Social Acceptance of Innovative Air Mobility in Ireland

A qualitative study on stakeholders' perspectives

Aurora De Bortoli Vizioli, Damiano Taurino, Linda Portoghese
Deep Blue
Rome, Italy

Abstract— **Urban Air Mobility (UAM) and its broader concept, Innovative Air Mobility (IAM), represent transformative advancements in urban transportation systems, offering potential solutions to the growing challenges of urban congestion and environmental sustainability. Ireland is actively engaging in this innovative field, with numerous initiatives aimed at enhancing technology and infrastructures while exploring effective methods for integrating drone services into existing systems. However, to successfully implement this emergent technology in wider society, social acceptance needs to be addressed. This study aimed at gathering stakeholder feedback on perceptions of drone operations and IAM services within the Irish context. Insights from potential users, industry experts, and local authorities have been collected to assess overall attitudes, expected benefits for the Irish ecosystem, and key concerns or barriers. Ultimately, our results will support the efforts of Irish authorities and the European Union in fostering a participatory approach to the development of the drone landscape, ensuring that people perspectives are considered in shaping the future of IAM in Ireland.**

Keywords-UAM, IAM, UAS, Drones, Social Acceptance, Ireland

I. INTRODUCTION

In a time of constant change in the field of transportation, Urban Air Mobility (UAM) and its broader concept, Innovative Air Mobility (IAM), are emerging as viable solutions to critical challenges such as rising urbanization, increasing traffic congestion, and the growing demand for sustainable transportation alternatives. UAM market projections forecast robust growth in the Asia-Pacific area, the United States, as well as Europe [1][2][3]. Also in the Irish context, a continuous expansion in usage of drones is anticipated, particularly in promising applications such as emergency services, medical transport, freight delivery, mapping, and inspections [4].

That being said, several challenges need to be addressed before this new mobility sector can reach its full potential. Alongside technological advancements and infrastructure development, societal acceptance represents a critical aspect in ensuring the successful integration of IAM into existing systems, as directly underlined by the European Commission's Drone Strategy 2.0 [5]. Having a direct influence on the viability of this emerging market, acceptance is dependent on a variety of factors including expectations of direct benefits to the society, perceived safety and security, sustainability, environmental impact, and the level of accessibility for different demographic groups.

In recent years, numerous initiatives have emerged in both EU and non-EU countries to assess societal acceptance of drones and Urban Air Mobility (UAM). A key study is the 2021 EASA report [6], which surveyed 3,690 participants across six European nations, revealing that 83% had a favorable view of UAM. Respondents highlighted benefits like improved emergency response times, reduced traffic congestion, lower emissions, and enhanced development of remote areas. Alongside the survey, EASA also engaged over 40 stakeholders in qualitative research, which indicated general support for UAM but raised concerns regarding public space limitations, pricing, safety and coordination challenges, or public resistance, stressing the importance of transparency and public involvement in decision-making. Similarly, the CORUS-XUAM project [7] consulted stakeholders on strategies to address public concerns, recommending measures such as minimum altitude limits, no-fly zones, renewable energy use, and fostering a strong safety culture in the drone industry to enhance acceptance [8].

Given the exponential growth of drones and UAM related social acceptance studies in the last ten years, an extensive body of data now exists regarding the public's overall disposition towards drone technology, preferred services and applications, as well as the underlying factors influencing acceptance levels and primary concerns expressed by the population.

Typically, surveys include questions to classify respondents according to their socio-economic status (age, gender, ethnicity, income, education, and occupation), and their knowledge about drones. According to research [9], females, older adults, and less-educated individuals generally show lower acceptance levels. Prior knowledge and experience with drones correlate with higher acceptance and reduced concerns, while a lack of technological knowledge can increase risk perceptions [9].

Apart from socio-demographic variables and familiarity with technology, the expected benefit related to the type of mission also emerged to be a strong predictor of public acceptance. Missions that benefit society such as search and rescue, disaster response, medical transport, and infrastructure or environmental monitoring are generally viewed positively [10]. In contrast, commercial uses such as package delivery or

passenger transportation (e.g., air taxi) are seen as riskier and have lower levels of support, although results show a very high variability, with support levels ranging from 18% in Switzerland [11] to 83% in Singapore [12]. Regarding passenger transportation, several studies have explored the market viability of this new modality, as well as people willingness to fly on autonomous aircraft (e.g., [13][14]). Research has shown an increase of support over time, probably due to an increase in familiarity with drone technologies and autonomous vehicles [15]. Globally, Singapore reports the highest support at 62% [12], while the US saw an increase from 12% in 2011 to 55% in 2018. Some authors identified the perceived safety-risk benefit as the most important factor when attempting to market the use of UAS to the public [16], while a NASA study conducted in 2019 [17] reported limited willingness to pay as one of the major social barriers toward the implementation of UAM. In support to this last point, a recent German study on 1074 participants revealed that about half do not want air taxis in Dresden in the future, with many unlikely to use them, highlighting willingness to pay as a major obstacle [18].

