25,7%	6,7%	27,3%		16,7%			33,3%
35-44	28,2%	26,7%	18.2%	50%	8,3%	20%	38,5%	11,1%
45-54	19,2%	33,3%	36,4%		41,7%		53,8%	44,4%
55-64	3,8%	6,7%						
Over 65		26,7%						
Level of education								
Junior high		26,7%						
Highschool			50%	100%	33,3%	100%	30,8%	11,8%
BA	41%	53,3%	50%		58,3%		38,5%	70,6%
Post graduate studies	59%	20%			8,3%		30,7%	17,6%
Occupation								
Student	3,8%		9,1%	50%	58,3%	80%	7.7%	47,1%
Employee	79,5%	53,3%	90,9%		25%		69,2%	23,5%

Business owner	3,8%%	6,7%	50%	8,3%	20%	23,1%	11,8%
Retired	9%	33,3%		8,3%			17,6%
Other	3,8%	6,7%					

In the case of answer "yes", the percentage of respondents have a higher education level. Also, 61,2% use their personal cars, and familiar (28,9%) and very familiar (31,6%) with the concept of smart urban mobility.

Table 9. Description to Question no. 9 – Answer "YES"

Answer YES	Bucharest	Cluj-Napoca	Iași	Constanța	Timișoara	Brașov	Craiova	Other Cities
Gender								
Male	64%	76,9%	77,8%	100%	75%	79,9		
Female	36%	23,1%	22,2%		25%	23,1%	100%	100%
Age								
Under 18								
18-24	3,5%		11,1%					
25-34	25,6%	30,8%	22,2%		100%	100%		
35-44	18,6%	7,7%	33,3%					
45-54	16,3%	46.2%		16,6%			100%	50%
55-64	36%	15.4%	33,3%	66,7%				50%
Over 65				16,7%				
Level of education								
Junior high								
Highschool	11,6%	7,7%	11,1%					50%
BA	32,6%	23,1%	11,1%	83,3%			100%	50%
Post graduate studies	55,8%	69,2%	77,8%	16,7%	**100%**	**100%**		
Occupation								
Student	4,7%							
Employee	67,4%	76,9%	88,9%	50%	100%	100%	100%	
Business owner	10,5%	15,4%	11,1%	33,3%				
Retired	17,4%	7,7%		16,7%				50%
Other								50%

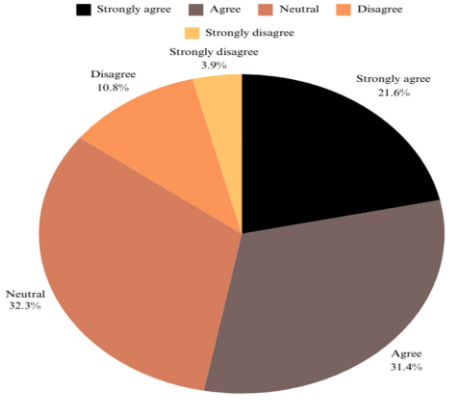


Q10. How would you rate your level of familiarity with smart urban mobility concepts (including electric vehicles, autonomous transportation, air mobility)?

Chart. 9. Question no. 10

In terms of familiarity with smart urban mobility, only 25,5% are familiar with this concept (46,2% from Bucharest, followed by Cluj-Napoca with 13,5%), while only 17,6% are very familiar. At the same time, 35,3% have a limited level of familiarity, while 21,6% are not familiar with this concept. As can be seen, the total percentage of people who have limited to no knowledge exceeds the percentage of people who are familiar. This is also in accordance with the previous question in terms of level of education and age.

Furthermore, the level of knowledge about eVTOL/sVTOL and smart urban mobility is proved by the answers to question no. 11 where a total of 47% of the respondents do not consider that sVTOL and eVTOL technologies could significantly reduce traffic congestion in Romanian cities. Most of the respondents (47%) who do not consider this technology, or are neutral about the impact on traffic congestion are from Bucharest and Cluj-Napoca.



