Country report on the use of drones in construction-related activities

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LIST OF ABBREVIATIONS

AAM	*Advanced air mobility*
AMC	*Acceptable Means of Compliance*
BIM	*Building Information Modelling*
BVLOS	*Beyond Visual Line of Sight Operations*
CAGR	*Compound Annual Growth Rate*
DESI	*Digital Economy and Society*
DUTO	*Declared UAS Training Organisations*
EASA	*European Aviation Safety Agency*
EC	*European Commission*
ECAC	*European Civil Aviation Conference*
EU	*European Union*
eVTOL	*Electric vertical take-off and landing*
IAA	*Irish Aviation Authority*
ICAO	*International Civil Aviation Organisation*
ICT	*Information Communication Technology*
JAA	*European Joint Aviation Authorities*
JARUS	*Joint Authorities for Rulemaking on Unmanned Systems*
LUC	*Light UAS operator certificate*
MTOM	*Maximum Take-off Mass*
MySRS	*My Safety Registration System*
NDP	*National Development Plan 2021-2030*
NPF	*National Planning Framework*
PDRA`s	*Pre-Defined Risk Assessments*
QR	*Quick Response*
RPAS	*Remotely Piloted Aircraft Systems*
S.I	*Statutory Instrument*
SME	*Small Medium Enterprise*
SORA	*Specific Operational Risk Assessment*
UAS	*Unmanned Aircraft System*
URL	*Uniform Resource Locator*
UTM	*Unmanned Aircraft System Traffic Management*
VLOS	*Visual Line of Sight*

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1 Overview – Ireland

1.1 Regulations (Standard Operating Conditions)

As one of the 27-member states of the European Union, drone usage in Ireland is governed under the European Unmanned Aircraft System (UAS) Regulations. These European regulations came into law in Ireland on 01st January 2021 replacing the now withdrawn Irish regulation S.I No. 563/2015 – Irish Aviation Authority (Small Unmanned Aircraft (Drones) and Rockets) Order, 2015. The UAS regulations may be summarised as:

- **Regulation 2019/947 - rules and procedures for the operation of unmanned aircraft**. This is referred to as the implementing regulation and sets out rules for the operation of drones (referring to an unmanned aircraft and the equipment to control it) and for personnel, including remote pilots and organisations involved in such operations (The European Commission, 2019a).

- **Regulation 2019/945 - Unmanned aircraft systems – design and manufacture requirements.** The delegated regulation covers three main issues: the technical requirements for drones and for remote identification add-ons; the rules for drones, accessories kits and remote add-ons available on the European Union (EU) market; the rules for non-EU drone operators conducting drone operations in the single European sky airspace (The European Commission, 2019b).

These EU regulations are applicable throughout all EU member states helping to standardise the rules, limitations, permissions and certifications for the safe operation of drones. The harmonised regulations will enhance the growth of the European Commercial Drone Market, the size of which has surpassed 3 billion USD in 2020 and is predicted to witness over 10% Compound Annual Growth Rate (CAGR) between 2021 and 2027.(Graphical Research, 2022)

The guiding principle of the implementing regulation is that the rules and procedures applicable to UAS operations should be proportionate to the nature and risk of the operation or activity. The regulations are safety centric however due to the unique capabilities of UAS, due consideration is also given to the potential privacy, security and data protection issues. Drone operations need to be adapted to the operational characteristics of the unmanned aircraft concerned and the characteristics of the area of operations, such as the population density, surface characteristics, and the presence of buildings (The European Commission, 2019a).The risk level criteria from both the ground and air as well as other criteria should be used to establish three

categories of operations as identified in 2019/947 which include, the '*open*', '*specific*' and '*certified*' categories, the defining criteria for which are summarised in sections 1.1.1 to 1.1.3.(The European Commission, 2019a)

Regulation 2019/945 primarily focuses on the technical aspects of UAS with new requirements for the design, manufacture and retailing of UAS. The regulation specifies Class identification labels (C-Markings) that are required to be fixed to a UAS meeting the defined criteria of the product standard. At the present time, the C-Marking acceptable means of compliance (AMC) standard is not available for UAS manufactures and so no C-Marked UAS are commercially available. The classification of drones as identified in Figure 1 has allowed for detailed specification of the types of drones (mass, speed, joules, payload, camera) permissible in the three categories of operations identified in Regulation 2019/947 (The European Commission, 2019a). UAS that do not comply with the C-Marking requirements in the future will be referred to as legacy drones.

Figure 1 C-Marking Labels as per regulation 2019/945 (EASA, 2022)

1.1.1 Open Operations (Subcategories A1, A2 & A3)

Open category operations do not require any authorisation from an aviation authority or declaration by the operator before the flight. These are considered as sufficiently low risk operations categorised by simple rules followed by sufficiently competent and trained remote pilots. There are three key subcategories (A1, A2 & A3) within the open category where the mass and type of the UAS and distance from '*uninvolved persons*' are explicitly specified. '*Uninvolved persons*' means persons who are not participating in the UAS operation or who are not aware of the instructions and safety precautions given by the UAS operator. The rules that are common amongst each of the subcategories for the Open Category include:

- Operations are restricted to visual line of sight (VLOS) only, beyond line of sight (BLOS) is outside of the scope of these operations.

- The maximum take-off mass of the UAS must be less than 25kg. Refer to subcategories A1, A2 & A3 for the allowable UAS masses and allowable speeds for each subcategory.
- The UAS must be maintained within a 120m altitude from the closest point on the Earth's surface.
- The UAS must be maintained at a minimum horizontal distance from an uninvolved person. Refer to subcategories A1, A2 & A3 for further details.

The rules and restrictions for safe aviation within subcategories A1, A2 & A3 of the Open Category may be summarised as follows:

Subcategory A1 – Fly over people

The A1 subcategory within the Open Category of Drone operations is identified as being very low risk of harm to '*uninvolved persons'* due to the very low weight of unmanned aircraft permitted for use in the subcategory. The operating area for this subcategory may be defined as sparsely populated areas in uncontrolled airspace or controlled airspace with height restrictions. Refer to Table 1 for further details.

Table 1 Open Category of Drone Operations – Subcategory A1 UAS & Remote Pilot requirements (Dublin City Council, 2021)

Category	Aircraft Type	Distance From Uninvolved Persons	Flight Over Assemblies of People	Operating Area	Operating Airspace	Pilot Competency
A1 Transition Period	'*legacy*' <500g* (Article 22 Operations)	No Intentional Flight Overhead People	Not Permitted	Populated & Sparsely Populated	Uncontrolled Airspace. Controlled Airspace within Height Restriction Zones. Some Restricted or Prohibited Geographic Zones with Permission from the Controlling Authority (e.g., Prison Service)	A1/A3 Proof of Online Training Certificate
A1	Private Built <250g <19m/s	Fly Overhead				Read User Manual
	'*legacy*' (placed on market before 01 Jan 2023) <250g (Article 20 Operations)	Fly Overhead				Read User Manual
	C0**	Fly Overhead				Read User Manual
	C1**	No Intentional Flight Overhead People				A1/A3 Proof of Online Training Certificate
	* From **01 Jan 2023** the Transition Period ends, and '*legacy*' unmanned aircraft placed on the market before 01 Jan 2023 weighing 250g or greater are restricted to A3 Subcategory only (Article 20 Operations). **C Class unmanned aircraft may not be available on the market until late 2022 or after.					

Subcategory A2 – Fly close to people

The A2 subcategory within the Open Category of Drone operations permits use of larger and more sophisticates UAS. Risk to uninvolved persons or assemblies of people is managed through specified minimum horizontal distances that the remote

pilots must maintain. There is also an additional competency standard and training (*A2 Category Training*) that the remote pilot must achieve in comparison to operations within the A1 & A3 subcategories.

Table 2 Open Category of Drone Operations – Subcategory A2 UAS & Remote Pilot requirement (Dublin City Council, 2021)

Category	Aircraft Type	Distance From Uninvolved Persons	Flight Over Assemblies of People	Operating Area	Operating Airspace	Pilot Competency
A2 Transition Period	*'legacy'* 500g to <2kg* (Article 22 Operations)	50m Horizontally	Not Permitted	Populated & Sparsely Populated	Uncontrolled Airspace Controlled Airspace within Height Restriction Zones. Some Restricted or Prohibited Geographic Zones with Permission from the Controlling Authority e.g., Prison Service	Open A2 Certificate of Competency
A2	C2**	30m Horizontally 5m with Low-Speed Mode				
	* From 01 Jan 2023 the Transition Period ends, and 'legacy' unmanned aircraft placed on the market before 01 Jan 2023 weighing 250g or greater are restricted to A3 Subcategory only (Article 20 Operations). **C Class unmanned aircraft may not be available on the market until late 2022 or after.					

Subcategory A3 – Fly far from people

The A3 subcategory of the Open Category of Drone operations is considered as low risk as it permits large and heavy unmanned aircraft (up to 25kg) to be flown in flight areas that over 150m from residential, commercial, industrial, and recreational areas. Flying operations are restricted to uncontrolled airspace or controlled airspace with height restrictions. Risk to an uninvolved person is effectively eliminated by the requirement to have no uninvolved person in the flight area.

Table 3 Open Category of Drone Operations – Subcategory A3 UAS & Remote Pilot requirement (Dublin City Council, 2021)

Category	Aircraft Type	Distance From Uninvolved Persons	Flight Over Assemblies of People	Operating Area	Operating Airspace	Pilot Competency
A3 Transition Period	*'legacy'* to <25kg (Article 22 Operations)	No uninvolved person in the flight area.	Not Permitted	Flight area 150m horizontally from Residential, Commercial, Industrial & Recreational areas.	Uncontrolled Airspace Controlled Airspace within Height Restriction Zones. Some Restricted or Prohibited Geographic Zones with Permission from the Controlling Authority e.g., Prison Service	A3 Proof of Online Training Certificate
A3	Private Built 250g to <25kg C3* & C4* *'legacy'* (placed on market before 01 Jan 2023) 250g to <25kg** (Article 20 Operations)					
	*C Class unmanned aircraft may not be available on the market until late 2022 or after. ** From 01 Jan 2023.					

1.1.2 Specific operations.

Specific operations require operational authorisation issued by the competent national aviation authority which in the context of Ireland is the Irish Aviation Authority (IAA), with certain exceptions. These operations are considered as medium to high risk operations that fall outside of the rules governing the limitations of the Open Category. Authorisation to fly in this category is based on a risk assessment and submission of an operations manual outlining operational procedures. Public bodies and private companies both need to register with the IAA as a UAS operator to operate in this category and all remote pilots must undertake *Specific Category* training. Some examples of operations that constitute the Specific Category of Operations include:

- Beyond visual line of sight operations (BVLOS) where the remote pilots are unable to see the UAS for some or all of the operation.
- Operations in controlled airspace or geographical zones not permitted within the open category.
- Where a UAS of 25kg or greater is required for the operations.
- When a flight altitude in excess of 120m from the closest point on the earth's surface needs to be achieved.
- For operations in built up and densely populated areas.
- Operations that require the dropping of payloads.

