



Drone4HER

Mapping Analysis Report

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drone4her.eu



Save the historic gardens' heritage using drones

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- European Route of Historic Gardens Association, Spain

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This document disseminates the work in progress under the project Save the Historic Gardens' Heritage Using Drones.

This report is the second project result and it is aimed at identifying the needs of the professionals and gardeners and staff working in the historic gardens in Italy, Spain and in other European countries reached by the European Network of Historic Gardens.

The data reported in this document have been collected through anonymous online questionnaires in 2023 and represent the needs raised by the staff of the gardens and researchers in the sector.

Drone4HER reports and documents are available at: <https://drone4her.eu/>

1. Acknowledgements

This report is the result of a teamwork done in 2023. The needs analysis of the gardeners working in the historic gardens was carried out by the partners of the Drone4HER project who shared the results of the research, developed the online questionnaires and distributed them to their databases.

It comprises one questionnaire in three different linguistic versions (EN, ES, IT) and the analysis of the questionnaires' results.

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2. Introduction

This report is a synthesis of the mapping exercise of the Small Scale Partnership Project in Adult Education financed by the Italian National Agency ERASMUS+ INDIRE. The project has the ambition to merge the fields of drone technology and the preservation and maintenance of historic gardens

The mapping exercise collects the opinions and the needs of gardeners, garden managers and researchers working in nine different European Countries and Ukraine. It provides an overview of the current situation and highlights the expectations and common needs of people involved every day in the management and maintenance of historic gardens.

Nowadays and in the coming years the needs of gardeners and their tasks may become easier, some jobs could disappear, new tasks will be created and technology could play an important role in garden design and maintenance, chemical and pesticide control and in irrigation management. Training in the world of gardening with new techniques becomes vital¹.

Eurostat² reports that “there is a need for skills linked to new technologies (workers need to operate the new technologies)” and that translated into occupation trends means that these workers are expected to be re-skilled and upskilled to meet the needs of the labour market. Education and training have to be supplemented and enriched by the continuous acquisition of new knowledge and skills, in a system allowing people to pursue learning, understanding and developing new specialized knowledge throughout their lives. Today's societies are knowledge societies where “knowledge is a central issue and a key to ensuring the future competitiveness of the European economic system” (ERT, 1989)³

¹ <https://www.hlservices.co.uk/what-will-gardening-jobs-be-like-in-the-next-50-years/>
Last retrieved 14.02.202

² https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Farmers_and_the_agricultural_labour_force_-_statistics
Last retrieved 24.04.2023

³ The Round Table of European Industrialists (ERT) (1989). Education for Life. A European Strategy. Butterworth

The mapping exercise has enabled the identification of the needs of people working in the field of historic gardens management, preservation and maintenance and the findings of this report in combination with the findings of the research lay the basis for the creation of the manual and the Drone4HER online training course.

3. Mapping needs

Climate change, environmental degradation and the process of transition to a green economy change the needs of the labour market and require reskilling and upskilling of workers to reduce the risk of rising unemployment, poverty and inequality.

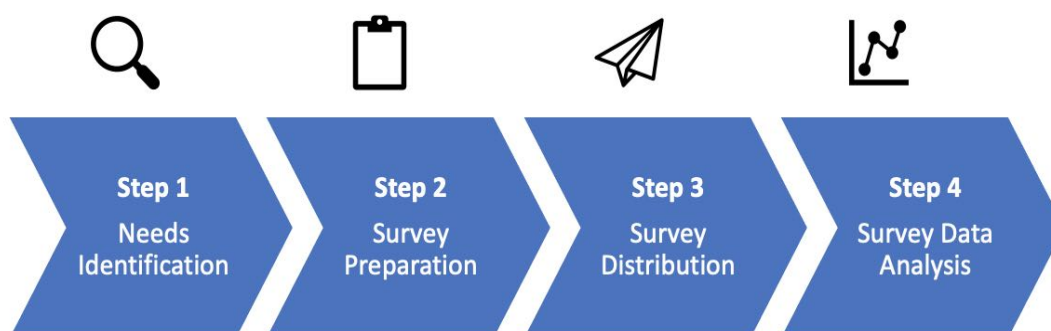
The report Skills for a Greener Future⁴ produced by the International Labour Organization in partnership with the Development of Vocational Training (Cedefop) provides new insights into likely occupational skill effects in declining and growing industries by 2030, however, there is no specific information about the future needs of the gardeners. The report mentions only an example of an innovative employment programme aimed specifically at people with disabilities is “Bushlink”, established by Northside Enterprise Inc. in 2009, in Australia.

Based on these findings the partners have identified that mapping the needs of the gardeners working in historic gardens in Europe was a necessary step to identify the current and future needs of people working in this sector and create training tools to fill this gap.

4. Methodology

The needs identification has been done through an online anonymous questionnaire prepared in three different languages (EN, ES and IT) and distributed to professional gardeners, garden managers and researchers in Europe, especially the gardeners and the staff working with the members of the ERHG.

The methodology consists of four steps:



⁴ https://www.ilo.org/wcmsp5/groups/public/---ed_emp/documents/publication/wcms_732214.pdf
Last retrieved 14.02.2023

The first step corresponds to the identification of the needs of the professional gardeners and staff working in the historic gardens which has been done through desk research. The results of the desk research have been presented, discussed and improved during a conversational focus group activity carried out in Italy with the head of gardeners working at the Villa Garzoni Garden managed by the Sviluppo Turistico Collodi and in Spain with Santa Clotilde Gardens' staff. This exercise has been an efficient way to learn by comparing research outcomes with the local management/maintenance systems and with an insightful first-hand description of problems and how they are dealt with in Italy and Spain.

The second step consists of using the results collected in the initial phase for the preparation of an online anonymous survey of twenty questions: fourteen closed-ended questions where the respondents choose from a set list of answers and six open questions where the respondents write unique responses. The survey is provided in three languages to facilitate the respondents and it has been prepared using the Google form. The decision to use an online anonymous survey was based on six main reasons: it is faster, cheaper, effective, easy to use for the respondents, takes them a minimum time and is more accurate than traditional face-to-face methods because the margin of error with the online survey is reduced to the minimum. In fact, the participants enter their responses directly and human errors are reduced to the minimum. The partners have decided to conduct an anonymous survey without collecting personal data then the GDPR implications do not apply, in fact, responses to the anonymous survey cannot be traced back to the respondents.

The third step was the distribution of the survey; the invitation to take part in the mapping exercise has been done by the ERHG which is the coordinator of the network European Route of Historic Gardens and by Sviluppo Turistico Collodi. The target groups of this activity were the staff of the partner institutions and also the staff of the institutions and organizations that are members of the network. The project's direct target groups are head of gardeners, gardeners, garden staff, garden manager, and research/expert. The results of the survey have been collected online after a period of two weeks from the date of the distribution. A reminder was sent after ten days.