Q11. How much do you agree with the following statement: sVTOL and eVTOL technologies could significantly reduce traffic congestion in Romanian cities?

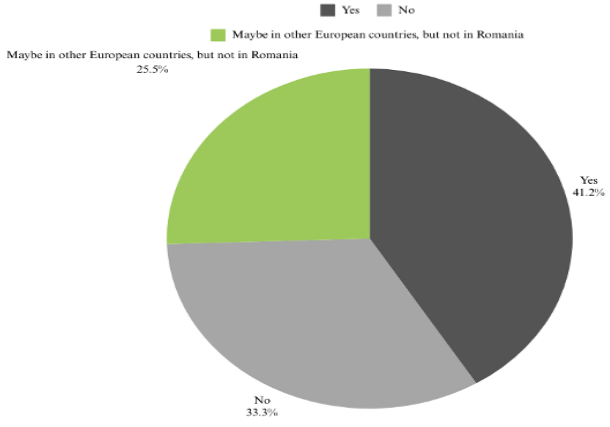
Chart. 10. Question no. 11

At the same time, 21,6% of the respondents strongly agree that eVTOL and sVTOL could reduce traffic congestion, and 31,4% agree. 43,8% of the respondents who agree are very familiar with the smart urban mobility concept.

The peculiarity is that the percentage of respondents who do not agree with question no. 11 are mostly familiar with the concept of smart urban air mobility (54,5%), and 63,6% have heard of eVTOL/sVTOL.

In terms of the main benefits of the UAM (question no. 12), the respondents underlined that (1) the traffic congestion will be reduced, (2) better accessibility for urgent situations, and (3) better connectivity with urban and suburban areas. In contrast, only 3,8% of the respondents do not see any major benefits of UAM, thus the pollution will not be reduced (3,8%). The respondents who selected these two options where there are no benefits toward improvement have limited knowledge on UAM.

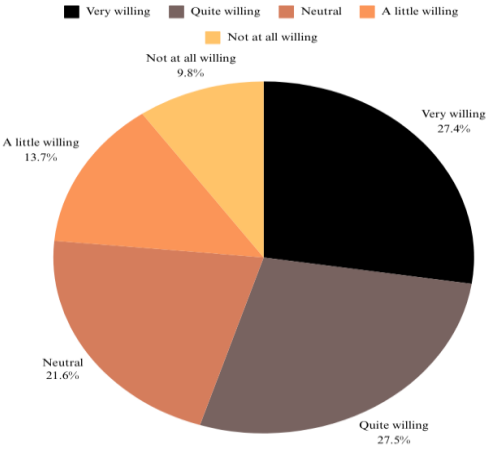
41,2% of the respondents consider it feasible that in the next 15 years, UAM with eVTOL and sVTOL will be achieved, while 25,5% consider that this will be accessible in other countries, but not in Romania. Furthermore, the 33,3% that assessed that UAM with eVTOL and sVTOL will not be achieved are not at all familiar with the concept of smart urban mobility (8,8%), 8,8% are not familiar, 26,5% are little familiar, 29,4% are familiar and 26,5% are very familiar with this concept.



Q13. Do you consider it feasible that in the next 15 years urban mobility will be achieved with sVTOL/eVTOL technologies?

Chart. 11. Question no. 13

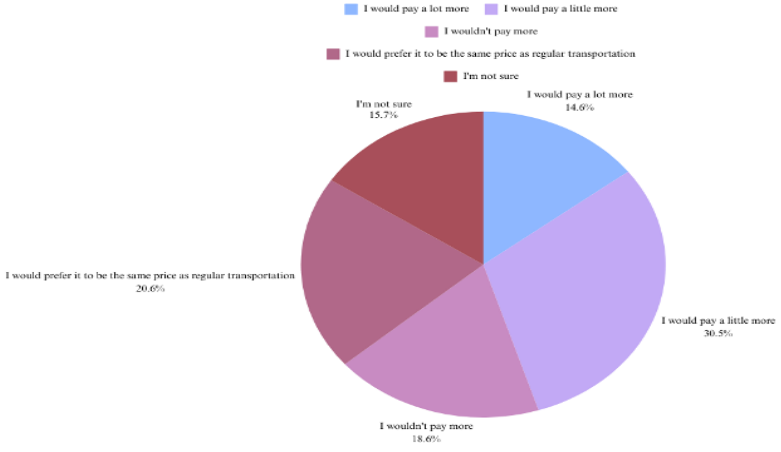
Consequently, the percent who do not consider that in the next 15 years, UAM will be achieved with sVTOL/eVTOL technologies are mostly located in Bucharest (38,2%), Constanța (18,6%), and Brașov (16,2%).