Where the operational intent of the drone operation falls outside of the limitations of the Open Category of Operations then the Specific Category is likely to apply.

Remote pilots operating in the Specific Category must comply with the procedures and limitations of the UAS Operators *'authorisation'* and their operations manual. Authorisation to operate in the specific category is primarily based on a risk assessment which should comply with Article 11 of Regulation 2019/947 "Rules for conducting an operational risk assessment". Amongst the criteria for risk assessments identified in Article 11 include the requirement to:

- **Describe the Operation**. The type of operation being conducted, the safety objectives, who is leading the operations as well as their competency levels and the environment in which the operations are being carried out.
- **Safety Assessment.** Identify all ground and air safety risks identifying and proposing operational and technical risk mitigation strategies to ensure the operation may be conducted as safely as possible.

There are three principle approaches or methodologies of utilising a risk assessment to obtain authorisation from the IAA which include:

UAS operator provided risk assessment - SORA

For non-routine or nonstandard operations, the UAS operator may be required to complete a *Specific Operations Risk Assessment* (SORA), a methodology developed by JARUS (Joint Authorities for Rulemaking on Unmanned Systems). This methodology provides the framework for Drone Operators to outline the risks and mitigation measures involved in their proposed operation and allows the aviation authority a systematic approach as to how the risks and mitigation measures may be assessed. The *'SORA'* is a 10-step process that includes the concept of operation definition, ground and air risk categorisation, an overall risk rating and operational safety objectives.(The European Commission, 2019a)

EASA provided risk assessment - PDRA

For more standard or routine operations, EASA has published a number of Pre-Defined Risk Assessments (PDRA`s) which permit clearly defined operations within specified operational and technical limitations. Where the operators proposed operation falls within these published risk assessments and associate limitations, the operator may make an application to the relevant aviation authority and "Authorisation" is granted based on the identified PDRA. As part of all PDRA applications, the operator is required to provide supporting documentation in the form of an Operational manual. There are currently 4 published PDRAs in circulation and it is anticipated that these will form the basis of the most common approach for a UAS Operator to acquire Authorisation within in the Specific Category.

Light UAS Operator Certificate ('LUC')

Local Authorites (Government Bodies) may apply to the national designated authority responsible for the implementation of national aviation regulations for a Light UAS Operator Certificate (LUC). A LUC allows local authorities assess the risk of drone related operations inhouse. It is up to the IAA in Ireland to assess whether the local authority has the competency required to assess the risk of a drone operation(s) inhouse. Where deemed sufficiently competent, a LUC certificate may be issued to allow 'inhouse authorise' of drone operations.

The *'LUC'* will outline what authorising privileges the Local Authority has but typically should allow for the authoristaion of *'PDRA'*s and to conduct operations using the Standard Scenario system. Where it is deemed that a high level of competency in assessment exists inhouse, those authorisies may authorise operations utilising the SORA process. The general requirments for an Authority to be considered as competent by the IAA are covered in regulaltion 2019/947 and include:

- a description of the UAS operator's management system, including its organisational structure and safety management system;

- the name(s) of the responsible UAS operator's personnel, including the person responsible for authorising operations with UASs;
- a statement that all the documentation submitted to the competent authority has been verified by the applicant and found to comply with the applicable requirements.

1.1.3 Certified operations.

Operations shall be classified in the '*certified*' category where the operation is conducted in any of the following conditions:

- When flying over assemblies of people which may be defined as gatherings where persons are unable to move away due to the density of the people present;
- When the operation involves the transport of people;
- When the operation involves the carriage of dangerous goods, that may result in high risk for third parties in case of accident.(The European Commission, 2019a)

These scenarios are recognised as some of the most complex operations that pose a risk similar in nature to manned aviation. In addition, UAS operations shall be classified as UAS operations in the 'certified' category where the competent authority, based on the risk assessment provided for in Article 11, considers that the risk of the operation cannot be adequately mitigated without the certification of the UAS and of the UAS operator and, where applicable, without the licensing of the remote pilot.[1]

1.2 Strategic plan for the development of RPAs/drones in the country. Priorities

Currently, there is no definitive strategic plan for the development of remotely piloted aircraft systems (RPAS) or drones in Ireland. The policy and regulatory landscape has struggled to keep pace with the rapidly evolving technology. In 2013, the Irish government published a "National Digital Strategy for Ireland, Phase 1" (Government of Ireland, 2013) which was closely followed in 2018 by the Irish National BIM Councils (NBC) publication "Roadmap to Digital Transition, for Irelands Construction Industry 2018-2021" (CITA, 2018). While not explicitly referenced in either publication, the utilisation of drones and other disruptive technologies for applications in digital construction and BIM has become synonymous. Leveraging such technologies to digitise the construction sector is a high priority in the NBC roadmap. In 2021, the Department of Public Expenditure and Reform published a National Development Plan (NDP) 2021-2030 (Department of Public Expenditure and Reform, Ireland, 2021). There are number of key priorities or investments that are planned for Ireland as highlight in the NDP (Department of Public Expenditure and Reform, Ireland, 2021):

1. Compact Growth – focusing on affordable housing and Urban Regeneration and Development
2. Enhanced Regional Accessibility – investment in active travel programme, enhancement of train and bus services
3. Strengthened Rural Economies and Communities – focusing on rural regeneration and development Fund, National Broadband Plan, supports for the remote working hub network and enhanced public transport through the Connecting Ireland bus programme
4. A Strong Economy, supported by Enterprise, Innovation and Skills – aiming at Green and Digital Transition, development of Technical Universities and national grand challenges programmes
5. High Quality International Connectivity – focusing on airports and ports development and investment
6. Enhanced Amenity and Heritage - Investments in the National Cultural Institutions, National Parks and sport related institutions.
7. Climate Action – retrofitting and flood relief schemes
8. Sustainable Management of Water and other Environmental Resources – Water and drainage
9. Access to quality Childcare, Education and Health Services
10. Other Sectors investment

The NDP 2021-2030 together with National Planning Framework (NPF) (Government of Ireland, 2022) combine to form Project Ireland 2040. The NPF sets the vision and strategy for the development of our country to 2040 and the NDP provides the enabling investment to implement that strategy This project focuses on number of areas aligned with the NDP document. As a result of this, one of the first enterprises

is a Build Digital Project (BDP) Ireland.(BDP, 2022). This is a first step into the incorporation and wider use of new digital technology in construction: "*The Build Digital Project will transform the Irish construction and built environment sectors by enabling all stakeholders, particularly SMEs, clients, and suppliers, to develop, maintain, and continuously improve their capabilities as digitally enabled, standards-based, agile, collaborative, and sustainable participants in the delivery of Project Ireland 2040*." According to Construction Sector Innovation and Digital Adopton Group, there are 7 innovation actions that will be delivered (Rudden, 2020):

- Construction Research
- Productivity and Sustainability Funding
- Modern Methods of Constrcution
- Construction Technology Centre
- Constrcution Skillnet
- ePlanning
- Build Digital Project.

Figure 2 illustrates the main linkages, actions and outcomes of the innovation actions identified above. Drones are a key focus area of the Construction Sector Group which are linked to the development of a new Construction Technology Centre which is currently under development.

The Construction Technology Centre (Enterprise Ireland, 2021) will be a industry led body together with Irish Government that with the right technical infrastructure will drive digitisation. Its key role will be focusing on:

- To provide funding avenue
- Share industry expertise
- Provide research and development capacity
- Become a collaboration platform of all construction industry stakeholders
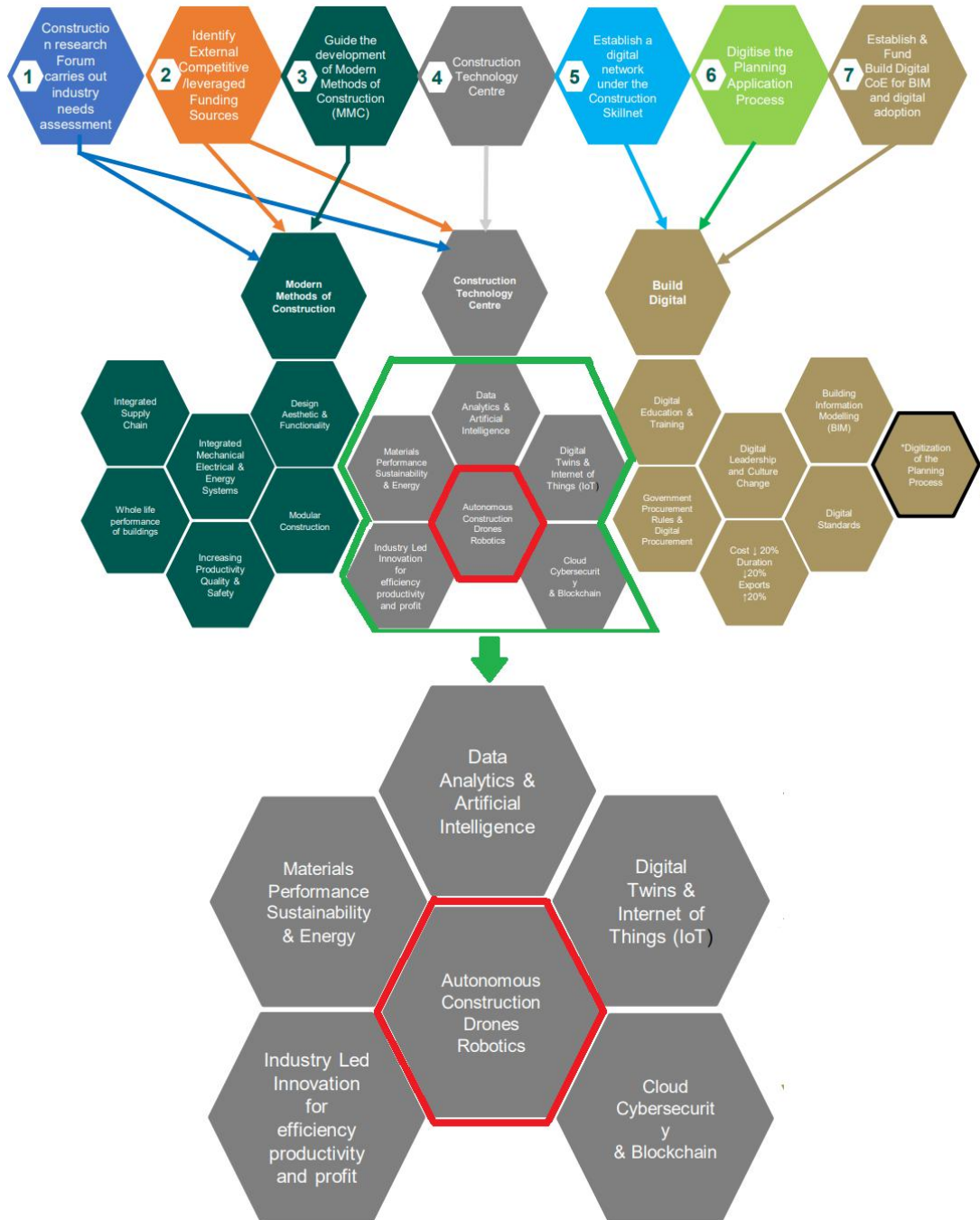
Figure 2 Construction Sector Group Innovation and Digital Adoption, Linkages, Actions and Outcomes (Rudden, 2020)