In addition to expected benefits, most research has focused on the concerns related to drone operations. The major issues perceived by the general public mostly refer to privacy, noise, safety, and negative environmental impact (e.g., [8][12]). As also highlighted in the European Commission Drone Strategy 2.0 [5], engaging with communities, providing comprehensive and transparent information, and implementing regulations that mitigate these issues will be essential steps in building public trust and maximizing the potential of drone operations.

Getting closer to the subject of our research, in 2021 the Dublin City Council launched the "Accelerating the Potential of Drones for Local Government" project, which produced a report [4] identifying how drones could enhance local government services and their future role. As part of this initiative, an online survey with over 900 participants assessed public attitudes toward emerging technologies like drones, revealing that Ireland is among the most accepting EU countries, with 84% of respondents expressing positive feelings towards drone technology [19]. Strong support was noted for drones in emergency services, planning, environmental monitoring and waste management, while concerns about privacy, security and safety were prevalent. On the contrary, noise annoyance was less of a concern in Ireland compared to other EU and non-EU countries. The survey also indicated a certain level of optimism regarding the integration of drones into everyday life, especially for cargo delivery, though skepticism remained regarding air taxis, with only 18% believing they would be common by 2025. Finally, while many participants highlighted the need for accessible information about drone flights, only a minority believed that this information would be easy to obtain.

Another relevant initiative undertaken by the Irish authorities is the public consultation launched in 2023 by the Irish Department of Transport for the development of a Policy Framework for Unmanned Aircraft Systems [20]. This document aims at setting out the vision, strategy, and priorities for the development of the UAS sector in Ireland focusing on key areas such as innovation, enterprise, airspace planning and use, compliance, and enforcement. The Policy Framework is intended to guide high-level strategic planning and development over the next years by supporting growth and innovation in the UAS sector while ensuring safety, security, and environmental considerations are managed effectively.

More recently, in May 2024, the Dublin City Council Smart City programme launched its Drone and Urban Air Mobility Strategy 2024 – 2029 [21], developed in close co-operation with the Irish Aviation Authority. The key objective of this strategy is to optimize and expand drone services, establishing a centralized corporate approach to drone operations that aligns with the evolving European regulations. The strategy aims to implement the use of drones across various services, including emergency response, mapping, inspections, and environmental monitoring, through the creation of a dedicated Drone Unit. This unit will centralize drone operations and expedite the adoption of drone technology throughout the council, enhancing operational efficiency and service delivery.

Inscribed within this promising stream of initiatives, the SESAR 3 JU funded ÉALÚ-AER project aims to establish Ireland's first Digital Sky Demonstrator at the Future Mobility Campus Ireland (FMCI) in Shannon. The project focuses on demonstrating U-space operations and their integration with Air Traffic Management (ATM) by performing various use-cases that will progressively increase in complexity. Within this framework, the project also aims at assessing the acceptance level of the Irish population towards drones' usage so as to ensure an introduction of IAM services that aligns with public expectations and concerns. The initial results of this consultation campaign are what comprise this research paper, that includes a qualitative exploration on the perspective of Irish stakeholders involved in this domain. Building on the findings from the qualitative research activities, the second part of this research will leverage quantitative methodologies and will consist of a public consultation where feedback on IAM acceptance and user needs will be collected from the general public through an online survey.

II. METHODS

A. Data collection

The data that inform this paper were collected at two separate events.

The first set of data was collected during the Drone-a-palooza, a one-day networking event held in January 2024 at the Future Mobility Campus Ireland (FMCI) facilities in Shannon, Ireland. The event brought together stakeholders from the UAS ecosystem to share operational experiences and discuss the challenges related to the use of UAS in Ireland. A workshop was embedded within the event to gather initial feedback on the social acceptance of UAS and IAM. During the workshop, a questionnaire was administered to participants, and the results were analyzed and discussed in real time. The questionnaire included 11 items, including multiple choice, rating scale, and open-ended questions. It is important to note that the purpose of

the questionnaire was not to collect quantitative data, but to facilitate a discussion aimed at gathering specific feedback on each item. This included ensuring that the questions were clear and relevant, identifying any ambiguous areas, and exploring specific aspects of the Irish ecosystem that warranted deeper investigation. Consequently, the collected data were not analyzed statistically, also due to the relatively low number of respondents and the incomplete dataset; instead, the analysis was qualitative.