Q.14 Assuming that there is a possibility of using these technologies for urban mobility, how willing are you to use an urban aerial mobility service (e.g. eVTOL) for your daily commute?

Chart. 12. Question no. 14

Question no. 14 asked the respondents how willing they are to use UAM for their daily commute. As can be seen in Chart. No. 12, 27,5% are very willing to use such services, while 9,8% are not willing at all to use it. Furthermore, the 9,8% that not willing at all do not travel by plane (30%) and consider eVTOL/sVTOL as unsafe (50%). At the same time, 50% are not familiar with this technology.



Q.15 To what extent would you be willing to pay more for an air mobility service compared to traditional public transport?

Chart. 13. Question no. 15

Cost is another important factor for UAM, as only 14,6% would pay a lot more to use these services, and 30,5% would pay a little bit more. In the case of the 14,6% that would pay more, over 50% are of age between 35 to 54, and are located in Bucharest and Cluj-Napoca, so in the areas where the monthly income is above the national level. Furthermore, over 66,7% use for daily commutes their cars.

Vehicle safety and reliability	100.00%
Service price	64.80%
Service accessibility and availability	34.20%
Comfort and time saved	25.00%
Environmental impact	16.17%

Q.16 What are the factors that would influence your decision to use an air mobility service?

Fig. 5. Question no. 16

The last question asked the respondents to select the factors that would influence their decision to use UAM. All the respondents selected the option of vehicle safety and reliability, while only 16,17% would use this transportation method based on environmental impact. The 3,8% of the respondents who at question no. 12 selected that the pollution will not be reduced have not selected that UAM will have impact on the environment.

7. Conclusions

In summary, based on the analysis of the 408 responses, this study showed that there is limited to no knowledge of eVTOL/sVTOL technology in Romania, and that it is a rather reluctance on UAM adoption. This can be linked with the lack of interest shown by the media and by the authorities in presenting, thus educating its citizens towards new technological developments. Without a clear education on UAM, smart cities, and new technologies, the level of acceptance and future success of the implementation of eVTOL/sVTOL technologies will be fundamentally reduced.

Consequently, when looking at the EASA survey [38], and thus comparing it with the results from our research, 49% of the EASA respondents are ready to try eVTOL, while in the case of Romania, only 27,5% are willing and very willing to use this technology for daily commute, while at the same time, only 37,3% heard of this technology.

In terms of the environment, 48% of the respondents of EASA underlined the beneficial factor of this technology in terms of the reduction of local emissions [38], while in Romania there is little concern about the pollution and reduction of emissions.

Without any question of doubt, UAM and air taxies with eVTOL/sVTOL will not be feasible in Romania in the next years due to a lack of programs, legislation and infrastructure, but at the same time, the population of this country needs to be *educated* toward this new technology.

References

[1] Yahoo Finance, "Archer Aviation Inc. (ACHR)," https://finance.yahoo.com/quote/ACHR/history/?period1=1730419200&period2=1732747443, 2024.

[2] Yahoo Finance , "Joby Aviation, Inc. (JOBY)," https://finance.yahoo.com/quote/JOBY/history/?period1=1730419200&period2=1732747149, 2024.