1.3 Government agencies with jurisdiction over RPAs

EASA (European Union Aviation Safety Agency), as established by the European Commission (EC) in 2002 (EASA, 2022), is Europe's leading agency responsible for civil aviation safety across the EU. EASA`s remit of responsibility includes but is not limited to:

- Draft implementing rules in all fields pertinent to the EASA mission
- Certify & approve products and organisations, in fields where EASA has exclusive competence (e.g. airworthiness)
- Provide oversight and support to Member States in fields where EASA has shared competence (e.g. Air Operations, Air Traffic Management)
- Promote the use of European and worldwide standards
- Cooperate with international actors in order to achieve the highest safety level for EU citizens globally (e.g. EU safety list, Third Country Operators authorisations) (EASA, 2022)

The Irish Aviation Authority (IAA) is Irelands designated national authority responsible for the implementation of National and European Aviation Regulations. The Authority ensures that Irish civil aviation operates to International and European safety standards and systems in accordance with international agreements. The IAA carries out a range of operational and regulatory functions and services on behalf of the Irish State relating to the safety and technical aspects of Civil Aviation including:

- Air Traffic Management
- Safety Regulation
- The Role of the National Supervisory Authority
- Single European Sky
- Legislation
- Commercial Services
- Aviation and the Environment
- Safety Assessment of Foreign Aircraft
- Policy on Consultation by Planning Authorities
- Non-Aviation Activities Impacting Airspace

Flying and operation of RPAs or Drones is regulated by EU regulation 2019/947 and the agency responsible for implementing and supervising is The Irish Aviation Authority (IAA)(IAA, 2022a). IAA also is responsible for provision of guidelines, regulating the use of drones warranting public safety.

The IAA is a commercial semi-state company responsible for three core functions:

- air traffic management and related services in Irish controlled airspace
- the safety regulation of the civil aviation industry
- civil aviation security supervision.

The table below represents detailed function that IAA is responsible for

Table 4 IAA Functions & Responsibilities (IAA, 2022a)

Functions	Responsibilities
Air Traffic Management	Air traffic control, ATC flight information, Alerting and search and rescue services, Aeronautical information, North Atlantic Communications.
Safety regulatory functions	Certifying and registering aircraft airworthiness, Licensing personnel and organisations involved in aircraft maintenance Licensing pilots, air traffic controllers and aerodromes, Approving and monitoring air carrier operating standards.
Supervision of civil aviation security	Inspections and Audits of:Airports, air carriers, cargo companies, airport suppliers, suppliers of in-flight services

In order to ensure the highest operating quality IAA operates in line with international standards:
- International Civil Aviation Organisation (ICAO)
- European Joint Aviation Authorities (JAA)
- EUROCONTROL
- European Civil Aviation Conference (ECAC)
- European Aviation Safety Agency (EASA)
- European Union (EU).

1.4 RPA operator qualification requirements / Pilot certifications needed

The Implementing Regulation 2019/947 - rules and procedures for the operation of unmanned aircraft, specifies unique responsibilities for both the UAS operator and the remote pilot. Article 2 of Regulation 2019/947 makes the clear distinction between the UAS Operator and remote Pilot as follows:

A **UAS operator** means any legal (government body or private company) or natural person (recreational pilot or sole trader) operating or intending to operate one or more UAS (The European Commission, 2019a).

A **'remote pilot'** means a natural person responsible for safely conducting the flight of a UAS by operating its flight controls, either manually or, when the UA flies automatically, by monitoring its course and remaining able to intervene and change its course at any time(The European Commission, 2019a).

Whether a public body, private company or sole trader, the enterprise carrying out the drone operations is required to be designated and registered as the UAS Operator with the IAA. Article 14 – Registration of UAS Operators and certified UAS, of regulation 2019/947, outlines a requirement for UAS Operators to register themselves:

a. when operating within the 'open' category, any of the following unmanned aircraft:

i. with a MTOM of 250 g or more, or, which in the case of an impact can transfer to a human kinetic energy above 80 Joules;

ii. that is equipped with a sensor able to capture personal data, unless it complies with Directive 2009/48/EC.

b. when operating within the 'specific' category an unmanned aircraft of any mass.

The vast majority of drone operations whether for commercial or recreational purposes, will require the ability to record data of some description (visual, audio, etc) thereby necessitating registration as a drone operator with the IAA. The only exception being where the UAS is privately built, less than 250g, has no sensors capable of capturing data and operating within the Open Category.

1.4.1 Registration and Training

Registration as a drone operator with the IAA is done through the MySRS (My Safety Regulatory System) portal in Ireland. This a purpose-built online platform for the management and issuing of RPA Licences/Certificates in Ireland. The first step in the registration process is to sign up for an account on MySRS where the operator will be required to upload identification in the form of a Drivers Licence, National ID or Passport. Once the operator's identification has been verified, they will be provided with login credentials for their own account on the MySRS portal and must pay the €30 fee to complete the registration process.

Once registered, the operator will need to complete the **online A1/A3 category training course**, this is the basic training requirement and foundation for all other training requirements. The training is provided within the MySRS portal and consists of a 20min slide show followed by a 40-question multiple choice exam. Where an applicant achieves a 75% or greater overall result, they will be able to download the A1/A3 proof of online training cert as per the exemplar certificate shown in figure 2. This certificate is issued by the IAA and entitles the operator to fly a RPAS in the A1/A3 Open category.

A1/A3 Category Training

A1 Subcategory: Drones weighing less than 500g or have a C0 or C1 label. Fly close to people below 120m and in sparsely populated and populated areas.

A3 Subcategory: Drones weighing between 500g and 25kgs or have a C2, C3 or C4 label. Fly 150m from Residential, Commercial, Industrial and Recreational areas below 120m

Figure 3 Exemplar A1/A3 Proof of Training Certificate (IAA, 2022a)

For open category A2, additional training to the A1/A3 training is required. In Ireland, all further training requirements are met through commercial UAS schools referred to as Declared UAS Training Organisations (DUTO). The additional training covers additional subject areas to enable an Open Category pilot fly within the A2 Subcategory. In Ireland, DUTO typically offer this training online through their own online portals which cumulates in a 30-question multiple choice exam.

A2 Category Training

A2 Subcategory: drone weighing 500g to <2kg, or has a C2 label. This legally permits a Remote Pilot with an unmanned aircraft weighing 500g to 2kg (4kg EU Class C2) to fly as close as 50m from 'uninvolved persons', or as close as 30m for those using EU Class C2 drones. Certification is valid for 5 years.

![Drones4Vet logo]

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Table 5 Summary of the A1, A2 & A3 Category Training Requirements (Dublin City Council, 2021)

Subcategory	Type of Training	Where	Award	Validity	Notes
A1/A3	Open A1/A3 Proof of Online Training	Online - IAA MYSRS	Open A1/A3 Proof of Online Training	5 Years	- 9 core subject areas. - 40 multiple choice question online exam (MYSRS). - Each remote pilot will be required to open an account with the IAA's MYSRS online portal.
A2	Open A2 Certificate of Competency	Declared UAS Training Organisation (DUTO) – Commercial UAS School	Open A2 Certificate of Competency	5 Years	- 3 additional subject areas covered over A1/A3. - 30 multiple choice question exam. - Self-practical training. - IAA issue Open A2 Certificate of Competency on recommendation of DUTO. - Remote pilot must first hold the Open A1/A3 Proof of Online Training certificate.

1.5 Key figures (nº of registered operators like corporations, SMEs…; registered aircrafts; …)

Although Ireland has a relatively small population of approx. 5million, it has a rapidly growing number of UAS pilots and SMEs utilising drones for commercial operations. The most common SMEs include those involved in Geospatial Surveying, Construction and Photography. According to information provided by the IAA, currently there are **7,533 registered drone operators**. As of 2022, the breakdown of remote pilot certificates successfully achieved and subsequently issued by the IAA was as follows:

- For **Open category A1/A3** - **11,994** remote pilot certificates issued
- For **Open category A2** - **1,218** remote pilot certificates issued
- For **Specific category (STS)** – **284** remote pilot certificates issued

Currently, there are 2 companies that have obtained a LUC which is a Light UAS operator certificate allowing organisations proving to be able to assess the risk of an operation themselves.

According to EU/Eurostat that has initiated a smart statistics approach in order to retrieving information on drone related businesses in Europe there are 681 companies found on the Web with services related to drones usage (European Commission. Statistical Office of the European Union., 2022).

This search engine was used to find URLs of drone operating businesses since data for Ireland is not available.

	CLOUD	CONSULTANCY	DISTRIBUTION	FILMING_IMAGING	INSPECTION	INSURANCE	MAPPING	MONITORING	RENTING	SOFTWARE	SURVEYING	TRAINING
CLOUD	1	1	0	0	1	0	0	0	0	0	1	0
CONSULTANCY	1	4	0	1	3	0	2	1	0	0	3	1
DISTRIBUTION	0	0	4	0	0	0	0	0	0	0	0	0
FILMING_IMAGING	0	1	0	35	15	0	11	1	0	0	15	0
INSPECTION	1	3	0	15	22	0	11	2	0	1	16	0
INSURANCE	0	0	0	0	0	1	0	0	0	0	0	0
MAPPING	0	2	0	11	11	0	15	2	0	0	11	0
MONITORING	0	1	0	1	2	0	2	2	0	0	2	0
RENTING	0	0	0	0	0	0	0	0	1	0	0	0
SOFTWARE	0	0	0	0	1	0	0	0	0	1	0	0
SURVEYING	1	3	0	15	16	0	11	2	0	0	25	0
TRAINING	0	1	0	0	0	0	0	0	0	0	0	3

Figure 4 Drone company activities in the value chain and their co-occurrence in Ireland (European Commission. Statistical Office of the European Union., 2022)

As clearly visible from the above table, the main drone related services provided by companies in Ireland are photogrammetry and imaging, surveying, inspections and mapping. Services like using drones for goods deliveries are still in its infancy.