The second set of data was collected during the Transport Research Arena (TRA 2024), a four-day event held in Dublin, Ireland, in April 2024. The TRA is the largest European research and technology conference on transport, covering all transport modes and aspects of mobility, and it attracted over 4,000 participants in 2024. During this event, semi-structured interviews were conducted with various stakeholders, including researchers, policymakers, and industry representatives. Each interview lasted approximately 15 minutes and was supported by infographic materials, as shown in Fig. 1 and Fig. 2. The transcriptions of the interviews were subsequently analyzed using a top-down thematic analysis approach [22], which involved identifying patterns and themes within the dataset and organizing them to provide more meaningful interpretations

Both the questionnaire and the interviews included items such as the participant's level of familiarity with IAM and exposure to drones, general attitudes and perceived benefits of drone usage, acceptability and pros&cons of various application cases, as well as concerns and barriers related to drone operations in Ireland. Despite the differences in data collection methodologies between the two datasets, the results of the questionnaire along with insights gathered from the workshop discussions and the interview responses have been combined and qualitatively analyzed, and therefore will be presented and discussed as a unified body of data. The aim of this work was indeed to collect qualitative data to support and inform future quantitative data collection, which will be conducted through the expanded distribution of a questionnaire to a broader audience within the Irish population.
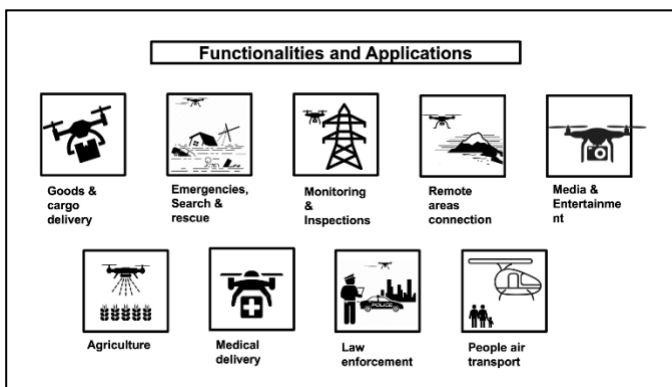
B. Participants

Drone-a-palooza event - Approximately 28 people took part in the workshop and shared their responses to our questionnaire. It should be noted that not all participants answered every question. Given the qualitative nature of this research, the lack of complete responses is not a major concern, and extensive demographic information was not collected. Most participants were male, comprising 83% of the total respondents. The age distribution of participants was primarily concentrated in the 18-35 age bracket (52% of the participants). This was followed by the 50-65 age group (30%), and the 36-49 age group (17%). When asked about their knowledge on the subject of IAM, 38% of workshop participants considered themselves to have a slight knowledge of the subject, 25% had a moderate knowledge, 33% had a very good understanding, and 4% claimed to be extremely knowledgeable. Additionally, the majority of participants (69%) stated that they have been exposed to drones, either in their professional roles as operators or as stakeholders in the industry.

TRA event - Nine interviews were conducted during the event, with seven administered to stakeholders involved in the Irish environment, specifically representatives from Dublin City Council, the Garda Síochána (the national police force in the Republic of Ireland), Limerick and Dublin Universities, Enterprise Ireland, and other stakeholders somehow involved in the UAS domain. Two interviews were conducted with non-Irish participants also engaged in the UAS sector, specifically within the logistics and aviation industries. The majority of interviews participants reported to have a good knowledge of the UAS domain, including IAM, with some of them also reporting direct exposure to drones.

III. RESULTS AND DISCUSSION

A. General feelings and perceived benefits

Not surprisingly, given that the workshop participants and interview respondents were primarily stakeholders somehow involved in the UAS domain, the overall sentiment towards UAS operations and IAM ranged from positive to very positive.
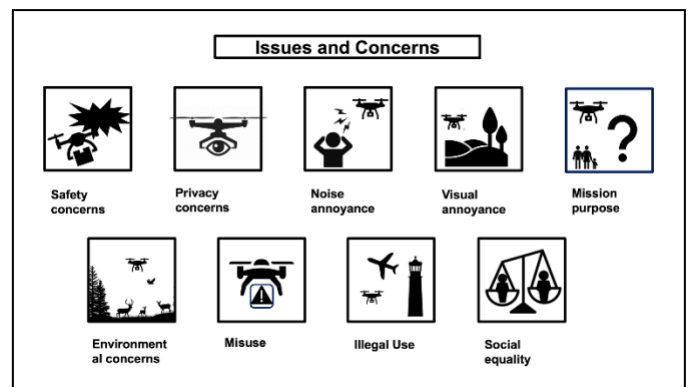

Figure 1. Infografic on potential UAS functionalities and IAM applications shown to interviews participants during the TRA event

Figure 2. Infografic on potential issues and concerns related to IAM and the use of UAS shown to interviews participants during the TRA event

However, some skepticism also emerged, primarily concerning: (i) the absence of a comprehensive regulatory framework governing drone operations and the complexity of the certification process; (ii) uncertainty about the real market potential for specific application cases; and (iii) social acceptance issues related to trust and social equality, particularly regarding autonomous passenger air transport.