[3] Business Wire, "Fly the Joby Aircraft in the New Release of Microsoft Flight Simulator," https://www.businesswire.com/news/home/20241119272339/en/Fly-the-Joby-Aircraft-in-the-New-Release-of-Microsoft-Flight-Simulator, 2024.

[4] Business Wire, "Joby Announces Beginning of Work on First Dubai Vertiport," https://www.businesswire.com/news/home/20241112662432/en/Joby-Announces-Beginning-of-Work-on-First-Dubai-Vertiport, 2024.

[5] Business Wire, "Japan Airlines' and Sumitomo Corporation's Joint Venture Company, Soracle, Announces Agreement Including Intended Purchase Of Up To $500M of Electric Aircraft From Archer," https://www.businesswire.com/news/home/20241107033638/en/Japan-Airlines%E2%80%99-and-Sumitomo-Corporation%E2%80%99s-Joint-Venture-Company-Soracle-Announces-Agreement-Including-Intended-Purchase-Of-Up-To-500M-of-Electric-Aircraft-From-Archer, 2024.

[6] M. Shubov, The Upcoming EVTOL Revolution, Independently published, 2024.

[7] S. A. S. ,. a. E. M. F. Adam P. Cohen, Urban Air Mobility: History, Ecosystem, Market Potential, and Challenges, IEEE Transactions on Intelligent Transportation Systems , 2021.

[8] I. A. D. Colin Harrison, "A theory of smart cities," in *Proceedings of the 55th Annual Meeting of the ISSS-2011*, 2021.

[9] S. Carboni, "Smart Cities in comparison: An analysis of the best Smart Cities," *Smart Cities and Regional Development (SCRD) Journal,* vol. 8, no. No. 3, p. 65–78, April 2024.

[10] "KPF," [Online]. Available: https://www.kpf.com/project/new-songdo-city. [Accessed 01 11 2024].

[11] M. City, "araburba," [Online]. Available: https://araburban.org/en/infohub/projects/?id=3537. [Accessed 01 11 2024].

[12] Z. Liu and J. Wu, "A Review of the Theory and Practice of Smart City Construction in China," *Sustainability 15(9), 7161,* 2023.

[13] Z. S. Esra Banu Sipahi, "The world's first "Smart Nation" vision: the case of Singapore," *Smart Cities and Regional Development (SCRD) Journal,* vol. 8, no. 1, pp. 41-58, January 2024.

[14] D. Kumar, "The Making of Smart Citizenry: Decoding 'Smart Citizen'," *Smart Cities and Regional Development (SCRD) Journal,* vol. 7, no. 2, pp. 85-96, June 2023.

[15] L. J. P. C. C. Brian Fabrègue, "Using smart people to build smarter: How smart cities attract and retain highly skilled workers to drive innovation (Belgium, Denmark, the Netherlands, Poland)," *Smart Cities and Regional Development (SCRD) Journal,* vol. 7, no. 1, pp. 9-30, March 2023.

[16] "The New York Times," 10 06 1964. [Online]. Available: https://www.nytimes.com/1964/06/11/archives/vtol-crash-kills-pilot.html. [Accessed 15 11 2024].

[17] S. B. Anderson, "NASA," 03 1981. [Online]. Available: https://ntrs.nasa.gov/api/citations/19810010574/downloads/19810010574.pdf. [Accessed 18 11 2024].

[18] Y. L. ,. Y. Z. Jiechao Zhang, "Overall eVTOL aircraft design for urban air mobility," *Green Energy and Intelligent Transportation,* vol. 3, no. 2, pp. 1-11, 2024.

[19] N. Mahajan, "eVTOL vs sVTOL: The Future of Military Aviation," 22 02 2024. [Online]. Available: https://raksha-anirveda.com/evtol-vs-svtol-the-future-of-military-aviation/. [Accessed 06 11 2024].

[20] O. Ugwueze, T. Statheros and N. H. Michael A. Bromfield, "Trends in eVTOL Aircraft Development: The Concepts, Enablers and Challenges," in *AIAA SCITECH 2023 Forum*, 2023.