2 Industry Overview

Considering that Ireland is a relatively small country (about 5.12 million people (Citizensinformation.ie, 2022)) with a drone industry is rapidly evolving, however there is no top-down approach as mentioned in chapter 1.2. Usage of drones is in Ireland is mainly used for:

- Image/Video capture
- Land and buildings Surveying
- LIDAR scanning
- Mapping

Of course there are other areas of drone usage in Ireland that are perhaps less trasnaprent such as: security activities, coast guarding, archaeology etc.

2.1 Focus. Related activities linked to RPAs

Apart from day to day use of RPAs in different industries such as: Construction, Surveying & GIS, Farming, Audio/Visual, Environmental Activities, Defence Forces, Archaeology, Coast Guarding and Security; there are number of national and local initiatives that are emerging.

2.2 Developments

There are number of research driven projects between academia and industry. One of few recent initiatives is project approved in June 2022 by European Union, controlled by Future Mobility Campus Ireland (FMCI)(Derguech, 2022). It is a three-year project worth around €7 million partnering Irish and European stakeholders such as Shannon Group, IAA, Collins Aerospace (Ireland and France), Dublin-based Avtrain, Manna and Deepblue in Italy. FMCI is a first test bed in Ireland that will focus on advanced mobility technologies both ground related technologies (ie. Autonomous driving, micro-mobility and others) and air technologies such as: unmanned drones, eVTOL, AAM, UTM).

Another research institute worth mentioning is a local based development is a project "Accelerating the potential of drones for local governments" led by Dublin City Council and Smart Dublin co-funded by Department of Public Expenditure and Reform (DPER) (SmartDublin, 2022). Following collection of drone use best practices in Europe, the project focused on usage of drone industry in Ireland in 5 sub-sectors: public safety, health and environment, planning and development, transport and logistics and finally energy.

There were number of results for drone usage that will aid future decision making such as (SmartDublin, 2022):
  → PUBLIC SAFETY:
      o Fire safety site mapping,
      o Fire Services High Rise Emergency Air Support

- o Firebreaks creation
- o Flood risk mapping and planning
→ Health and Development:
- o Defibrator Delivery,
- o Medical Supplies delivery
- o Urban areas sanitation
- o Organ Transplant Delivery
- o Pollution monitoring and control
- o Critical infrastructure control
→ Planning and Development:
- o Site Inspection and Enforcing,
- o Aiding Construction and development for local Government buildings
→ Transport and logistics:
- o Road maintenance and monitoring,
- o Traffic surveillance
- o Presence of drones in ports
- o Post and other deliveries enabled by drones
→ Energy:
- o Monitoring Energy Storage and Transmission Systems,

Another interesting output of this project was National Survey (902 responses) which 50% of responders knew about drone technology and uses and 46% had some idea. When asked about drone usage in Ireland, 84% of respondents were positive about the technology. It seems that public is expecting drone deliveries to be well in use by 2025. Amongst highest uses of drone technology according to responders would be:

- emergency response
- planning
- environmental monitoring and policing
- waste management
- traffic management
- policing

Amongst biggest concerns were privacy (75%) illegal activities (inl. Data hacking) 54% and safety (50%). As a final result worth mentioning was lack of knowledge of which agency is drone technology (less than 20%)(SmartDublin, 2022).

2.3 Sector statistics

According to a report delivered by Dublin City Council "*Accelerating the potential of drones for local governments.International best and emerging practice report*" (SmartDublin, 2022) in 2015, there were 5000 registered drones in Ireland, by 2020 that number increased to over 22 000. According to Statista.com (Statista, 2022) it

is predicted that Irish Drone sector is expected to show a volume growth of 25.8% in 2022. There isn`t many existing publications regarding Drone sector available at the moment apart from websites and blogs run by enthusiasts and companies providing drone related services. According to Statista (Statista, 2022)Drone sector Revenue in Ireland amounts to €1.87m in 2022 and it is expected to grow annually by 0.75% (Compound Annual Growth Rate 2022-2027). These figures consider consumer drones, hobbyist and under 5kg equipment. These figures, excludes however military, radio-controlled two-wing aircraft and helicopters, Commercial drones and accessories.

2.4 Sector challenges - Technology adoption and gaps (Drone adoption)

According to Dublin City Council report (SmartDublin, 2022) Ireland with relation to drones has number of strengths and weaknesses:

Table 6 Strengths and Weaknesses for Drone technology adoption in Ireland (SmartDublin, 2022)

Strengths	Weakness
Advanced capabilities in financing	Commercial drone manufacturing
Drone delivery	Uncertainty over regulations coming from the EU
Regulatory / Industry cooperation	Airspace access restrictions
Urban Air mobility planning	Length of time to get permission to fly
Uncongested airspace and an Irish Aviation Authority (IAA) with a dedicated Drone Support Division and dedicated full-time drone champion	The cost of administration
Drone test-site locations to support various drone services development	Poor weather
Regulatory agencies are readily accessible (IAA, ComReg, Data protection)	Problems with public perception & trust
Healthy economy	Unauthorised drones
Strong technology/ICT investment from very large global companies	Lack of awareness
Access to Drone R&D expertise, regulatory specialists and licensed operators	
Supportive and proactive local government and public agencies	

Looking at above table it is clear that Ireland is well placed to progress and increase use of drones, however there are few items that need to be developed (SmartDublin, 2022):

1. Nationwide use cases their positive impacts and benefits needs to be closely monitored
2. Increase recognition and awareness of drone technology in Ireland
3. Safety and privacy concerns safeguarding practices
4. Drone services – national strategy to increase public trust
5. To help grow the sector build a road-map with national and EU stakeholders
6. A high-level strategic review of the Irish drone industry to identify strengths and weaknesses, opportunities and threats
7. Development of drone testing zones and regulated training

2.5 Key takeaways from the survey (from companies & professionals

The Irish national survey of companies and professionals with regards to their drone related activities was sent to approx. 30 strategically identified enterprises around Ireland and to one professional user group based on LinkedIn with over 100 professionals working in AEC sector in Ireland. Microsoft Forms was utilised to assist in the distribution of the survey and to expedite the recording and analysis of survey results. The following section details some of the key findings however a full list of the recorded responses to all survey questions is available in Appendix 1.

In total, there were 30 responses to the survey from companies and professionals engaged in a diverse range of sectors including:

- 23.3% Engineering
- 10% Civil Works
- 6.7% Specialised Industrial Construction
- 3.3% Residential Building
- 3.3% Facilities Management
- 3.3% Surveying
- And some 50% of respondents identifying as "other" in relation to the sector that the company belonged to.

The size of the organisations (31 resonses) varied with 71% stating they had 100 employees or more (Large), 16% had between 0-25 employees (small) and 13% had between 25-100 employees (medium).

For drone related activities, over 60% of respondents noted that they hire drone service providers with just 40% stating that they had the inhouse expertise and licencing to conduct such operations inhouse. The number of employees involved in the use and or management of drones was shown to be:

- 1-4 employees in 32% of companies
- 5-9 employees in 13% of companies
- 10-24 employees in 6% of companies
- 25-99 employees in 3% of companies
- 45% of companies stated they had no employees involved

When asked on the frequency of usage of drone technology in the company:

- 6.5% reported extensive use
- 48% reported occasional use
- 39% reported rare use
- 6.5% reported no use

Interestingly, 74% of respondents expected drones to be used utilised more frequently in the future with only 26% stating they were unsure if there would be increased demand. No respondents were recorded as stating that drone usage will not increase in the future.

In relation to the prevailing applications for which drones are being utilised within companies and by professionals, the survey data recorded the following results based on the application choices that were available to respondents:

- 33.3% - involved in progress tracking and communication
- 30% - preconstruction and planning
- 30% - other
- 3.3% - used drones for job site risk mitigation
- 3.3% - first assessment and bid process preparation

Further to application usage of drones by companies and professionals, when asked which specific tasks are being developed using drones, respondents were not limited to one answer and so the following hierarchy of drone related tasks (118 Tasks selected by respondents) were observed:

- 21.2% - Surveying
- 19.5% - Photography and Video
- 12.7% - Progress Monitoring
- 11% - Asset Inspections
- 9.3% - 3d Modelling

- 8.5% - Measurements (Volumes areas etc)
- 5.9% - Digital Surface Terrain Models
- 5.1% - Thermal Imaging
- 1.7% - Equipment Tracking
- 1.7% - Security Surveillance
- Less than 1% Other

When asked which of the identified tasks are you willing to implement in the future, 3D Modelling, Measurements & Digital Surface terrain models saw the largest increases in selection at 18% 16%, & 11% respectively.

For construction related activities, companies were asked to identify based on their experience, what advantages could be achieved through the use of drones. Respondents were not limited to only one answer and out of the 122 recorded responses that were chosen, the following hierarchy was observed:

- Time Saving 17%
- Mitigation of risks and time saving 16%
- Cost Saving 13%
- More accurate progress monitoring 12%
- Operational Efficiency 12%
- Higher Data Acquisition 11%
- More appealing marketing material 9%

Companies reported some difficulty in finding suitably qualified professionals to fill drone related roles with 42% of respondents stating that it ranged from somewhat difficult to extremely difficult to find suitably qualified professionals. No respondents were recorded as noting it was easy to find suitably qualified persons. 58% of respondents recorded a neutral response.

Companies were asked what in their opinion was the reason(s) behind such skills shortages with the following hierarchy of answers being observed:

- Lack of specific skills pathways
- Low adoption of innovative technology by companies
- Inadequacy of facilities or equipment to provide practical training
- Culture of drone technology is perceived as intimidating
- Slow implementation of new training programmes adapted to new trends in construction
- Fragmentation of the construction sector causing a broad gap between the education system and the industry
- Low investment in the implementation of upskilling or reskilling training programmes

- Trainees have limited exposure to this type of technology during their education or on their job apprenticeship

When asked as to what the likely solution(s) to tackle this skills shortage could be, 66% agreed that an *Awareness of drone technology and the various benefits it brings within the construction industry* **was the main solution**. The hierarchy of recorded answers from the survey as to the potential solutions(s) was as follows:

- Awareness of drone technology and the various benefits it brings within the construction industry (66%)
- Implementation of standardised training courses that match the different jobs in the sector (15%)
- Foster open exchange and communication between companies and educational institutions to favour cooperation (7%)
- Implementation of standardised training courses that match the different jobs in the sector (7%)
- Investing in the upgrading of training centres (4%)

The respondents were asked if there were any other proposals that could be beneficial to tackle the issue. An additional 6 proposals were identified as follows:

- More exposure by the private companies on drone capabilities, legislative review on where they can be used etc.
- Provide workshops outlining what can be done by drones and the benefits they have. Provide relevant training or incentives to upskill employees to use drones.
- Cost analysis between the application of drones for certain tasks versus the traditional way.
- Safety benefits to all stakeholders within the Construction Industry
- Awareness of the potential uses and capabilities of Drone technology for the industry would improve the uptake of both workload and training for this field. The Drone Technology market can be seen as a gimmick with little to no knowledge on how to leverage the potential of the Drone Technology.