The fourth step corresponds to the analysis of the survey data which is the resultant data that was collected from the respondents who have taken part in the survey. This data represent all the information gathered from the primary target groups of the Drone4HER project about the following specific topics:

- Respondents' profile
- Maintenance, conservation and planning
- Computerized management of maintenance plans
- Digitalization of the green heritage
- Planning and programming of conservation interventions
- Cataloguing of the garden's elements
- Detected infrastructure needs
- Observations and recommendations

The results of the survey are summed up in the Mapping Analysis Report which provides information to the partners to create the framework for the learning

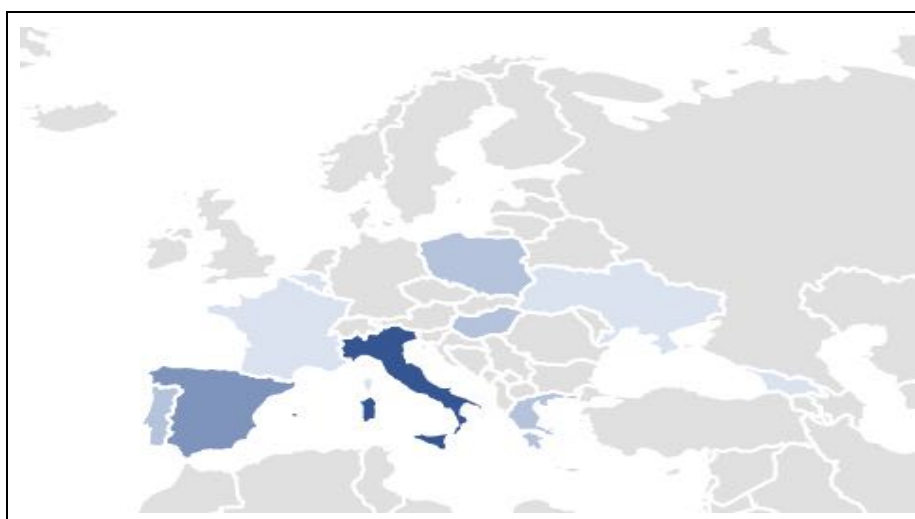
materials and tools of the training course. The Analysis Report aims to collect the real needs of professionals working in the historic gardens and assess measures for upskilling and adapting the primary target group competencies to climate change-related challenges and promote new learning paths that will enable professional gardeners to contribute to preserving the green heritage while responding to the contemporary need to invest in people's capabilities for safeguarding their job and reducing the risks of unemployment. The aim of the training is to reskill and upskill the gardeners and the staff of the historic gardens based on their real needs and strategically integrate digital tools to implement the daily work of the primary target groups. Combining the development of professional gardeners' technological and digital skills as part of their professional qualifications is an essential process for the digital transition and for reducing the degradation of historic gardens due to the effect of climate change.

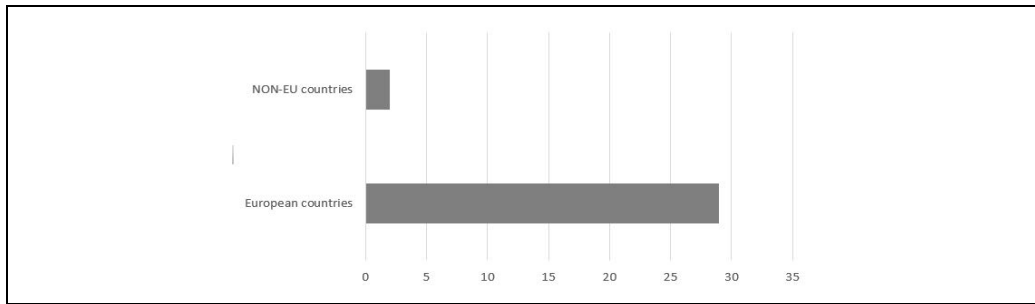
5. Data Analysis

5.1 Analysis of the Respondents' Profile

This report is based on the inputs of thirty-two respondents working in and for European historic gardens coming from eight European countries and two non-European countries Graph 1.

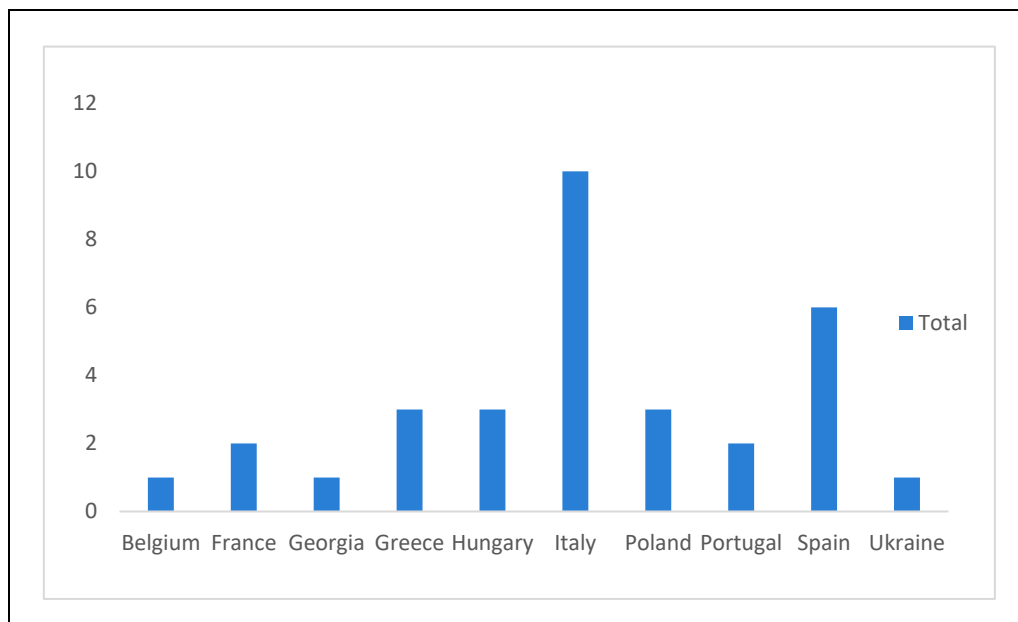
The group of respondents includes thirty (93,75%) respondents who work in EU countries and two (6,25%) in Non-EU countries (Georgia and Ukraine), the respondents work as gardeners, garden managers and experts/researchers few of them are working in recreational activities inside the historic gardens.