Mixed feelings also appeared to have a relation with the perceived timeline for the full deployment and widespread acceptance of two main business cases (i.e., cargo delivery and passengers transport). Most respondents believed that the complete rollout of cargo delivery services would occur within the next 5 to 10 years, with medical delivery applications expected to see the fastest adoption within this sector. In contrast, participants predicted that widespread adoption of passenger air transport would take 20 to 25 years, with the timeline depending on factors like the establishment and consolidation of the regulatory and standardization frameworks, public trust, and technological maturity. Piloted eVTOLs have been anticipated to precede autonomous passenger vehicles.

Both workshop and interview participants were asked to identify the potential benefits that the usage of drones could bring to individuals and society in Ireland. The analysis of responses revealed that the most mentioned benefits were related to "*safety and emergency response*". Participants also mentioned the potential for improvements in logistics and connectivity in urban, rural, and remote areas, using terms such as "*cost-effective, efficient, convenient, and faster*" to describe these benefits. Additionally, environmental benefits were frequently mentioned, along with the advantages of using drones for monitoring, surveying, mapping, and acquiring data more accurately, safely, and quickly. Economic benefits for society, such as "*business development opportunities, new markets, job creation, increased competitiveness, and financial gains*", were also cited by participants. In contrast, only a small number of participants recognized potential benefits in areas such as tourism and recreation. It was mentioned that using drones for these activities could positively impact the community by familiarizing them with drone operations and promoting habituation. Similarly, demonstrating eVTOL flights is viewed as a means to inform the public and build trust. However, other participants highlighted that some individuals may be disturbed by drone usage perceived as non-beneficial to the common good, and recreational use could negatively affect them due to noise and visual disturbances.

The distribution of benefits mentioned by participants were found to align with their perceived acceptance of various application cases, when these potential applications were clearly outlined to them either through the questionnaire items or through the infographics shown during the interview. Specifically, the applications that received the highest attention and the most positive evaluation were those related to public good, such as "Emergency services" (e.g., search and rescue), "Medical deliveries", "Inspection and monitoring of public and industrial infrastructures", and "Environmental monitoring". Referring to the last use case, it is worth to note that some

initiatives have been already implemented in Ireland, especially concerning the ecological monitoring of birds and marine mammals [23].

A higher variability among respondents was instead observed for applications such as "Freight delivery for commercial use", "Passenger mobility" and "Agriculture". While the use of drones in agriculture has been evaluated as potentially useful, but not so relevant within the Irish ecosystem, cargo delivery and passenger transport via UAS received more controversial evaluation, encompassing both positive and negative assessment. On one hand, cargo delivery for commercial use is perceived to have significant potential in meeting the increasing demand for faster delivery times and improving freight transportation to remote areas. This application could contribute to the overall development of these regions, particularly in parts of Ireland that are poorly connected. Furthermore, cargo delivery is viewed as environmentally beneficial due to lower emissions compared to traditional road transport and a reduction in traffic congestion. However, on the other hand, drone logistics poses some questions related to the service's cost-effectiveness and market development. While drones could excel in specific scenarios, such as crossing geographical barriers, traditional delivery methods might be cheaper in many cases. Therefore, the viability of cargo delivery by drone will depend on it being cost-effective compared to traditional methods, especially "*once the novelty wears off*". The responses collected on this topic closely align with the existing literature, which also indicates a high variability in disposition and acceptance, influenced by a range of factors including socio-demographic and economic variables, as well as geographical considerations [13][24][25].

"Passenger mobility" was the application that received the lowest acceptance rate and the highest volume of criticisms and doubts, confirming existing data on this matter [26][27][28]. Some participants expressed reluctance regarding fully autonomous passenger transport, preferring piloted options due to widespread concerns about safety and the risk of accidents. Social acceptance issues, including mistrust and social inequality, were also prevalent. There was a consensus that initial air taxi services would likely serve wealthier individuals due to high costs, with obvious repercussion on public acceptability. While some participants anticipated broader accessibility, and consequent acceptability, as technology advances and costs decrease, others were skeptical about the overall viability of the passenger air taxi business case.

Finally, participants were asked about the use of drones for "*Surveillance and Law Enforcement*," which also revealed a higher variability in responses. In Ireland, where issues such as smuggling, illegal trade, and drug trafficking are significant, the use of drones for coastal patrolling and law enforcement is seen as beneficial. Additionally, drones are recognized for their potential in waste management and illegal dumping identification (e.g., [29]), and in Ireland several councils are already using drones in their investigations into fly-tipping. However, the use of drones for law enforcement also faces legislative barriers, and it is currently restricted to very limited

circumstances pending the passage of specific legislation. As an interviewee noted, police use of drones for surveillance requires a warrant, which is why broader applications are not being implemented. While the air support unit is authorized to operate drones, their use is confined to specific situations, such as search operations, rather than for collecting evidential data. Apart from the legal complexities, the use of UAS technology within the context of domestic policing activities raises also serious concerns about personal privacy and the intrusion of new forms of 'Big Brother' surveillance in people's daily lives. These issues, closely tied to a recent controversy in Ireland surrounding the implementation of body cameras by the police force, are complex and varied. They encompass concerns about data usage, collection and storage methods, public accessibility of information, state surveillance laws, and, in general, citizen's fear for being monitored in open public places, at work, and in or near their homes. Furthermore, a lack of trust, transparency, regulation, and technical knowledge can result in what is known as "chilling effects", where individuals engage in self-preservation/self-censorship by limiting their behaviour when they feel they are being monitored [30]. This dynamic can exacerbate tensions between the perceived threats to privacy and the legitimacy of drone use. Ultimately, the acceptance of this application will largely depend on how the problem will be framed to the public, on the implementation of measures to address privacy concerns, and on the tangible results that can be achieved by using drones to combat illegal activities [10][31].