When asked as to how agreeable respondents were to the following statement, "*The implementation of standards & certification for operation will help to leverage drone operation*", 50% agreed, 43% somewhat agreed and 7% didn't know.

When asked as to how agreeable respondents were to the following statement "***Cooperation between educational institutions, industry and related stakeholders will reduce the gap between existing training and the real needs of the sector",*** 83% agreed, 13% somewhat agreed and 6% didn't know.

3 Training

3.1 Specific training and licensing for RPAS pilots

There are three key Drone Categories of Operation as outline in regulation 2019/947 (refer to the Section 1.1 of this report for a more detailed description of each). The training and licencing requirements that a Remote Pilot requires depends on which Drone Category of Operation(s) the Drone Operator will be exposed to when flying an UAS.

Regardless of the Drone Category of Operation to be employed, registration is the first step in the training and licencing of remote Pilots. UAS Regulation 2019/947 mandates for the issuing of all remote pilot certificates through a "designated entity" which in an Irish context is the IAA. The IAA has developed a purpose-built online platform called "MYSRS" which is a training and pilot certificate issuing portal in Ireland.
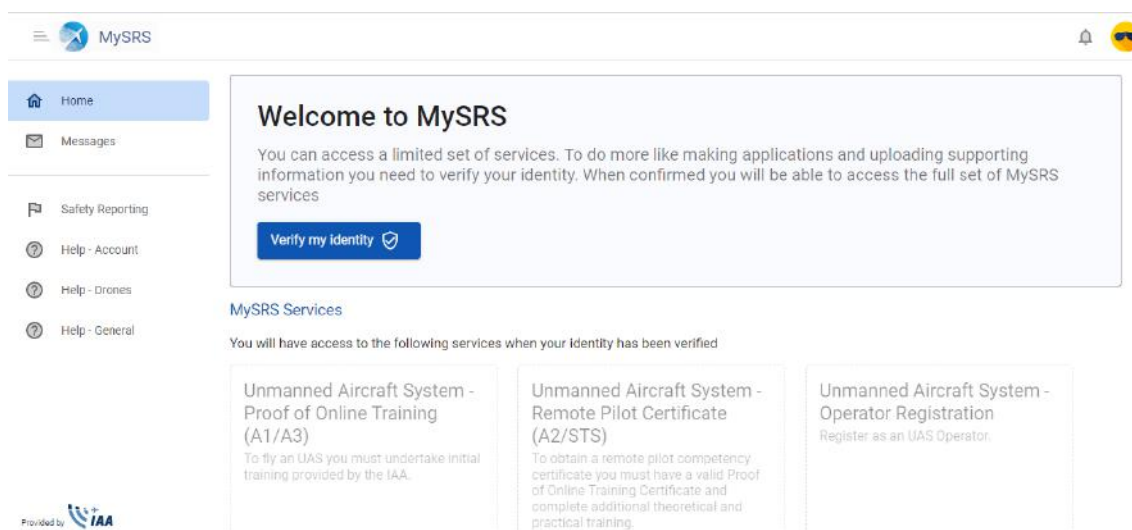
Figure 5 MYSRS Portal (IAA, 2022b)

Previously in Ireland, the now withdrawn Irish regulation S.I No. 563/2015 – (Small Unmanned Aircraft (Drones) and Rockets) Order, 2015, required unmanned aircrafts to be registered. The current UAS regulation 2019/947 requires the "Drone Operator" to be registered. Each unmanned aircraft that is to be flown by a drone operator, must have the UAS Operators registration number fixed to the frame. A QR (quick response) code may be used instead of the alphanumeric string. In Ireland, registration can be acquired for one or two years. The UAS Operator is required to re-register before the expiry date of the current registration period.

3.1.1 Open Category training and licencing

Remote pilots are required to meet the competency requirements of the category of operation that they intend to operate within. The **minimum training requirement is Open A1/A3** (refer to section 1.1.1 for further details) which in practical terms is necessary for remote pilots to operate a UAS of 250g or greater or a UAS with a sensor capable of capturing human data. The A1/A3 training consists of an online theory course/short online training videos followed by an online 40-question multiple choice theoretical knowledge assessment. This training may be completed on the "MYSRS" online portal. There is no requirement to undertake a practical flight test. The training is the foundational basis upon which all other levels of remote pilot competency is built.

For open category A2, additional training to the A1/A3 training is required. In Ireland, all further training requirements are met through commercial UAS schools referred to as Declared UAS Training Organisations (DUTO). The additional training covers additional subject areas to enable an Open Category pilot fly within the A2 Subcategory. In Ireland, DUTO typically offer this training online through their own online portals which cumulates in a 30-question multiple choice exam.

Subcategory A2 refers to drones weighing 500g to <2kg, or has a C2 label. This legally permits a Remote Pilot with an unmanned aircraft weighing 500g to 2kg (4kg EU Class C2) to fly as close as 50m from 'uninvolved persons', or as close as 30m for those using EU Class C2 drones. Certification is valid for 5 years.

Table 7 A1/A3 & A2 Training Details (Dublin City Council, 2021)

Subcategory	Type of Training	Where	Award	Validity	Notes
A1/A3	Open A1/A3 Proof of Online Training	Online - IAA MYSRS	Open A1/A3 Proof of Online Training	5 Years	- 9 core subject areas. - 40 multiple choice question online exam (MYSRS). - Each remote pilot will be required to open an account with the IAA's MYSRS online portal.
A2	Open A2 Certificate of Competency	Declared UAS Training Organisation (DUTO) – Commercial UAS School	Open A2 Certificate of Competency	5 Years	- 3 additional subject areas covered over A1/A3. - 30 multiple choice question exam. - Self-practical training. - IAA issue Open A2 Certificate of Competency on recommendation of DUTO. - Remote pilot must first hold the Open A1/A3 Proof of Online Training certificate.

3.1.2 Specific Category training and licencing

For operations that fall outside of the scope of the Open Category, the EU Specific Category is likely to apply (refer to section 1.1.2 for detailed description of Speciifc Category Operations criteria). Remote pilots require additional training to the A1/A3 minimum standard to fly in the EU Specific Category. Authorisation by the designated authority (IAA for Ireland) is required to fly in this category and is based on a risk assessment and submission of an operations manual outlining operational procedures. Remote pilots operating in the specific category are required to meet the competency standard outlined in the risk assessment which for PDRA and STS operations includes the following traning:

- EU Specific Category Training Theory Course
- EU Specific Theory Exam
- Practical Skills assessment

Remote Pilots must first complete the Open A1/A3 Training via the MySRS portal. Following this, the EU Secific Category training can be received at a designated entity which in the case of Ireland will be at one of the Declared UAS Training Organinstaions (DUTOs) as identified in in Table 8.

Table 8 Summary of the training requirements for the Specific Category (Dublin City Council, 2021)

Risk Assessment	Type of Training	Where	Award	Validity	Notes
PDRA/STS	Theory & Practical	Open A1/A3 Online - IAA MYSRS. Specific category theory - DUTO	Theory Remote Pilot Certificate of Theoretical Knowledge Practical Certificate of Completion of Practical Skill Training.	5 Years	- 9 core subject areas enhanced with additional course material. 4 additional subject areas - 40 multiple choice question exam (MYSRS). - Each remote pilot will be required to open an account with the IAA's MYSRS online portal. - Theory certificate issued by the IAA through MYSRS on recommendation of DUTO. - Practical certificate issued by DUTO.
SORA	As defined by risk assessment to include Theory & Practical	Open A1/A3 Online - IAA MYSRS. Specific category theory - DUTO	As required	As required	- Risk assessment will define training requirement. It is expected that as a minimum, the PDRA/STS course may be required. - Depending on operation, 4 Additional subject areas over PDRA/STS course may be required for example radio licence.

3.1.3 DUTOS in Ireland

There are a number of DUTOs in Ireland as identified in Table 7 which can provide the training requirements for remote pilots to operate within the EU Specific or A2 categories.

Table 9 DUTOS in Ireland (IAA, 2022a)

NAME	ADDRESS	EMAIL
SkyTec Ireland	Rochestown Cork Co.Cork	steveslade@skytecireland.com
Avtrain	Suite 317 Guinness Enterprise Centre Taylor's Lane Dublin 8	julie@avtrain.aero train@avtrain.aero
USpaceAero		support@uspaceaero.com
FlyRyte Drone Academy	The Media Cube DIADT Dun Laoghaire Co. Dublin	info@flyryte.com
EU Drone School	DeltaCopter SRL Rue De L'Industrie 20 1400 Nivelles Belgium	info@droneschool.eu
Survey Drones Ireland	Unit 6a Ballymount Cross Industrial Estate Dublin 24 D24 EC56	info@surveydrones.ie wfloyd@surveydrones.ie
Safe Drone	Westmanstown Conference Centre Clonsilla Dublin 15	mark@safedrone.ie

3.2 Description and comparison of the current training offer

As highlighted in section 3.1.3, there are a number of DUTOs offering drone related training services in Ireland. The primary training offer is the additional training required to operate within the A2 Open Category or EU specific category. This training is heavily focused on a theoretical knowledge of the relevant legislation, meteorology, UAS flight performance and technical and operational mitigation measures for both

ground and air risks. An example of some of the indicative content covered as part of these training offers is shown in Table 8. With the exception of practical flight exam as part of the EU Specific Training, there is little or no actual UAS flight training.

Some DUTOs recognise this and offer additional "flight training" which focuses more on the practicality side of UAS operations from the different flight modes to achieving best data capture through optimum camera settings.