Graph.1 EU and NON-EU countries

The total sample of thirty-two respondents geographically corresponds to ten (31,25%) respondents from Italy, six (18,75%) from Spain (18,75%), three (9,37%) from Greece, three (9,37%) from Hungary, three (9,37%) from Poland, three (9,37%) from Portugal and one (3,12%) from Belgium, one (3,12%) from France, one (3,12%) from Georgia and one (3,12%) from Ukraine. Graph 2



Graph. 2 – Countries where the respondents work

Concerning the occupation of the respondents the data have been merged in the following four groups:

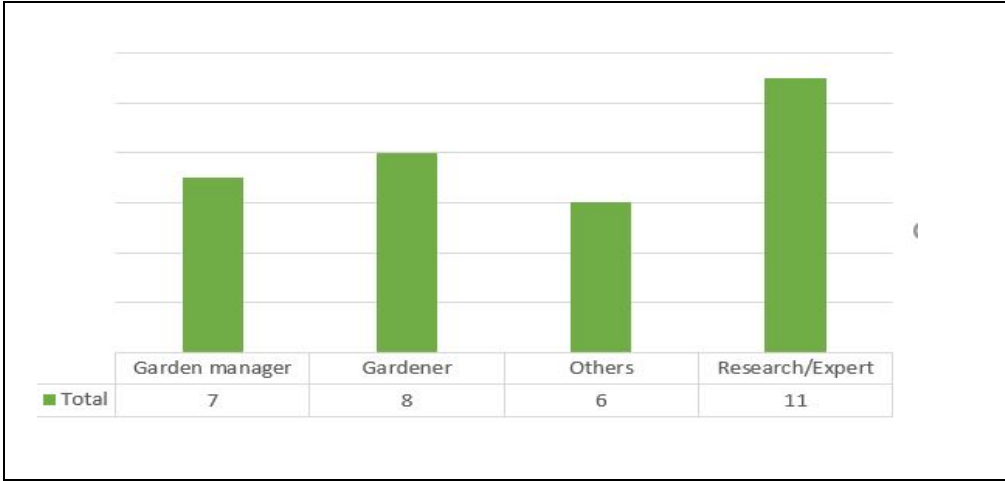
Group 1 - Eight respondents (25%): **Garden Manager group** that includes seven garden managers of which three are from Spain, two from Greece, one from Portugal and one president of garden from Belgium.

Group 2 - Seven respondents (22%) **Gardener group** that includes five heads of gardeners of which one from Poland, one from Georgia, one from Hungary, one from France, one from Spain, two gardeners from Italy and one garden assistant from Italy.

Group 3 - Eleven respondents (34%) **Expert/researcher group** that includes one land architect from Hungary, one architect from Italy and one landscape

protection specialist from Poland, Eleven researchers and experts in the sector of historic gardens. of which two are from Italy, one from Greece, one from France, one from Hungary, one from Poland, one from Portugal and one from Spain.

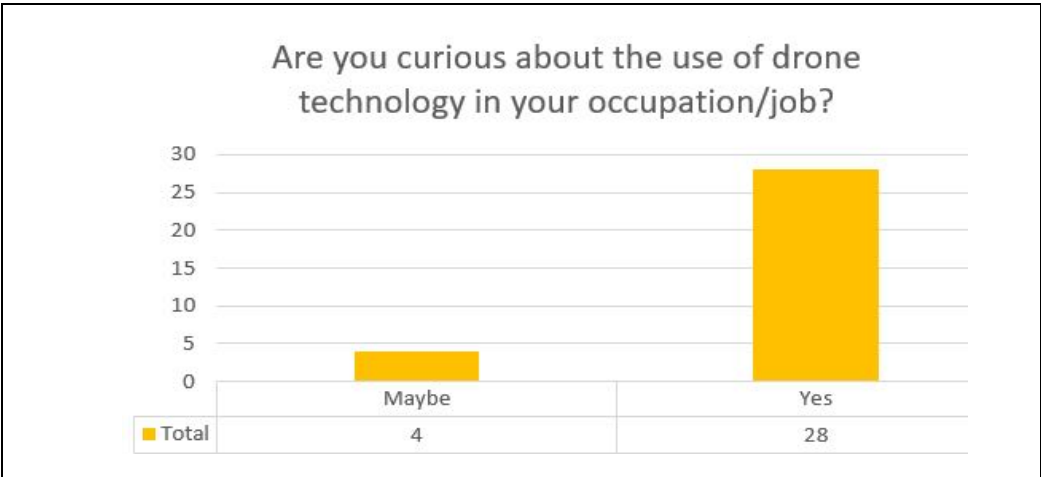
Group 4 -Six respondents (19%) **Others group** includes one educator from Italy, two entertainers working in historic gardens from Italy, one communication officer from Italy, and one from Spain who has qualified himself as 'other'. Graph. 3



Graph 3 – Current occupation

The views of the target group are significant for the preparation of the training course and its contents and also for understanding their interest and availability to follow the Drone4her training course.

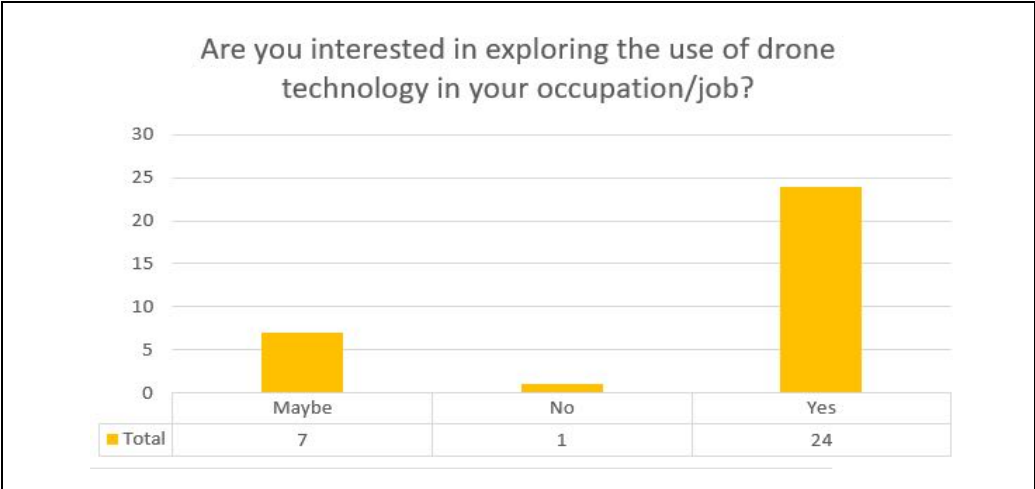
Most of the respondents twenty-eight (87,5%) have declared that they are curious about drone technology and four (12,5%) of them have declared that they may be interested. Graph 4



Graph 4

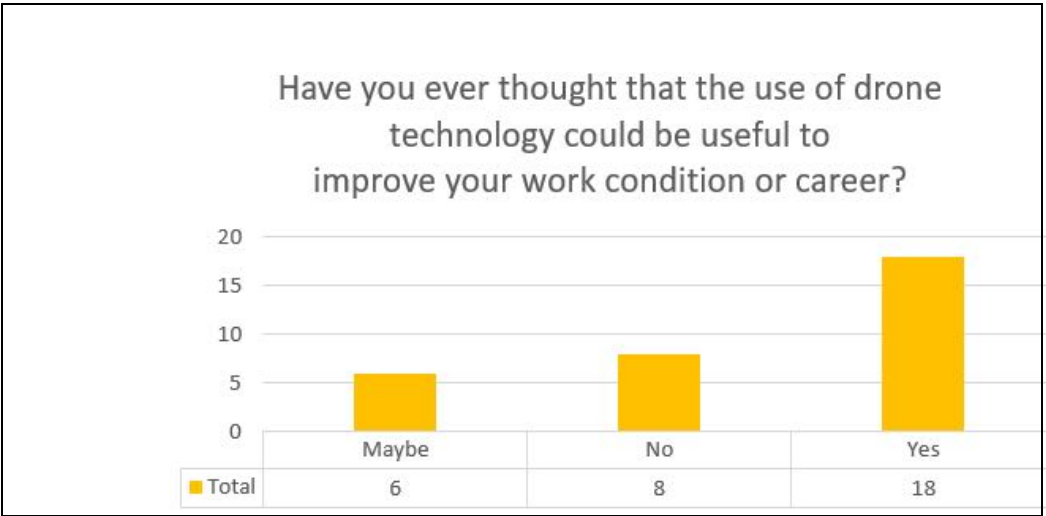
The interest of the respondents in exploring the use of drone technology in their job is high:

Of the total number of respondents twenty-four (75%) of them are interested, seven (21,8%) are not sure and only one (3,1%) is not interested. Graph 5



Graph 5

The majority of the respondents think that it is possible to improve their work conditions or careers by learning drone technology. Eighteen (56,25%) of them believe that drone technology can be useful, eight (25%) are negative and six (18,75%) are uncertain. Graph 6



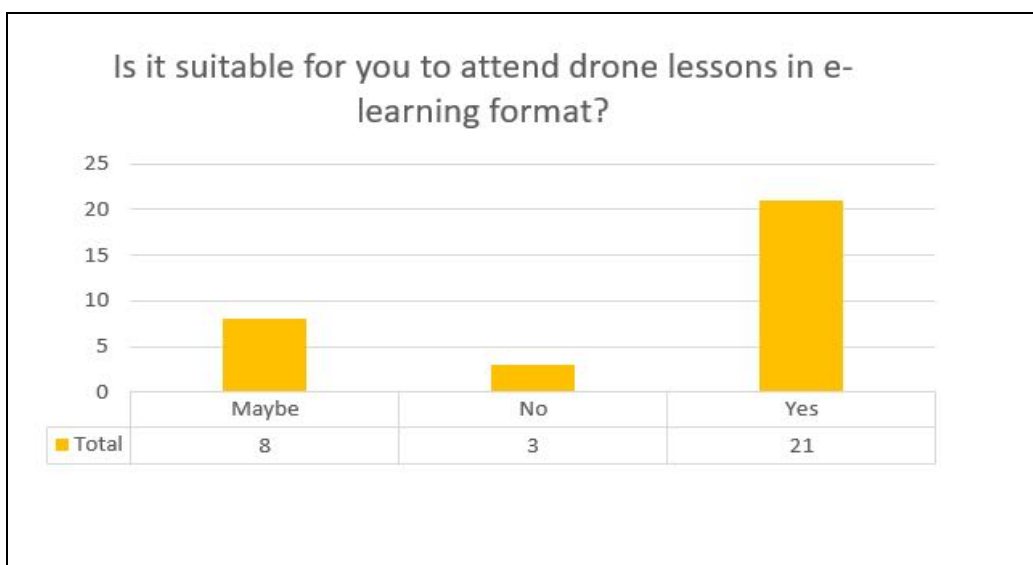
Graph 6

The view of the respondents is important concerning the digital skills of the gardeners that work in historic gardens. Seventeen (53,12%) of them confirm that the gardeners have no digital skills, fourteen (43,75%) that the gardeners have digital skills and 1 (3,12%) did not answer. Graph 6



Graph 7

Concerning the online training course most of the respondents confirm that online learning suits them. There are twenty-one (65,25%) positive responses, eight (25%) are uncertain and only three (9,37%) are negative. Graph 8



Graph 8

5.2 Qualitative Data Analysis

After presenting the demographics of the target group, we proceed to the analysis of the qualitative data of our research.

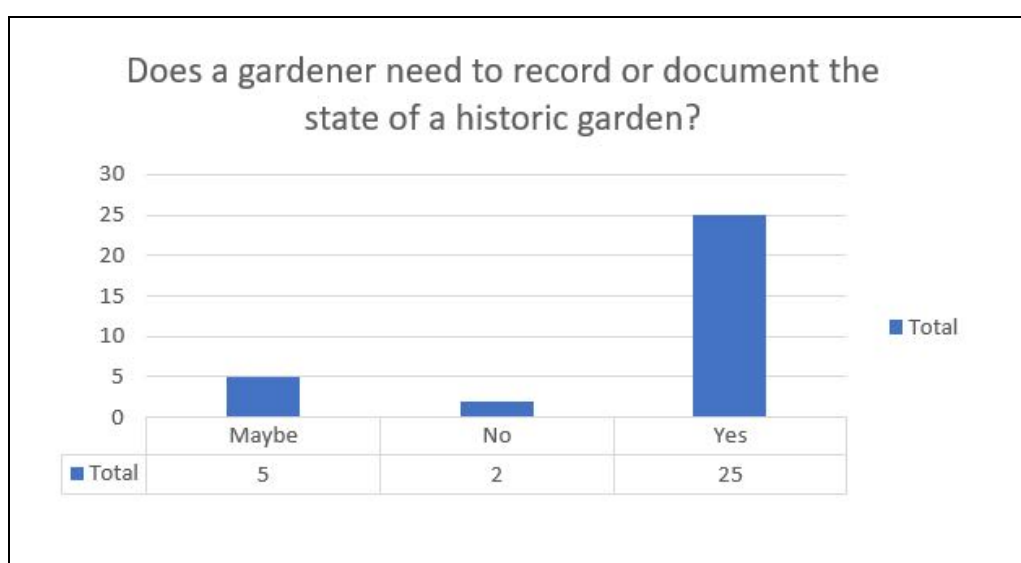
To reach our data first, we converted the responses into text and then we organized and indexed the data for easy retrieval and identification. The next step was to get acquainted with the data by reading the entries and taking notes. This was followed by the codification where we set criteria always keeping in mind the purpose and the objective of our research. Finally, we wrote the topics and the emerging concepts from the data. This way of preparing the analysis of

data was considered the most appropriate for the identification of gardeners' needs, attitudes and expectations.

From the carried out of the content analysis, the following categories and subcategories were created, which are presented in text and tables.

5.3 Frequency of interventions in the historic gardens

With regard to recording the state of the historic gardens, most of the respondents (78,12%), have answered positively. Four respondents answered maybe and two of them (a garden manager and a head of gardeners) answered no. Graph 9



Graph 9

Concerning how often a gardener needs to monitor, evaluate and report the health of a historic garden the feedback of the respondents is very variable. And for a better analysis result, the different responses have been merged into the following four groups

Group 1 - Four times a year or less, seven respondents (21,87 %). In this group, the following responses were gathered:

- *Four times a year*
- *Three times a year*
- *Twice a year*
- *Once a year*
- *It depends on the monitored item - for example, a different frequency will be for the irrigation of lawns, different for the health condition of trees. Nevertheless, at the end of the year, it is advisable to have a coherent summary report.*
- *10 years' term for the whole area of the historic garden, 3-5 years for special parts like tree canopy”.*