[21] D. Aerospace, Doroni Aerospace, 07 03 2022. [Online]. Available: https://www.linkedin.com/pulse/air-taxi-fareswhat-can-i-expect-pay-doroni. [Accessed 18 11 2024].

[22] IMARC Group, "Top 13 eVTOL Aircraft Companies in the World," 2023. [Online]. Available: https://www.imarcgroup.com/top-evtol-aircraft-companies. [Accessed 25 11 2024].

[23] Archer Aviation, "Archer Aviation," [Online]. Available: https://www.archer.com/aircraft. [Accessed 25 11 2024].

[24] Joby Aviation, "Joby Aviation," [Online]. Available: https://www.jobyaviation.com/. [Accessed 24 11 2024].

[25] E Hang, "EHang 216," [Online]. Available: https://www.ehang.com/ehangaav/. [Accessed 24 11 2024].

[26] Vertical Aerospace , "Vertical Aerospace VX4," [Online]. Available: https://vertical-aerospace.com/meet-the-vx4/. [Accessed 24 11 2024].

[27] H. Ritchie, "Cars, planes, trains: where do CO_2 emissions from transport come from?," 6 09 2020. [Online]. Available: https://ourworldindata.org/co2-emissions-from-transport. [Accessed 25 11 2024].

[28] European Parliament, "CO2 emissions from cars: facts and figures (infographics)," 6 12 2019. [Online]. Available: https://www.europarl.europa.eu/topics/en/article/20190313STO31218/co2-emissions-from-cars-facts-and-figures-infographics. [Accessed 25 11 2024].

[29] European Environment Agency, "Average CO_2 emissions of pools of car manufacturers," 20 09 2024. [Online]. Available: https://www.eea.europa.eu/en/analysis/maps-and-charts/data-visualization-55. [Accessed 26 11 2024].

[30] European Environment Agency, "CO2 emissions from new passenger cars," [Online]. Available: https://co2cars.apps.eea.europa.eu/?source=%7B%22track_total_hits%22%3Atrue%2C%22query%22%3A%7B%22bool%22%3A%7B%22must%22%3A%5B%7B%22constant_score%22%3A%7B%22filter%22%3A%7B%22bool%22%3A%7B%22must%22%3A%5B%7B%22bool%22%3A%7B%22should%22%3A%5B%7B%22term%2. [Accessed 26 11 2024].

[31] International Association of Public Transport, "Climate action and public transport Analysis of planned actions," International Association of Public Transport, 2014.

[32] Electric VTOL News, "Skynet Project Genesys X-2," [Online]. Available: https://evtol.news/skynet-project-ueva. [Accessed 10 11 2024].

[33] Electric VTOL News, "Skynet Project Genesys X-1," [Online]. Available: https://evtol.news/skynet-project-genesys-x-1. [Accessed 11 11 2024].

[34] EUROPEAN COMMISSION, "COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Sustainable and Smart Mobility Strategy – putting European transport on track for the future," 9 12 2020. [Online]. Available: https://transport.ec.europa.eu/transport-themes/mobility-strategy_en. [Accessed 15 11 2024].

[35] European Commission, "Delivering the European Green Deal On the path to a climate-neutral Europe by 2050," 2021. [Online]. Available: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en. [Accessed 19 11 2024].

[36] L. B. M. R. J. Elena Maria De Miguel Munoz, "Driving the Future A Comparative Analysis of Electric Vehicle Trends in Norway and Spain," *International Conference on Smart Cities, Systems, Devices and Technologies (SMART),* pp. 32-41, 2023.

[37] European Union Aviation Safety Agency, "Urban Air Mobility (UAM)," [Online]. Available: https://www.easa.europa.eu/en/domains/drones-air-mobility/drones-air-mobility-landscape/urban-air-mobility-uam. [Accessed 28 11 2024].

[38] European Union Aviation Safety Agency, "Urban air mobility 10 key survey results," [Online]. Available: https://www.easa.europa.eu/en/uam-10-key-findings. [Accessed 28 11 2024].