Table 10 DUTOs Training Offer (Survey Drone Ireland, 2022)

Training type	Valid for	Content	Duration of the course	Cost
EU Open Category A2	5 years	• Open Category. • Meteorology. • UAS flight performance. • Technical and operational mitigation's for ground risk. • Geographical Zones – Ver 18. • Multiple Choice – Written Exam.	3-4 hours	149
EU Specific Category Theoretical Ground School Course	N/A	• Specific Category • Airspace. • U.F 101 Application to request Permission to Fly a UAS inside a Controlled Traffic Area. • Navigation. • Meteorology. • Technical and operational mitigation's for ground risk. • UAS Flight Performance. • SORA (Specific Operating Risk Assessment) Part One. • SORA (Specific Operating Risk Assessment) Part Two. • Technical and operational mitigation for air risks. • Human Factors. • Data Protection – Introduction. • Written Exam.	12 hours	750
Flight Training	N/A	• Introduction to Aircraft • Maintenance of Aircraft • Introduction to FM App • App Settings and Functions • Basic Flight Modes • Flying Basic Flight modes	Not specified	800

		• Camera Settings – Introduction to Shutter Speeds, Apertures (f-stop) Settings, ISO settings, White Balanced explained and others	

3.3 Key takeaways from the survey (from learners/trainees; maybe trainers?)

The Irish National Survey was disseminated to approximately 300 students, all of which were enrolled in third level education from level 6 up to level 9. Approx. 30 % (87 responses) of the students responded through the MS Forms platform with their answers. Some of the key takeaways form the survey included:

Question 1 was to determine which education level responders were:

1. 49 answers (56%) from Bachelor's Degree (NFQ Level 8)
2. 19 (22%) from Ordinary Bachelor's Degree (NFQ Level 7)
3. 1 answer (1%) from Adult learning/Continuing training
4. 18 from Masters students stood for 21%

Question 2 was to determine how familiar with drone technology survey respondents are. It seems that the majority of surveyed students (78%) understand drone technology but only 27% have used them in the field.

The majority of respondents (70) are interested in Engineering (or related disciplines i.e. Civil Works, Energy, Telecoms) as a future carrier path. Smallest number of respondents were into Mining (6 responses) on Telcom's (6 responses).

With respect to the usage of drone technology, students were quite consistent answering: areas of surveying, photography and preconstruction and site planning usage.

Majority (91% of surveyed) had clear understanding of in demand jobs; Building Information Modelling and digitisation stood for 66% of answers. There were no drones mentioned amongst answers.

Question 7 was trying to determine pathways leading to drone training, about 41% were neutral in their opinion. Majority of surveyed group 58% found it difficult to access information.

Amongst main answers for difficulty accessing information respondents highlighted three main reasons:

• Lack of specific training programmes – 49 answers
• Limited exposure in secondary education or apprenticeship – 42 answers

As the least issue lack of official training body (13 responses) and trainers (22) were highlighted.

One of the main solutions to aforementioned issues (69 responses) pointed to increase awareness to drone technology and implementation of standardised training courses (49 responses).

Alongside these answers, respondents gave a number of paths and solutions to increase exposure of drone technology sector to interested parties, such as:

- Funded training or incentives for companies to buy drones and train staff etc
- Enable access to drone technology in secondary schools and college, so people can gain an interest in them from a young age.
- Increased information on how drone technology is beneficial and how It can improve different aspects of day to day life or in each individuals career.
- Promotion and advertisement

Statement "Dissemination of drone technology applications and the related range of job opportunities within the construction sector, will increase the number of suitably qualified workers" was agreed in principle by 80%. Disagreed by 1%.

When asked about aspects of training for effective learning and insertion into the market answers were responders suggested:

- Active practice – 75
- Visits to real site – 55
- Up-to-date technological equipment – 41
- Training and demonstrations (respectively 38 and 49)
- Carrer guidabce – 9 responses

4 Conclusions

While Ireland is embracing the broad spectrum of digitalisation ranking 5th in Europe on the DESI Index (European Commission, 2022) government policy and regulation aimed towards exploiting the full potential of drones specifically has struggled to keep pace. The UAS industry in Ireland is rapidly growing organically and shows great promise across almost all sectors of the economy from agriculture, construction, photography, geospatial to transport.

Recent government backed projects such as the Build Digital Project (BDP, 2022), part of Project Ireland 2040 plan (Government of Ireland, 2022), will help to increase the adoption rate of technologies such as drones in specific industries such as construction. The new Construction Technology Centre which is in development will become a national hub in Ireland where drones and automation are one of the key focus areas further driving developments related to construction. However more joined up thinking is required across government departments to realise the full potential of UA systems and the value this technology can add to our life's and the economy at large.

A National survey of companies and professionals (C&P) utilising drones in Ireland was conducted as part of this report. Upon analysis of the results, 74% of respondents expected drones to be utilised more frequently in the future in Ireland. Just 40% of the respondents had the inhouse skills necessary to carry out drone related operations with 60% outsourcing their drone related requirments. Companies reported some difficulty in finding suitably qualified professionals to fill drone related roles with 42% of respondents stating that it ranged from somewhat difficult to extremely difficult to find suitably qualified professionals. No respondents were recorded as noting it was easy to find suitably qualified persons. Companies were asked what in their opinion was the reason(s) behind such skills shortages with the most popular anwer being "*Lack of specific skills pathways" and "training"*.

A key pillar of the successful adoption and integration of drones into European and Irish society will be the successful training of professionals across a range of different sectors. Training in the form of the safe operation and licencing of drones but also in relation to the associated technologies. The technology surrounding the various applications for which drones will be used has the potential to crossover many areas of ICT (Information Communication Technology), from big data to AI (Artifical Intelligence). UAS training that aims to leverage such technologies will realise the greatest benefits across the various sectors.

With no current formal training in the usage of drones at VET or third level in Ireland, the Drones4VET programme has the potential to become the catalyst that will significantly enhance drone usage across all sectors of the Irish economy. As part of the national survey of C&P, when asked as to how agreeable respondents were to the following statement "Cooperation between educational institutions, industry and related stakeholders will reduce the gap between existing training and the real needs of the sector", 83% of the respondents agreed. It is clear therefore, that tailored European wide training programmes in the use of drones is a key pillar to unlocking the full potential of this technology in Ireland and Europe.

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6 Appendix

6.1 National Survey results for Professional

Figure 6 National Survey for Professionals, Question 1 results

1. Which sector does your company belong to?

More Details

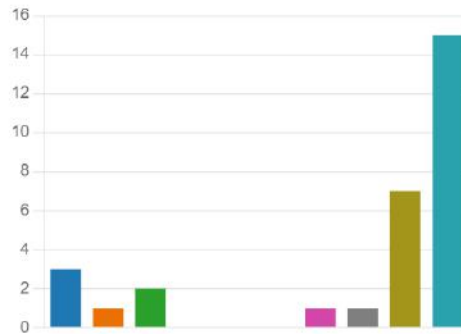|	
● Civil works	3
● Residential building	1
● Specialized industrial constructi...	2
● Mining	0
● Energy	0
● Telecoms	0
● Facilities Management	1
● Surveying	1
● Engineering	7
● Other	15

Figure 7 National Survey for Professionals, Question 2 results

2. What size is your Company

More Details   ☼ Insights

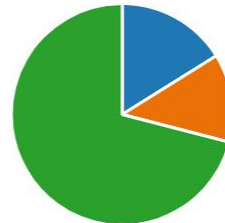|	
● Small (0 -25 employees)	5
● Medium (25 -100 employees)	4
● Large (100+ employees)	22

Figure 8 National Survey for Professionals, Question 3 results

3. Does your company have in-house expertise or does it hire a drone service provider?

More Details

● In-house expert team	11
● External service provider	19
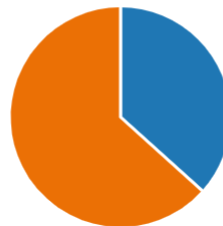
Figure 9 National Survey for Professionals, Question 4 results

![DRONES4VET logo]

Co-funded by the
Erasmus+ Programme
of the European Union

4. How many full-time, part-time, and contract employees are involved with the use or management of drones at your company?

More Details · Insights

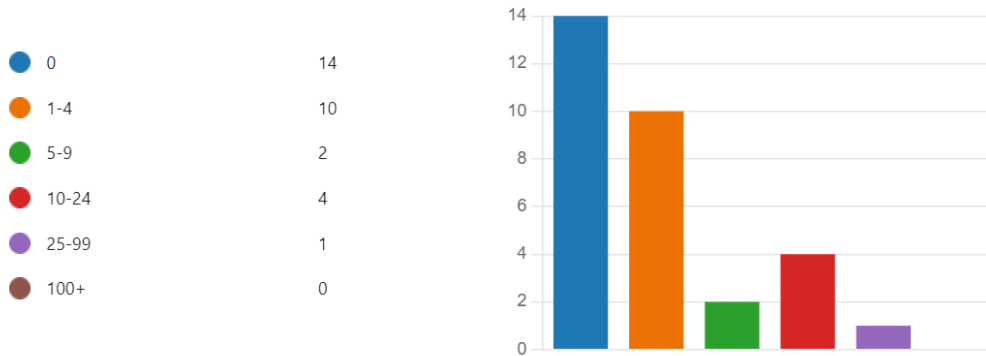|	
● 0	14
● 1-4	10
● 5-9	2
● 10-24	4
● 25-99	1
● 100+	0

Figure 10 National Survey for Professionals, Question 5 results

5. Which one of these best describes the degree of drone technology use in your company?

More Details · Insights

● No use	2
● Rare use	12
● Occasional use	15
● Extensive use	2

Figure 11 National Survey for Professionals, Question 6 results

7. Which applications has drone technology in your company?

More Details

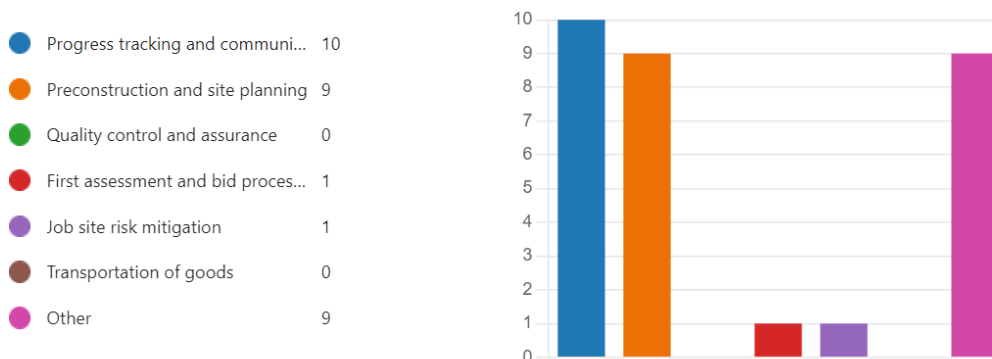|	
● Progress tracking and communi...	10
● Preconstruction and site planning	9
● Quality control and assurance	0
● First assessment and bid proces...	1
● Job site risk mitigation	1
● Transportation of goods	0
● Other	9

Figure 12 National Survey for Professionals, Question 7 results

6. Assessment of the future evolution of drone usage: Does your company expect the deployment of drones to be more frequent in the future?