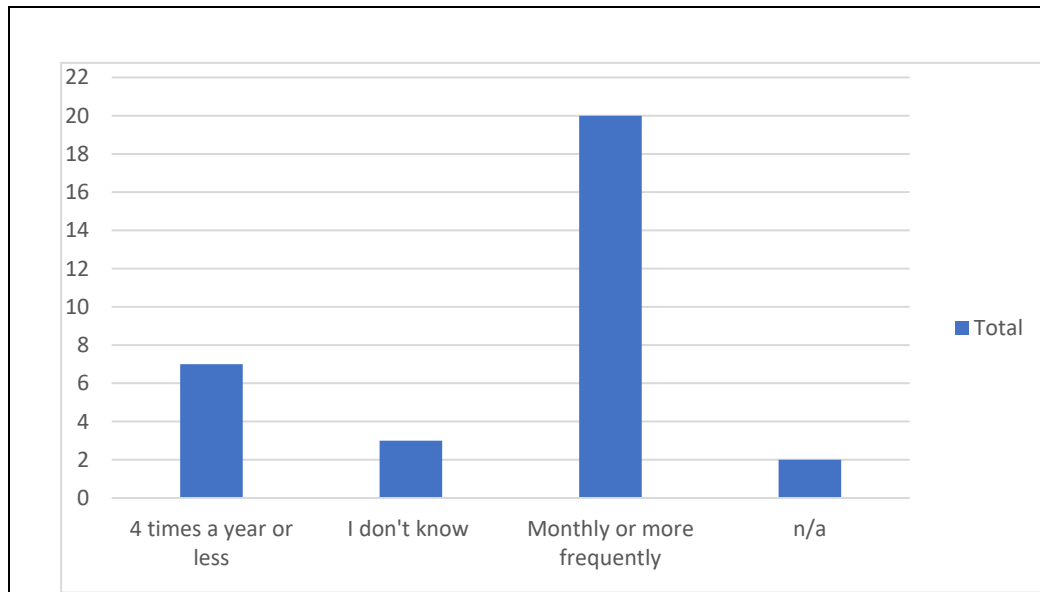
Group 2 - I don't know, three respondents (9,37 %) of which one researcher and two entertainers.

Group 3 - Monthly or more frequently, twenty respondents (62,50 %). In this group, the following responses were gathered:

- *Every day*
- *Twice a week*
- *Once a week*
- *On a regular basis.*

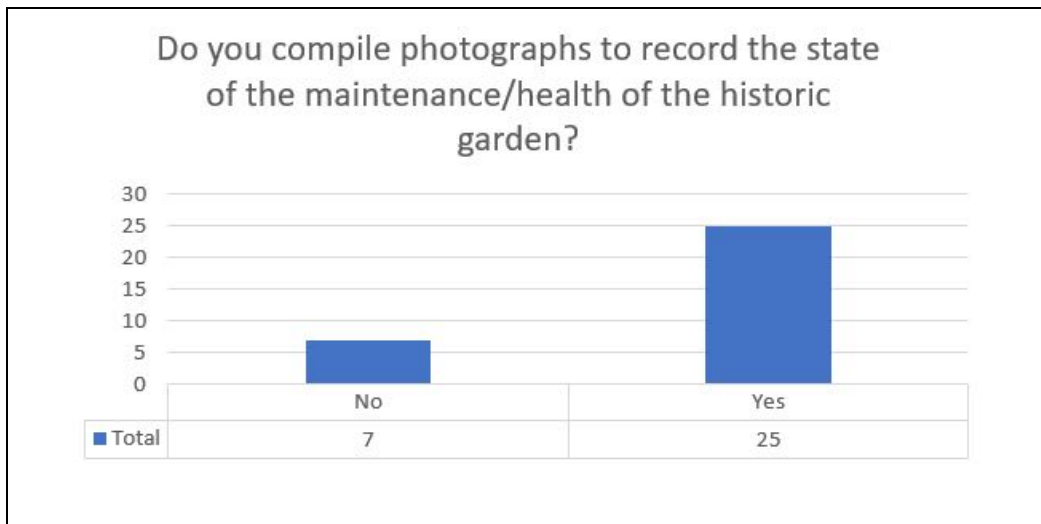
Group 4 - n/a Two respondents (%) both of them garden managers.

Graph. 10



Graph 10

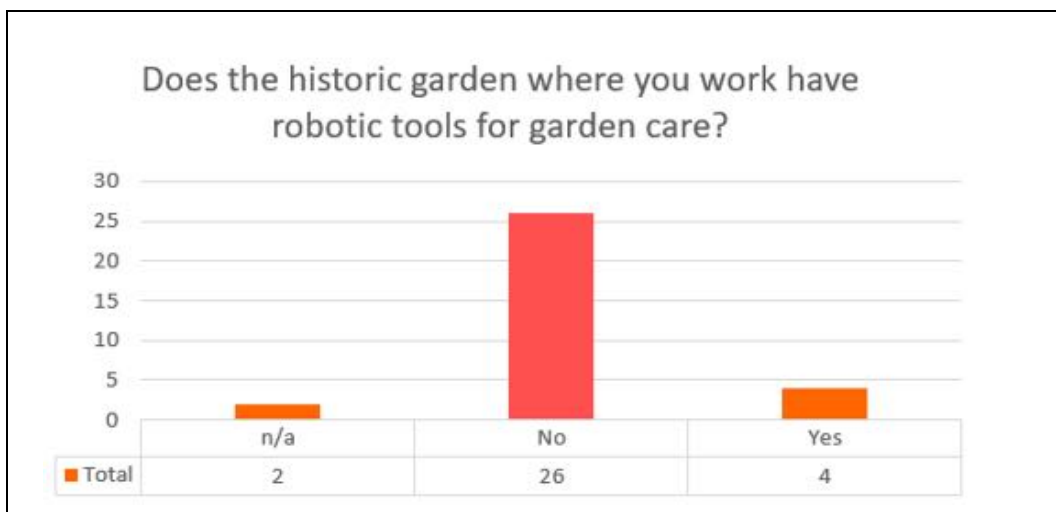
The survey reveals that the compilation of photographs is normally used by gardeners and it is an essential aid for the conservation and maintenance programmes of historic gardens. A good photographic record enables better analysis and interpretation of the state of health and photographs are also a valid help to document both the original state of the natural/architectural component being conserved and the conservation process. Twenty-five (78,12%) respondents are used to compile photographs. Graph 11



Graph 11

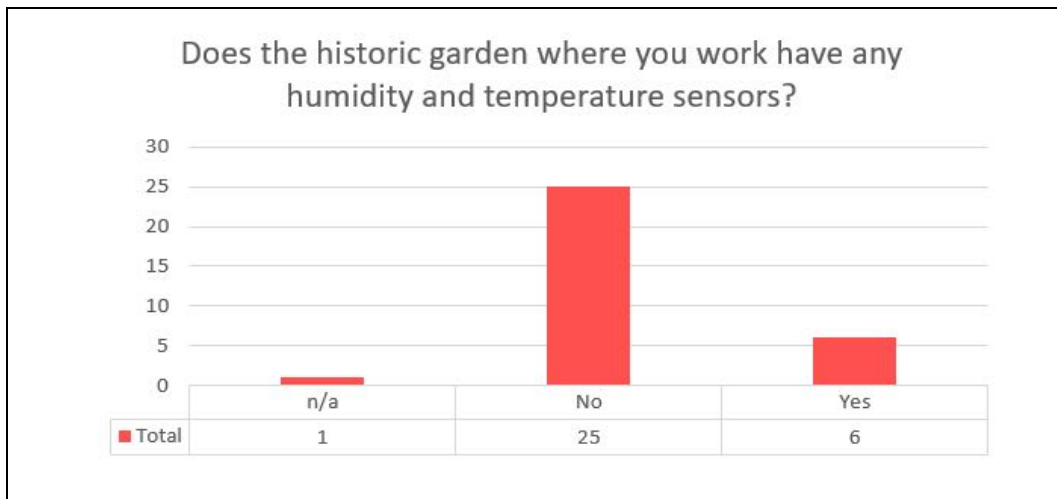
5.4 Historic gardens and new technologies