B. Issues and concerns, barriers and showstoppers.

While some potential issues related to the use of drones had already emerged during the discussion on UAS applications, in the second part of the workshop/interview, participants were directly asked to further elaborate on their concerns and identify the main barriers and showstoppers hindering the full deployment of IAM in Ireland

The primary concern cited by participants was "*safety",* with many highlighting the potential for increased traffic or congestion in airspace, which could lead to conflicts and potential accidents. Other prominent concerns included "*privacy issues, noise pollution, misuse (including illegal activities), and security risks*". Although less frequently mentioned, "*job losses due to drones replacing human-provided services*" and "*environmental disruptions*" (such as wildlife disturbance) were also noted. "*Social inequality*", particularly the concern that services might only be affordable for the wealthy or privileged, and *"Land use and build",* involving the use of public space for infrastructure development, received mixed responses. While workshop participants generally expressed little to no concern or neutrality on these topics, interview participants showed higher sensitivity. This disparity can be attributed to the slightly different composition of participants in the two data collections, since the TRA event interviews involved more individuals affiliated with national governmental institutions and research institutions, whereas the workshop participants were more representative of the industry domain. The most cited barriers hindering the development and deployment of IAM applications were related to regulatory and certification matters (with some

participants expressing frustration concerning the difficulties in obtaining flight permits in Ireland), technological maturity and social acceptance aspects mostly related to safety, trust, and accessibility. While infrastructural readiness is considered essential, it is not viewed as a major issue at this stage.

Overall, also in the case of concerns and barriers, the responses obtained through our investigation strongly resemble those collected in similar studies [6][8]. However, it must be noted that the perspectives of experts and stakeholders involved in this domain can diverge from those of the general public. Research indicates that expert stakeholders prioritize safety considerations, along with technological and regulatory aspects, while the general public is more concerned about ensuring that their quality of life is not impacted by regular drones' operations [6][8]. Concerns among non-expert citizens, indeed, frequently revolve around issues such as noise pollution, visual disturbances, privacy, and the potential intrusion of drones related infrastructures into community spaces. Nevertheless, as social acceptance is a complex construct, and many different variables can contribute to shaping whether individuals support or oppose a certain idea, it can happen that a specific aspect or event could suddenly become more prominent and significantly impact people's perceptions and feelings, driving the public sentiment toward a specific direction or leading to a shift in support or opposition. This is the case in the Irish context, where the topic of UAS misuse has become particularly sensitive. UAS misuse includes illegal activities such as flying drones in restricted airspace or without proper authorization [32]. In the first 8 weeks of 2023, Dublin Airport was closed six times due to illegal drone activity, raising major safety concerns for aviation and causing significant inconvenience for travellers. These disruptions led to suspensions of airport operations, resulting in flight diversions and delays and had a strong resonance on Irish media influencing the public opinion. Although these events are classified as illegal use, since the drones has been operated in non-authorized airspace, they have the potential to damage the reputation of the entire UAS/IAM ecosystem. The negative perceptions resulting from such events can indeed create uncertainty on the safety of UAS operations and erode trust in relevant authorities and regulatory bodies.

When asked to express their opinions on how the Irish population might react globally to the introduction of IAM and to anticipate the acceptance levels among Irish citizens, many workshop and interview participants shared an optimistic perspective. This positive outlook aligns with the findings of the previously mentioned survey conducted in Ireland in 2021, which indicated a high level of acceptance compared to other EU countries. However, although this optimism stems from expert stakeholders within the UAS domain who have strong connections to the Irish socio-political and economic ecosystem, only a subsequent nationwide survey can provide a clearer picture of the actual situation in Ireland and provide insights that could explain trends in public perception and shifts in opinions, if any.