[39] "COMMISSION IMPLEMENTING REGULATION (EU) 2024/1111 of 10 April 2024 amending Regulation (EU) No 1178/2011, Implementing Regulation (EU) No 923/2012, Regulation (EU) No 965/2012 and Implementing Regulation (EU) 2017/373, as regards the establishment of requ," 23 05 2024. [Online]. Available: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202401111. [Accessed 28 11 2024].

[40] Airmobi, "EU Approves General Policy Regulations for Manned eVTOL Aircraft," Airmobi Limited, 25 06 2025. [Online]. Available: https://www.airmobi.com/eu-releases-comprehensive-regulations-for-

evtol/?srsltid=AfmBOooERvhPmX0D_4TdBhDpO0j0s9bhgk5PbOT9jLo-9prLzozOnGYn. [Accessed 25 11 2024].

[41] European Union Aviation Safety Agency, "VTOL designs for Urban Air Mobility," European Union Aviation Safety Agency, [Online]. Available: https://www.easa.europa.eu/en/light/topics/vtol-designs-urban-air-mobility. [Accessed 25 11 2024].

[42] European Union Aviation Safety Agency, "Vertiports in the Urban Environment," [Online]. Available: https://www.easa.europa.eu/en/light/topics/vertiports-urban-environment. [Accessed 28 11].

[43] European Umion Aviation Safety Agency, "Prototype Technical Design Specifications for Vertiports," 24 03 2022. [Online]. Available: https://www.easa.europa.eu/en/document-library/general-publications/prototype-technical-design-specifications-vertiports. [Accessed 28 11 2024].

[44] Lilium, "Designing a scalable vertiport," 02 07 2020. [Online]. Available: https://lilium.com/newsroom-detail/designing-a-scalable-vertiport. [Accessed 28 11 2024].

[45] Consiliul General al Municipiului Bucuresti, "i de colaborare dintre Municipiului Bucure Institutul National de Cercetare - Dezvoltare Aerospatiala "Elie Carafoli"," 2023. [Online]. Available: https://doc.pmb.ro/consiliu/sedinte/490/oz/11132.pdf. [Accessed 05 11 2024].

[46] Heli Taxi, "Heli Taxi inchirieri de elicopter la pret bun," Heli Taxi, [Online]. Available: https://helitaxi.ro/. [Accessed 15 12 2024].

[47] Aero Taxi, "Aero Taxi," [Online]. Available: https://inchirieriavioane.ro/. [Accessed 14 12 2024].

[48] Regional Air Services, "Regional Air Services," [Online]. Available: https://www.regional-air.ro/en/home/. [Accessed 14 12 2024].

[49] Institutul Național de Statistică, "Populatia rezidenta pe sexe, grupe de varsta, macroregiuni, regiuni de dezvoltare si judete," 2021. [Online]. Available: https://www.recensamantromania.ro/rezultate-rpl-2021/rezultate-provizorii/. [Accessed 14 09 2024].

[50] I. Brace, Questionnaire design: How to Plan, Structure and Write Survey Material for Effective Market Research, Kogan Page Publishers, 2008.

[51] U. Nations. [Online]. Available: https://www.un.org/uk/desa/68-world-population-projected-live-urban-areas-2050-says-un.

[52] H. Schaffers, N. Komninos, M. Pallot, B. Trousse, M. Nilsson and A. Oliveira, "Smart Cities and the Future Internet: Towards Cooperation Frameworks for Open Innovation," in *The Future Internet - Future Internet Assembly 2011: Achievements and Technological Promises*, 2011.

[53] G. Dogaru, "Parcul auto al României: radiografia unei țări în care dieselul și mașinile de peste 20 de ani sunt la putere," 10 02 2023. [Online]. Available: https://www.autocritica.ro/feature/parcul-auto-al-romaniei-radiografia-unei-tari-in-care-dieselul-si-masinile-de-peste-20-de-ani-sunt-la-putere/. [Accessed 10 2024].