The survey reveals that the use of robotic tools is not very common in the historic garden where the respondents are working: twenty-six (81,25 %) respondents have provided a negative answer. Twelve (12,5%) respondents use robotic tools and two (6,25 %) of them did not answer. Graph 12



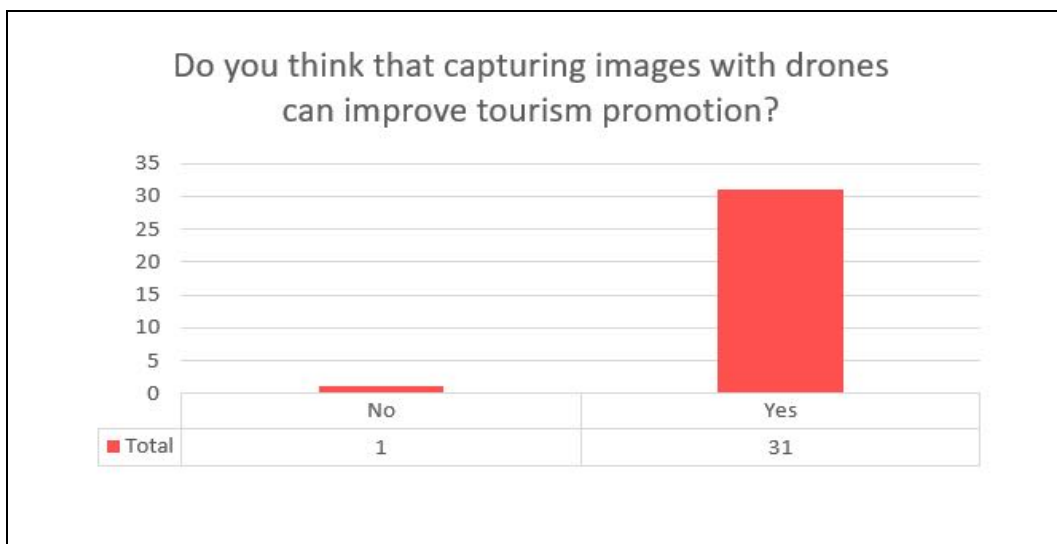
Graph 12

Environmental sensors are monitored through mobile devices and can be used to retrieve environmental conditions like temperature and humidity and allow an adjustment of watering practices based on real needs and weather circumstances. Twenty-five (78,12% %) respondents provided a negative answer. Six (18,75%) respondents use robotic tools and one (3,12 %) of them did not provide any answer. Graph 13



Graph 13

Drone technology is an advantage for producing videos and photos for communication purposes. The majority of the respondents thirty-one (96,87%) of them think that photos/videos taken with a drone can improve tourism promotion. Graph 14

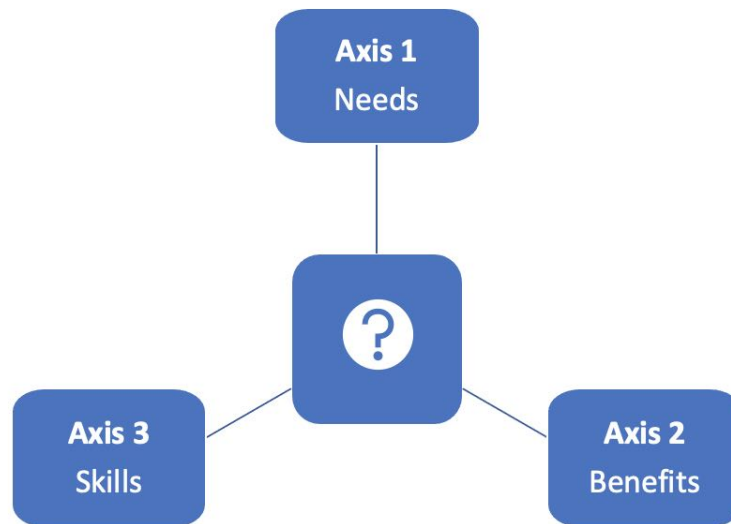


Graph 14

6. Analysis of semi-open and open questions

Data presentation

This is a presentation of data collected through open-ended and closed-ended questions. Using open-ended questions the respondents answer in detail while for the closed-ended questions, we have used multiple choice questions which provide respondents with multiple answer options. The information provided by the respondents have been elaborated to identify three main axes and we have included some categories that are presented below for a better interpretation of the data.



Axis 1. Needs Analysis

Axis 2. Benefits of Using Drone Technology

Axis 3. Expected Acquisition of Skills

Axes	Categories	Questions
AXIS 1 Needs analysis	1.1. Needs Identification	Please choose the phrase most relevant to your needs.
	1.2 Increasing Efficiency at the Workplace	Can drones be used to improve the efficiency of gardeners/garden employees' tasks?
	1.3. Difficulties in Accessing Sites /Artefacts to be Inspected	What kind of architectural/botanical elements in your historic garden are difficult to access for a person who needs to inspect them?
AXIS 2 Benefits of using drone technology in historic gardens: personal perception of the respondents	2.1. Benefits of Using Drone Technology in Gardens Management and Maintenance	What are the potential benefits of using drones in managing and maintaining historic gardens?
	2.2 Benefits of Using Drone Technology for Security	What could be the main benefits of using drones in historic gardens for security purposes?
	2.3. Benefits of Having Aerial	How do you think having a high-definition aerial view of a historic

	Garden Images	garden will support the daily work of a gardener or a garden staff/manager?
AXIS 3 Expected acquisition of skills /personal expectations of the respondents	3.1. Skills acquisition	Which of the following skills would you like to develop using drones in historic gardens?

6.1.AXIS 1 Needs analysis

The data categorized in AXIS 1 corresponds to the analysis of the responses to the following questions proposed in the survey.

1.1 Needs Identification

Question: Please choose the phrase most relevant to your needs

Set of answers

1. I'm interested in upgrading my skills through technology and drones.
2. The reason to use drones is to document the historic gardens.
3. The reason to use drones is for operational purposes (e.g. Capacity management, security, etc.).