As suggested by a participant to the interviews, a good practice would involve the conduction and repetition of surveys

and consultations alongside demonstrations and informative campaigns, to have a picture that is evolving with society. Indeed, currently, the general public's perception of drones largely stems from sporadic encounters with privately operated drones and media coverage. Therefore, it is crucial to evaluate how the perceptions of citizens will evolve as they become increasingly exposed to systematic UAS operations, including the occurrence of accidents and incidents. Moreover, while surveys and research are fundamental for understanding public perceptions, providing projections, and informing decision-making processes is it is important to recognize that only a small portion of those surveyed may be familiar with UAS operations. Furthermore, no one is fully aware of the reality under investigation (i.e., the IAM concept), as this reality does not yet exist in the European context. The limited exposure to drone operations and the lack of awareness regarding their potential impact on people's lives can make it challenging to assess certain factors that require direct experience to be evaluated. For instance, determining acceptable flight altitude levels may prove difficult, as respondents may struggle to visualize the effects of drones operating at altitudes of e.g., 75 vs 100 meters. Within this context, surveys conducted at pilot sites, complemented by live demonstrations or virtual reality simulations, or studies using audio prompts to assess public acceptability concerning noise annoyance could enhance respondents' understanding and yield more accurate results [33][34].

Finally, to gain a deeper understanding of participants' personal experiences, they were asked to elaborate on the specific concerns they encountered when observing drones operating in their local area. Through analysing the responses obtained, a trend emerged wherein safety was rarely mentioned as the explicit primary concern. On the contrary, individuals were mostly concerned about their inability to know the purpose of the flight, whether the operation had been authorized, if the drone was collecting any forms of data, and finally, whether the pilot was experienced, properly trained, and knowledgeable of regulations. Based on the responses from participants, it is evident that the concerns related to drones operating in their local area are closely tied to safety and privacy issues. However, a significant focus was placed on the need for transparency regarding the flight, and the entity responsible for the operation. These aspects, reflecting individuals' desire for access to information, represent a challenge that calls for the implementation of mitigation strategies. To address this issue, some technologies have been developed, such as remote ID technology and an improved tracking and detection feeding a drone traffic monitoring system that, if accessible by bystanders, would allow individuals to check the intentions of the UAS operating in their vicinity and ensure the traceability of the platform. Additionally, explicit visual cues such as color-codes to identify the different operators (e.g., red for medical delivery, blue for police etc.) could provide individuals with and immediate answer regarding the purpose of the mission. Such technological advancements and strategies, coupled with stricter regulations and enforcement, will hopefully improve the ability to identify drone operators and ensure responsible and accountable use of this technology.

Implementing these types of mitigations to address and reduce public concerns is pivotal for enhancing public acceptance. In a 2022 article, Çetin et al. [8] identified different categories of mitigation actions for societal concerns: Regulation and policy (i.e., mitigations that should be part of a regulation made by the authorities); Operational and ConOps (measures related to rules enabling the safe integration of drones with other airspace users); Human Response and Metrics (measures that engage the public); and Tool and Technologies (measures that can be built into or used by drones). Among the proposed mitigation measures, "Limit minimum altitude" and "Establish no-fly zones for drones" address multiple concerns, including noise and visual pollution, impacts on animals and flora, safety, security, and privacy.

To specifically mitigate the impact of drone noise, a collaborative effort among vehicle manufacturers, regulatory bodies, and local governments is required. Progress has already been made under European regulation (EU) 2019/945, which sets noise limits for drones in classes C1 and C2, alongside the release of Guidelines and Environmental Protection Technical Specifications (EPTS) for measuring and limiting noise from UAS and air taxis [35][36][37].

In a similar vein, but related to privacy concerns, EASA has released a body of resources such as the Privacy by design Guide [38] and the Privacy Handbook [39] aimed at incorporating and applying the principles of privacy and data protection to drones manufactures and operations.

IV. CONCLUSIONS

This paper presents findings from a set of activities (a workshop including a survey, and some interviews) conducted with a group of Irish experts. The activities provided insights into the opinions and perspectives of key stakeholders within the Irish UAS domain. While the sample size and representativeness of the group prevented comprehensive statistical analysis, the results lay the foundation for further research and give way to a few key considerations.

As previously indicated, the results of this assessment aimed to delineate the current perspective of Irish stakeholders regarding drone operations and IAM. This included an exploration of the anticipated future benefits for the country, the application cases that are most likely to develop and gain acceptance, as well as the primary concerns and barriers that may arise. Overall, our findings align with those reported in other EU and non-EU countries. However, they also suggests that the Irish ecosystem possesses some unique characteristics that could enhance acceptance levels and a favourable disposition among the Irish population towards these new technologies and services. These elements, which emerged during our consultation campaign, are likely to be reflected, at least partially, in the broader Irish population. First, Ireland is known as a hub for technological development, which may positively impact acceptance levels, as several studies have demonstrated a correlation between knowledge, familiarity with technology, and positive perceptions towards drones operations. Second, the use of drones services is already a reality in some

parts of Ireland, and people are becoming increasingly familiar with drone operations and various applications. This trend is expected to continue in the coming years. Finally, the Irish authorities have been actively collaborating with industry partners, regulatory bodies, and research institutions to address evolving challenges and capitalize on emerging opportunities within the rapidly developing drone landscape. This collaborative effort aims to define and accomplish a strategic framework to optimize the utilization and expansion of drone services.