More Details

●	Yes	23
●	No	0
●	Don`t Know	8

Figure 13 National Survey for Professionals, Question 8 results

8. In relation to the previous question, which specific tasks are being developed using drones?

More Details

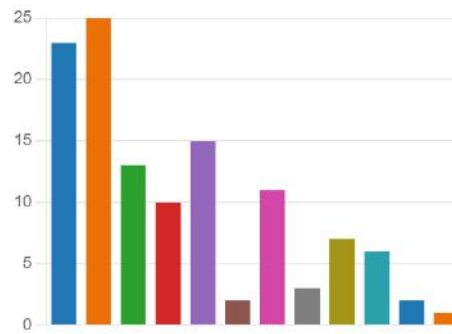|		
●	Photography and/or video	23
●	Surveying	25
●	Asset inspection	13
●	Measurements (volume, area an...	10
●	Progress monitoring	15
●	Equipment tracking	2
●	3D modelling	11
●	Orthomosaics	3
●	Digital surface/terrain models	7
●	Thermal imaging	6
●	Security surveillance	2
●	Other	1

Figure 14 National Survey for Professionals, Question 9 results

9. In the near future, which tasks or services are you willing to implement in your company?

More Details

●	Photography and/or video	17
●	Surveying	23
●	Asset inspection	9
●	Measurements (volume, area an...	19
●	Progress monitoring	15
●	Equipment tracking	1
●	3D modelling	21
●	Orthomosaics	2
●	Digital surface/terrain models	13
●	Thermal imaging	5
●	Security surveillance	3
●	Other	3
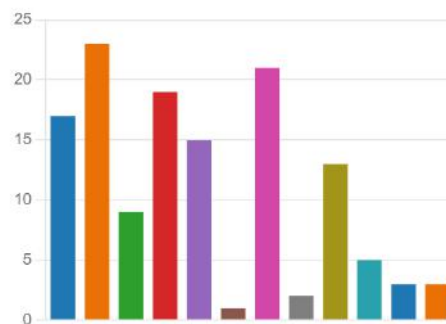
Figure 15 National Survey for Professionals, Question 9 results

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10. Based on your company's experience, which advantages entails the use of drones in construction related activities?

More Details

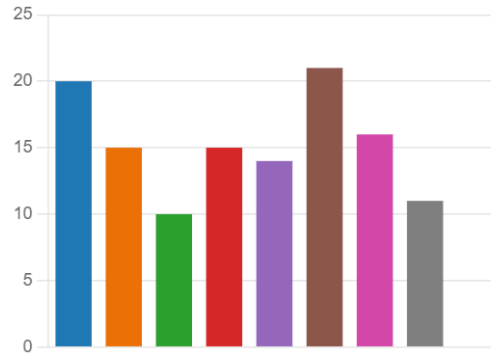|		
🔵 Mitigation of risks and improve...	20
🟠 Operational efficiency	15
🟢 Increased productivity gains	10
🔴 More accurate progress monitor...	15
🟣 Higher data acquisition	14
🟤 Time saving	21
🟣 Cost saving	16
⚫ More appealing marketing mate...	11
🟡 Other	0

Figure 16 National Survey for Professionals, Question 11 results

11. Do you consider difficult to find qualified profiles to fill drone-related positions?

More Details   💡 Insights

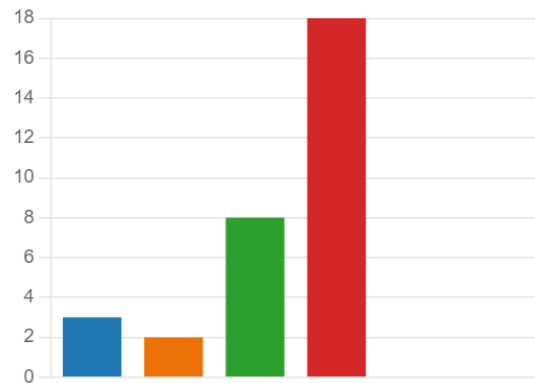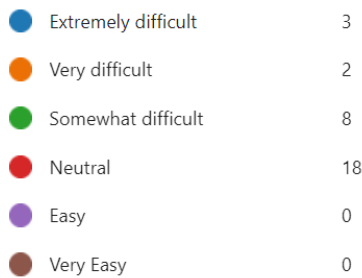|	
🔵 Extremely difficult	3
🟠 Very difficult	2
🟢 Somewhat difficult	8
🔴 Neutral	18
🟣 Easy	0
🟤 Very Easy	0

Figure 17 National Survey for Professionals, Question 12 results

12. If difficult, from your point of view, which are the reasons for the skills shortage?

More Details

- ● Culture of drone technology is ... 4
- ● Lack of specific skill pathways 6
- ● Trainees have limited exposure t... 1
- ● Inadequacy of facilities or equip... 4
- ● Lack of sectoral official bodies (... 0
- ● Lack of qualified trainers 0
- ● Slow implementation of new tra... 3
- ● Low investment in the impleme... 1
- ● Low adoption of innovative tech... 5
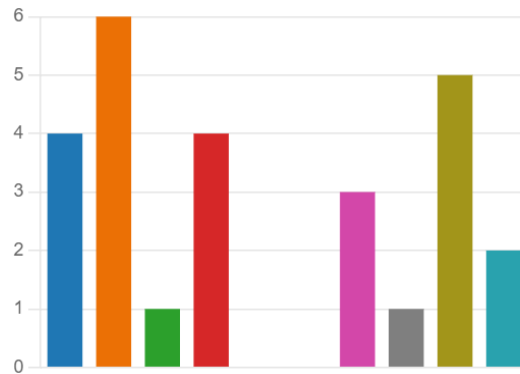- ● Fragmentation of the constructi... 2

Figure 18 National Survey for Professionals, Question 13 results

13. In relation to the previous question, what could be the solution(s) to tackle this skills shortage?

More Details

- ● Awareness of drone technology ... 18
- ● Dissemination of the wide range... 0
- ● Foster open exchange and com... 2
- ● Implementation of standardised... 4
- ● Investing in the upgrading of tr... 1
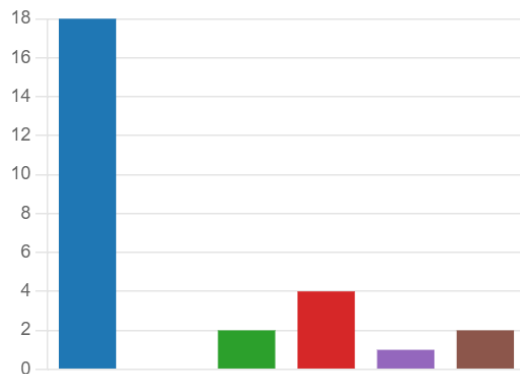- ● Improve the training of trainers ... 2

Figure 19 National Survey for Professionals, Question 14 results

![DRONES4VET logo]

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14. Please briefly outline any other proposals that you think would be beneficial to address the problem:

More Details   🔅 Insights

6
Responses

Latest Responses

4 respondents (**67%**) answered **drone** for this question.

training for this field certain tasks Construction Industry   benefits to all stakeholders
drones and the benefits   application of drones   legislative review
Technology market   Industry **drone** training   uses and capabilities
potential uses
Safety benefits   drone capabilities relevant training Drone technology
private companies   workload and training   training or incentives
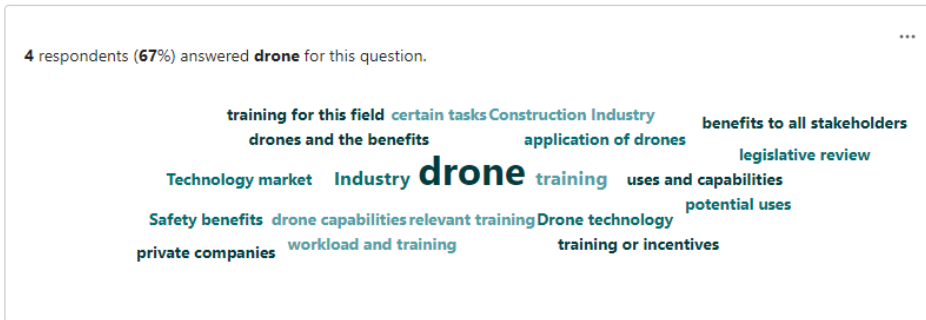
Figure 20 National Survey for Professionals, Question 15 results

15. Please indicate your level of agreement with the following statement: "The implementation of standards & certification for operation will help to leverage drone operation"

More Details

|		
🔵 Agree	15
🟠 Somewhat agree	13
🟢 Disagree	0
🔴 Don`t know	2

Figure 21 National Survey for Professionals, Question 16 results

16. Please indicate your level of agreement with the following statement: "Cooperation between educational institutions, industry and related stakeholders will reduce the gap between existing training and the real needs of the sector"

More Details

🔵 Agree	25
🟠 Somewhat agree	4
🟢 Disagree	0
🔴 Don`t know	1
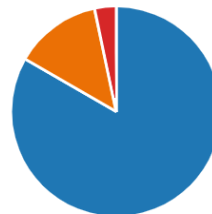
6.2 National Survey results for learners/trainees

Figure 22 National Survey for Learners/trainees, Question 1 results

1. What level of education are you currently enrolled in?

More Details   Insights

- Intermediate VET programme (u... 0
- Higher VET programme (post-se... 0
- Ordinary Bachelors Degree (Lev... 19
- Bachelor's degree (Level 8 NFQ) 49
- Master's degree (Level 9 NFQ) 18
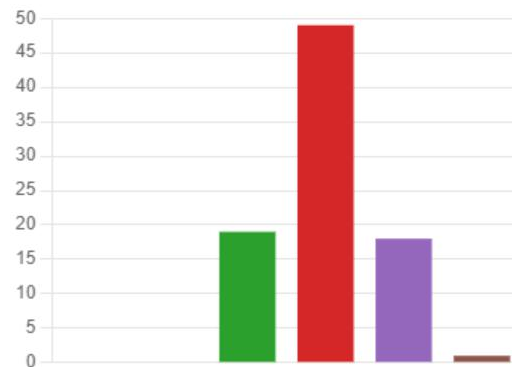- Adult learning/Continuing traini... 1

Figure 23 National Survey for Learners/trainees, Question 2 results

2. What is your level of familiarity with drone technology?

More Details

- Very knowledgeable/Have used ... 4
- Knowledgeable/Have used a dr... 20
- Somewhat knowledgeable/Have... 44
- Not very knowledgeable/Never ... 19

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Figure 24 National Survey for Learners/trainees, Question 3 results