Others:

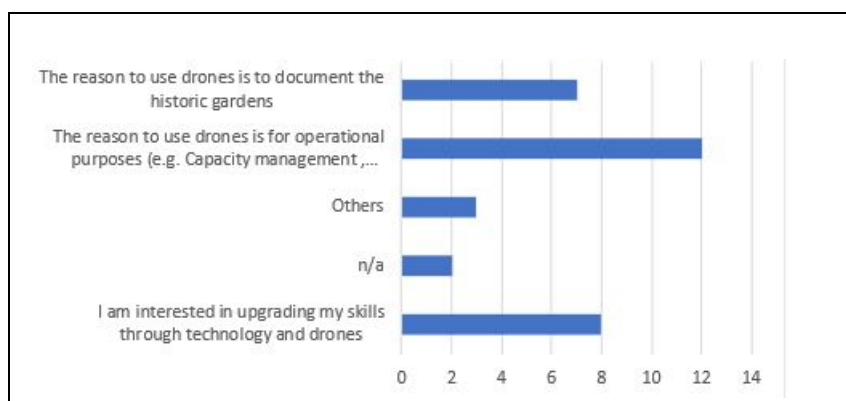
The respondents had been invited to choose one answer from the set of three provided above or to write their own answers in the section "Others". The analysis of the responses provides a clear distribution of needs:

- 37,5% of the respondents need to use drones for operational purposes that include capacity management and security reasons;
- 25% need to upgrade their skills;
- 21,87% need technological tools for collecting data for historic gardens documentation.

Needs reported in the section 'Others' are:

- Improve skills and take more archive material
- Plant health
- I am very interested in photography and video recording through the use of drones

Two respondents provided no responses and are classified as n/a.



Graph 15

Geographical findings:

Among the English-speaking respondents, 41,7% have expressed their interest in operational purposes and 33,3% in collecting data for documentation;
 Among the Italian-speaking respondents, 50% have expressed their interest in upgrading their skills and 33,3% in collecting data for documentation;
 Among the Spanish-speaking respondents the majority 66, 7% have expressed their interest in operational purposes.

1.2 Increasing efficiency at the workplace

Question: Can drones be used to improve the efficiency of gardeners/garden employees’ tasks such as: (it is possible to select more than one answer)

Set of answers:

1. Risks management
2. Thermographic control to detect areas with excess/lack of water
3. Inspection of difficult-to-access areas
4. Fire prevention
5. Capacity management
6. Control of access to the garden along the whole perimeter

Others:

Focusing on tasks and identifying how drone technology can contribute to improving the daily tasks of a gardener. The respondents had been invited to choose one or more answers from a set list of six provided tasks and to write/add their own extra answers in the section ‘Others’. Totally the respondents have provided 99 answers. The table below reports how many times each answer has been selected by the respondents:

Answer	Times selected	%
Risk management	15	15,15%
Thermographic control to detect areas with excess/lack of water	15	15,15%
Inspection of difficult-to access-areas	21	21,21%
Fire prevention	11	11,11%

Capacity management	14	14,14%
Control of access to the historic gardens along the whole perimeter	20	20,20%
Others	3	3,03%
Total	99	99,99%

Answer provided in the section 'Others':

- Emergency administration of products for biological pest control, control of ecological corridors, and promotional purposes.

The analysis of the responses provides the following main findings: The inspection of difficult-access areas in the gardens (21,21%) and the control of the perimeter of gardens (20,20%) are the most important needs identified by the respondents. They are followed by the thermographic control for detecting areas with excess/lack of water (15,15%) and risk management (15,15%). Then it comes to capacity management and fire prevention respectively. Fire prevention is ranked low even if we live in a world where fire accidents are increasing and dangerous tasks should be left to machines.

1.3 Difficulties in Accessing Sites /Artefacts to be Inspected

Question: What kind of architectural/botanical elements in the historic garden where you work are difficult to access for a person who needs to inspect them?

The respondents had been invited to provide their unique responses in an open-text format based on their knowledge and direct experiences about the architectural/botanical elements that are difficult to access for inspection. The thirty-two responses have been divided into the following groups to identify specific settings for possible application of drone technology.

Group 1: The health of arboreal and specifically of the health of big/veteran/monumental trees

- *Answer:* Mature trees with crown problems
- *Answer:* Tree crowns
- *Answer:* Historic trees

Group 2: The architectural elements and their state of conservation

- *Answer:* High buildings with difficult access (e.g. relics of old buildings)
- *Answer:* The state of conservation of elements of buildings that are difficult to observe closely and their energy dispersion
- *Answer:* Ancient statues and fake ruins

Group 3: Specific parts of the garden area that need special attention and care

- *Answer:* Part of the garden area is periodically flooded and wet plants
- *Answer:* The allees and the difficult shapes in the forest
- *Answer:* Shrub, the hedges of *Buxus sempervirens*⁵
- *Answer:* Bushes, wetlands

⁵ *Buxus sempervirens* is a species of evergreen shrub that is commonly known as common boxwood. It is native to Europe, North Africa, and Western Asia, but it is widely cultivated in many parts of the world for its ornamental and hedging qualities.

6.2 AXIS 2 Benefits of using drone technology in historic gardens

The data categorized in AXIS 2 corresponds to the analysis of the collected open-ended answers to the three following open-text questions that have been provided by the respondents. The responses are based exclusively on the personal and working experiences of the respondents.

2.1 Benefits Concerning the Management and Maintenance of Historic Gardens

Question: What are the potential benefits of using drones in managing and maintaining historic gardens?

The thirty responses collected from this question have been divided into two groups that identify specific benefits in managing and maintaining historic gardens.

Groups 1 Management

- Get a different and more efficient management perspective.
- Accuracy in inspection and in-depth knowledge and perception of details.
- Improving the plan for future interventions and better control of the garden
- Saving energy and time: the possibility of being able to understand more quickly the interventions to be carried out reduce the impact of the work to be done and the cost of the interventions.
- Improving safety at work through a quick control of elements difficult to reach and at a height (no need to use climbing techniques).
- Improving risk management through a quick outline of the areas of intervention and anticipating possible problems, woodland risk assessment.
- Improving services offered to visitors.
- *Answer:* "I think it can help in planning the general maintenance works"
- *Answer:* "Potential benefits are connected to management, conservation and services"
- *Answer:* "Understand more quickly the interventions to be carried out, with a lower cost"

Groups 2 Maintenance

- Better documentation of changes in the garden and in the surrounding areas and better, quick and detailed monitoring activities through aerial photos and films of the area.
- Ability to quickly inspect a larger area.
- Improvement in planning the general maintenance works and documenting changes in the garden and surrounding landscape.
- Scheduling targeted interventions.
- Possibilities of intervening in a more prompt manner with respect to problems of maintenance, safety, pest prevention, phytosanitary treatments, the humidity of the soil, irrigation and diligent intervention, plant pathologies, monitoring of the perimeter areas of the garden, monitoring of movements of fauna entering or transiting in the garden, health and stability problems of mature trees, crown deformations etc.
- *Answer:* "Detailed monitoring of the garden"
- *Answer:* "Phytosanitary status of the plantation"

2.2 Benefits Concerning the Security of Historic Gardens

Question: What could be the main benefits of using drones in historic gardens for security purposes?

The twenty-eight responses collected for this question have been divided into the following three groups that identify specific benefits for improving security aspects in historic gardens. Especially during and after the Covid-19 pandemic, gardens became more and more popular and the number of visitors was increasing due to the positive impact on people's health. This new trend has a negative effect on the vulnerability and security of the gardens. Drone technology contributes to improving security because it enables capturing data impossible to obtain in any other way.