Moving forward, to gain a comprehensive understanding of the sentiments of the Irish population regarding the use of UAS and the deployment of IAM, our objective is to integrate our qualitative findings with quantitative data obtained from a widespread questionnaire distributed to the Irish public. The sample is expected to be representative of the Irish population covering geographical range (urban vs. rural environment), age, gender, socio-economic status, and education level. The survey will include items aimed at capturing demographic information, the level of knowledge/awareness of drones' technology and operations, the perceived acceptability, usefulness and benefits of different applications, and concerns. Specific items tailored to the Irish community will be incorporated. The insights gathered from this activity will provide us with a clearer and comprehensive understanding of specific aspects, nuances, and potential pros and cons related to the Irish context. The survey will also be supported by visual material (e.g., pictures of platforms and routes) created ad hoc starting from the material collected during the project work. Moreover, social acceptance activities will be organized in conjunction with project demos to maximize stakeholders' engagement and collect informed feedback from locals on the specific use-cases that the project aims to develop. This final dataset will be compared with previous research conducted in Ireland as well as in other EU countries and further integrated with the results of the many institutional initiatives currently on-going in this country.

Within this framework, the topic of "*knowing the mission purpose*" will receive special attention in this discussion, as we believe it warrants further investigation. While extensive literature highlights how acceptance levels are influenced by various predictors, such as the use case and the specific contexts in which drones operate [12], there remains a significant gap in understanding how real-time knowledge of a mission's purpose can affect public concerns. Existing studies have shown that the entity responsible for the flight can shape people's dispositions [9]. However, we believe that more research is needed to explore potential strategies for informing the public about mission purposes and to identify the preferred options among the population for receiving such information. By incorporating the knowledge associated with a mission as a predictor, we can gain valuable insights that could shift our perspective on the acceptability of civil drones. People's perceptions related to safety and privacy, for instance, could drastically change with the introduction of strategies designed to provide immediate and clear information about a flight. Similarly, negative perceptions

stemming from noise and visual pollution may also evolve based on an understanding of the mission's purpose.

REFERENCES

[1] Cohen, A. P., Shaheen, S. A., & Farrar, E. M. (2021). Urban air mobility: History, ecosystem, market potential, and challenges. *IEEE Transactions on Intelligent Transportation Systems*, *22*(9), 6074-6087.

[2] Drone Industry Insights. Global Drone Market Report 2022–2030.

[3] SESAR Joint Undertaking. European Drones Outlook Study: Unlocking the value for Europe. 2016 [cited 2023 27.07.2023]; Available from: https://www.sesarju.eu/sites/default/files/docum ents/reports/ European_Drones_Outlook_Study_2016.pdf.

[4] Mc Carthy, T. (2022). Accelerating the Potential of Drones for Local Government International Best and Emerging Practice Report. Available from: https://smartdublin.ie/wp-content/uploads/2022/05/Drone-Report-V15-Digital-Version.pdf

[5] European Commission. A Drone Strategy 2.0 for a Smart and Sustainable Unmanned Aircraft Eco-System in Europe. 2021. Available online: https://ec.europa.eu/commission/presscorner/detail/en/ip_22_7076

[6] EASA. Study on the Societal Acceptance of Urban Air Mobility in Europe. 2021. Available online: https://www.easa.europa.eu/sites/default/files/dfu/uam-full-report.pdf (accessed on September 2024).

[7] CORUS-XUAM Project. U-Space ConOps and Architecture (Edition 4). 2023. Available online: https://sesarju.eu/sites/default/files/documents/reports/Uspace%20CON OPS%204th%20edition.pdf (accessed on September 2024).

[8] Çetin, E., Cano, A., Deransy, R., Tres, S., & Barrado, C. (2022). Implementing mitigations for improving societal acceptance of urban air mobility. Drones, 6(2), 28.

[9] Wang, N., Mutzner, N., & Blanchet, K. (2023). Societal acceptance of urban drones: A scoping literature review. Technology in Society, 102377

[10] Tepylo, N., Straubinger, A., & Laliberte, J. (2023). Public perception of advanced aviation technologies: A review and roadmap to acceptance. Progress in Aerospace Sciences, 138, 100899

[11] Klauser, F., & Pedrozo, S. (2017). Big data from the sky: popular perceptions of private drones in Switzerland. Geographica helvetica, 72(2), 231-239.

[12] Tan, L. K. L., Lim, B. C., Park, G., Low, K. H., & Yeo, V. C. S. (2021). Public acceptance of drone applications in a highly urbanized environment. Technology in Society, 64, 101462.

[13] Kloss, B.; Riedel, R. Up in the Air: How Do Consumers View Advanced Air Mobility? Available online: https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/up-in-the-air-how-do-consumers-view-advanced-air-mobility

[14] Goyal, R., Reiche, C., Fernando, C., & Cohen, A. (2021). Advanced air mobility: Demand analysis and market potential of the airport shuttle and air taxi markets. *Sustainability*, *13*(13), 7421

[15] Rice, S., Winter, S. R., Mehta, R., & Ragbir, N. K. (2019). What factors predict the type of person who is willing to fly in an autonomous commercial airplane?. *Journal of Air Transport Management*, *75*, 131-138.