3. Are there any sectors which you are interested in as a future career path?

More Details

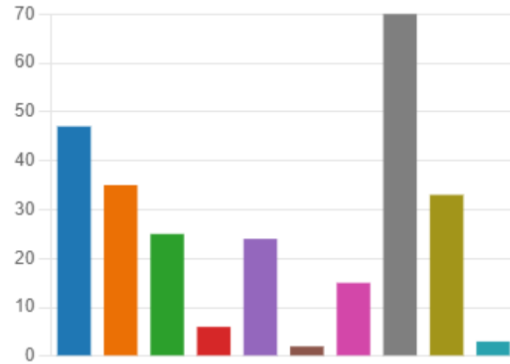|		
🔵	Civil works	47
🟠	Residential building	35
🟢	Specialized industrial constructi...	25
🔴	Mining	6
🟣	Energy	24
🟤	Telecoms	2
🩷	Facilities management	15
⚫	Engineering	70
🟡	Surveying	33
🔵	Other	3

Figure 25 National Survey for Learners/trainees, Question 4 results

4. What applications of drone technology are you most interested in?

More Details

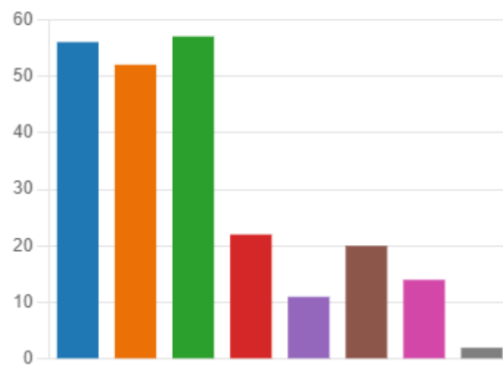|		
🔵	Surveying	56
🟠	Photography and/or video	52
🟢	Preconstruction and site planning	57
🔴	Quality control and assurance	22
🟣	First assessment and bid proces...	11
🟤	Job site risk mitigation	20
🩷	Transportation of goods	14
⚫	Other	2

Figure 26 National Survey for Learners/trainees, Question 5 results

5. Are you aware of the most in-demand jobs or relevant emerging roles in the construction industry?

More Details

🔵	Yes	8
🟠	No	79

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Figure 27 National Survey for Learners/trainees, Question 6 results

6. If Question 5 was answered "Yes" please specify below, if "No" please go to Question 7?

More Details   💡 Insights

8
Responses

Latest Responses
"Surveying "

3 respondents (**33**%) answered **BIM** for this question.

fields and sites   drone   Data Analisys   sustainable development
specific application   AEC sector   Structural Eng
Surveying fields   BIM Managers   **BIM**   Softwar specialist demand
Analisys specialist   Digital
Managers and Coordinators   BIM and sustainability   Construction roles
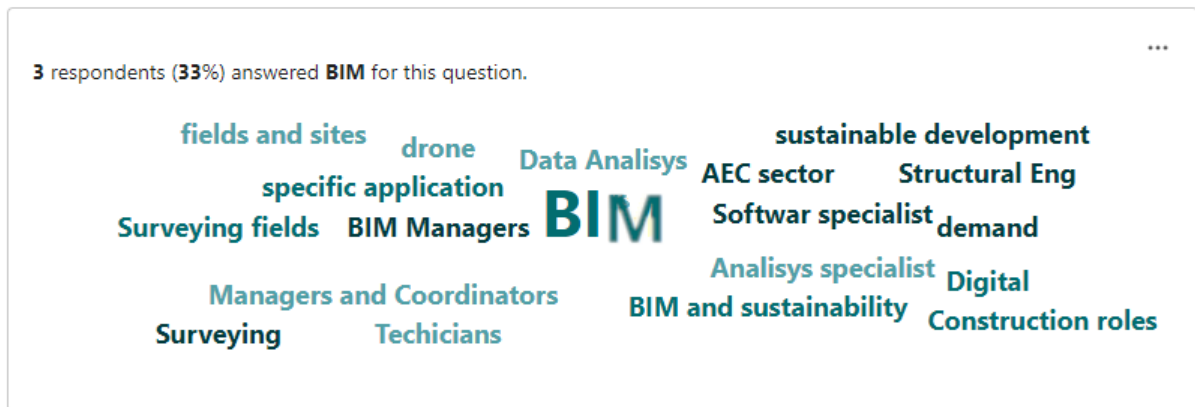Surveying   Techicians

Figure 28 National Survey for Learners/trainees, Question 7 results

7. Do you find it difficult to access drone-related training pathways that match your interests?

More Details

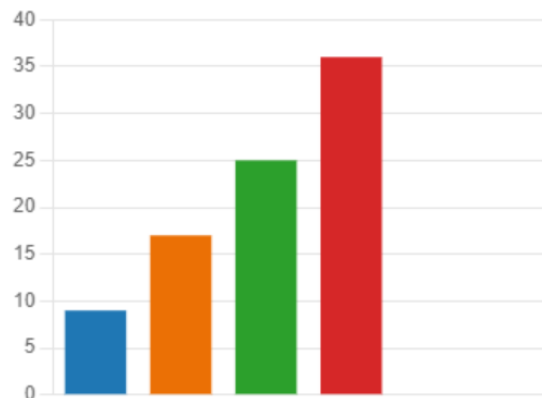|	
🔵 Extremely difficult	9
🟠 Very difficult	17
🟢 Somewhat difficult	25
🔴 Neutral	36
🟣 Easy	0
🟤 Very easy	0

Figure 29 National Survey for Learners/trainees, Question 8 results

8. In relation with previous questions, if difficult, which are the reasons for the lack of drone-related training pathways?

More Details

- Culture of drone technology is ...   20
- Lack of specific training progra...   49
- Limited exposure to this type of ...   42
- Inadequacy of facilities or equip...   31
- Lack of sectoral official bodies (...   13
- Lack of qualified trainers   22
- Slow implementation of new tra...   21
- Low investment in the impleme...   24
- Low adoption of innovative tech...   22
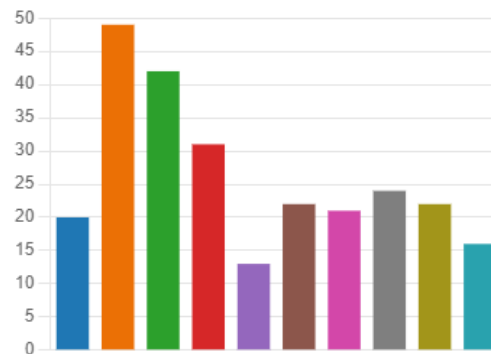- Fragmentation of the constructi...   16

Figure 30 National Survey for Learners/trainees, Question 9 results

9. Based on your previous answer, what could be the solution(s) to tackle this issue?

More Details

- Increased awareness of drone te...   69
- Dissemination of the wide range...   17
- Foster open exchange and com...   25
- Implementation of standardised...   46
- Investing in the upgrading of tr...   36
- Improve the training of trainers ...   28

![DRONES4VET logo]

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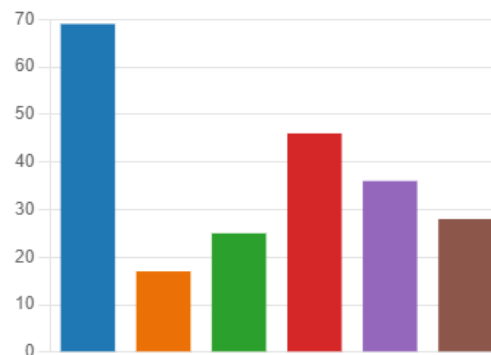of the European Union

Figure 31 National Survey for Learners/trainees, Question 10 results

10. Please briefly outline any other proposals that you think would be beneficial to address the problem:

More Details   Insights

12
Responses

Latest Responses

4 respondents (**33**%) answered **drone** for this question.

technology is beneficial   construction and engineering
drone technology   use of drones   aspects of day schools and college
flight simulator   train **drone**   company business and staff
user and company   training or incentives
induction day   day to day   train staff   construction
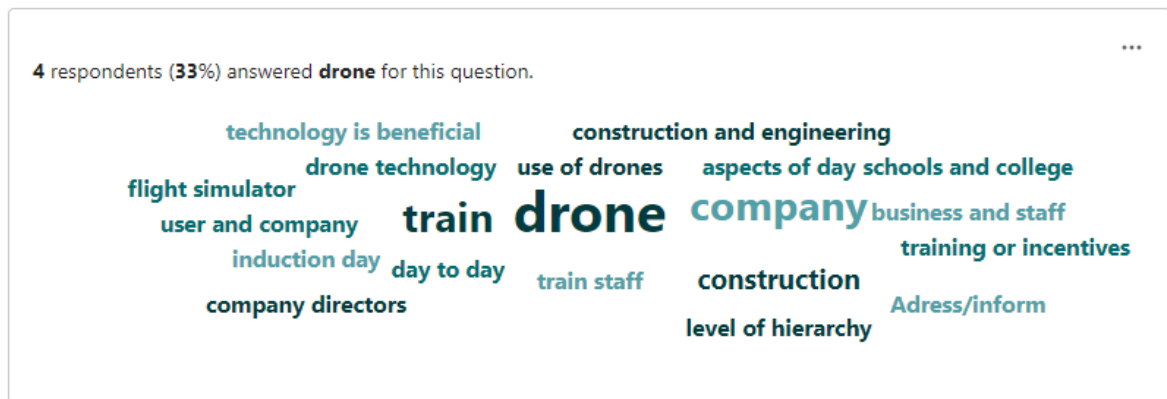company directors   Adress/inform
level of hierarchy

Figure 32 National Survey for Learners/trainees, Question 11 results

11. Please indicate your level of agreement with the following statement: "Dissemination of drone technology applications and the related range of job opportunities within the construction sector, will increase the number of suitably qualified workers"

More Details   Insights

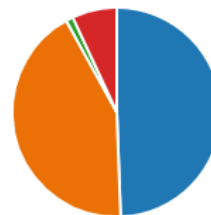|	
● Agree	43
● Somewhat agree	37
● Disagree	1
● Don`t know	6

Figure 33 National Survey for Learners/trainees, Question 12 results

12. Which aspects of training do you consider most important for effective learning and subsequent insertion into the labour market?

More Details

🔵	Relevant and up-to-date learnin...	49
🟠	Theoretical content	13
🟢	Active practice	75
🔴	Demonstrations by trainers	38
🟣	Visits to real work sites	55
🟤	Modern and well-equipped trai...	33
🩷	Up-to-date technological equip...	41
⚪	Qualified specialised trainers	29
🟡	Reinforcement pills to increase l...	12
🔵	Career guidance	9
🔵	Other	3