[16] Keller, D. K. Adjekum, B. N. T. Alabi, and B. Kozak, "Measuring Public Utilization Perception Potential of Unmanned Aircraft Systems," *International Journal of Aviation, Aeronautics, and Aerospace*, vol. 5, no. 3, 2018, doi: 10.15394/ijaaa.2018.1243.

[17] S. Hasan Urban Air Mobility (UAM) Market Study NASA Urban Air Mobility. (2019) https://ntrs.nasa.gov/api/citations/20190026762/downloads/20190026762.pdf

[18] L. Riza, R. Bruehl, H. Fricke, and P. Planing, "Will air taxis extend public transportation? A scenario-based approach on user acceptance in different urban settings," *Transp Res Interdiscip Perspect*, vol. 23, p. 101001, Jan. 2024, doi: 10.1016/J.TRIP.2023.101001.

[19] Dublin City Council Drones and Emerging Technology National Survey. Executive Report 2021

[20] Department of Transport (2024) Unmanned Aircraft Systems – Public consultation on Policy Framework https://www.gov.ie/pdf/?file=https://assets.gov.ie/281606/7fd2dff1-7767-4ba2-9643-29499de43c2b.pdf#page=null

[21] Dublin City Council - Drone and Urban Air Mobility Strategy 2024-2029 Available at: https://smartdublin.ie/wp-content/uploads/2021/01/DCC-Drone-Strategy-24-Web.pdf

[22] Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative research in psychology, 3(2), 77-101.

[23] Kandrot, S., & Holloway, P. (2020). Applications of drone technology for sustainable development of the coastal zone: A literature review. Project report.

[24] Melo, S., Silva, F., Abbasi, M., Ahani, P., & Macedo, J. (2023). Public acceptance of the use of drones in city logistics: A citizen-centric perspective. Sustainability, 15(3), 2621.

[25] Kellermann, R., Biehle, T., & Mostofi, H. (2023). Modelling public attitude towards drone delivery in Germany. European Transport Research Review, 15(1), 38

[26] End, A., Barzantny, C., Stolz, M., Grupe, P., Schmidt, R., Papenfuß, A., & Eißfeldt, H. (2023). Public acceptance of civilian drones and air taxis in Germany: A comprehensive overview.

[27] Straubinger, A., Rothfeld, R., Shamiyeh, M., Büchter, K. D., Kaiser, J., & Plötner, K. O. (2020). An overview of current research and developments in urban air mobility–Setting the scene for UAM introduction. *Journal of Air Transport Management*, *87*, 101852.

[28] Mostofi, H., Biehle, T., Kellermann, R., & Dienel, H. L. (2024). Modelling public attitude towards air taxis in Germany. *Transportation Research Interdisciplinary Perspectives*, *24*, 101045.

[29] Sliusar, N., Filkin, T., Huber-Humer, M., & Ritzkowski, M. (2022). Drone technology in municipal solid waste management and landfilling: A comprehensive review. Waste Management, 139, 1-16.

[30] Kaminski, M., and S. Witnov. 2015. The Conforming Effect: First Amendment Implications of Surveillance. Beyond Chilling Speech. University of Richmond Law Review 49(2): 465–518.

[31] Klauser, F. (2022). Policing with the drone: Towards an aerial geopolitics of security. *Security Dialogue*, *53*(2), 148-163.

[32] Jackman, A., & Hooper, L. (2023). Drone incidents and misuse.

[33] Stolz, M., Papenfuss, A., de Albuquerque Richers, G. C., Bahnmüller, A., Syed, A. M., Gerndt, A., ... & Biella, M. (2023). A mixed-method approach to investigate the public acceptance of drones. *CEAS Aeronautical Journal*, *14*(4), 835-855.

[34] Torija, A. J., Li, Z., & Self, R. H. (2020). Effects of a hovering unmanned aerial vehicle on urban soundscapes perception. *Transportation Research Part D: Transport and Environment*, *78*, 102195.

[35] European Aviation Safety Agency, " Guidelines on noise measurement of unmanned aircraft systems lighter than 600 kg operating in the specific category (low and medium risk)" (2023).

[36] European Aviation Safety Agency, "Environmental Protection Technical Specifications applicable to VTOL-capable aircraft powered by non-tilting rotors" (2023)

[37] European Aviation Safety Agency, "Environmental Protection Technical Specifications applicable to VTOL-capable aircraft powered by tilting rotors" (2024).

[38] https://www.easa.europa.eu/en/domains/civil-drones/privacy/privacy-by-design

[39] https://www.easa.europa.eu/en/domains/civil-drones/privacy/privacy-handbook