Group 1 Increasing security in the following sectors

- Plant security, stability of mature trees, detection of sanitary state of the plants and gardens, lack of water soil moisture, risk of light pollution, all kinds of degradation including wild animals living nearby the gardens.
- Problems of deterioration of walls and artefacts in visitor transit areas.
- Branches drying out, accessibility to wetlands or floodable areas near watercourses, surveillance of cliffs.
- Ecological corridors.
- Control of gardens' perimeter.
- *Answer: "Perimeter control and detection of security breaches"*
- *Answer: "Data capture that is impossible to obtain in any other way"*

Group 2 Protection

- Improving the ability to record videos useful for investigations or even quickly locate people in difficulty.
- Protection against the intrusion of wild animals living in the areas near the gardens.
- Improving monitor and control of the visitors during day and night, tourist flow, and control of illegal activities done in the garden (i.e. garden theft, junk throwers).
- *Answer: "Monitoring customers from the sky and quickly locate people in difficulty"*
- *Answer: "Being able to record videos useful for investigations"*

Group 3 Prevention

- Fire, robbery, accidents at work.
- *Answer: "It would prevent vandalism"*
- *Answer: "The use of ladders and scaffolding would be reduced and limited"*

2.3 Benefits of Having Aerial Garden Images

Question n.3

How do you think having a high-definition aerial view of a historic garden will support the daily work of a gardener or a garden staff/manager?

The thirty-one responses collected for this question have been divided into four groups that identify specific benefits of using aerial garden images of historic gardens. From the answers of the respondents, drone technology could contribute to monitoring, evaluation, efficient daily management and control.

Group 1 Monitoring

- Monitoring changes through the years and through each season.
- Monitoring changes that are related to the landscape and plants of the garden and their health issues (pests and different diseases).
- Monitoring and verification of dryness on trees and meadows, control of structural conditions of buildings.
- Monitoring statues and their state of conservation.
- *Answer: "Monitor changes that are related to the plant health in the garden"*
- *Answer: " Verification of dryness and control of structural conditions of the soil"*

Group 2 Evaluation

- Evaluation of overall condition and detailed health survey of tree canopy; artificial or natural water systems, lack of water, drought areas, invasive plant settlement etc.
- Evaluation of the three-dimensional characteristics of the specimens and pathologies.
- Soil.
- *Answer: "... Evaluation of water needs and the onset of pathologies"*

Group 3 Efficient daily management

- Providing additional information on the state of conservation.
- Enabling targeted and detailed interventions.
- *Answer: "It makes it easier to check the state of the garden and identify interventions"*
- *Answer: "Check that all visitors have left"*

Group 4 Control

- Access to the garden can be controlled along the entire perimeter and when it is closed, the drone can be used to go around the garden and check that all visitors have left.
- *Answer: " We have carried out a program of drone recordings entitled "four seasons". Its purpose was to document the state of the garden landscape, illustrate the transformations of space during the year, and use the material for promotional purposes. At the moment, we use drones to document the condition of historic buildings. We also plan to link them with other detectors in the Environmental Management System"*
- *Answer: "Of no use in my daily activities"*
- *Answer: "Certainly a lot"*

6.3 AXIS 3. Expected Acquisition of Skills

3.1 Skills Acquisition

The data categorized in AXIS 3 corresponds to the analysis of the responses to the following question proposed in the survey.

Question Which of the following skills would you like to develop using drones in historic gardens?

Set of answers:

1. Pruning and planting
2. Water monitoring
3. Photography
4. Video recording

5. Photography and graphic design software
6. Pest and disease management
7. Thermographic control to detect areas with excess/lack of water
8. Risk prevention/fire
9. Capacity management
- Others

This point is about the categorization of data concerning the expected skills that the target group would like to gain by learning drone technology. It is a very important aspect of the project because this information is fundamental for assuring the commitment of the trainees and the success of the online course. The respondents had been invited to choose one or more answers from a set list of ten provided skills and to write/add their own answers in the section 'Others'. Totally the respondents have provided 154 answers. The table below reports how many times each answer has been selected by the thirty-two respondents.

Answer	Times selected	%
Pruning and planting	7	4.54%
Water monitoring	13	8.41%
Images analysis	17	11.03%
Photography	22	14.28%
Video recording	21	13.63%
Photography and graphic design software	12	7.79%
Pest and disease management	19	12.37%
Thermographic control to detect areas with excess/lack of water	18	11.68%
Risk prevention/fire	17	11.03%
Capacity management	8	5.19%
Others	n/a	n/a
TOTAL	154	99.95%

No answer was added to the section 'Other' It is an indication that the set of provided responses covers the expectation of participants in the survey.

The analysis of the responses provides the following main findings: Photography and video recording are in the top position concerning the expected tasks to gain during the online course. Skills that allow pest disease management and thermographic control to detect areas with excess /lack of water are also highly requested followed by risk prevention including fire prevention.

Taking into consideration that four responders in Italy work in the historic garden with tasks related to education and communication we can conclude that photography, video recording pest and disease management, thermography control and risk prevention and analysis of the images are the main topics that should be offered during the online course to meet the majority of the expectation of the respondents.

7. Conclusion

Using drones in historic gardens can provide significant benefits for gardeners, tourists, and the overall health of the garden. While there may be some challenges in introducing new technology to historic gardens where digital skills are not widely prevalent, the advantages of using drones for monitoring, photography, and maintenance in areas that are difficult to access make it a worthwhile consideration.

By implementing drone technology, gardeners can improve their control, safety, and management of the garden. Drones can help them to monitor the health of tall trees, inspect delicate sculptures or ornaments, and assess the condition of hard-to-reach roofs or gutters. They can also assist in identifying areas where maintenance or repair work is needed, allowing gardeners to respond more quickly and efficiently to any issues that arise.

In addition, drones can be used to capture stunning aerial photographs and videos of the garden, providing a unique and exciting perspective for visitors and tourists. This can make the historic garden more attractive to tourists, which can increase revenue and support the garden's preservation.

While historic gardeners may not use much technology, the introduction of new tools like drones can improve their skills and enhance their work. The training can be conducted in an online format, making it accessible for gardeners to learn and improve their drone operation and maintenance skills.

Overall, the use of drones has the potential to greatly enhance the maintenance and preservation of historic gardens. By providing better access and management of the garden, gardeners can ensure that these important historical landmarks remain vibrant and beautiful for years to come.

8. ANNEXES:

Link to the Web-based Tool Template (project result n.1)

EN version: <https://forms.gle/Kv3HpAZKJomQL4Df9>

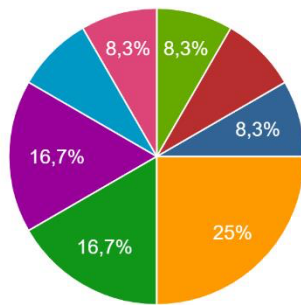
IT version: <https://forms.gle/jmbxeSgAk7Wic5JFA>

ES version: <https://forms.gle/5vfta7wXNkhtZWxi8>

SURVEY RESULTS- English Language Analysis of results
Number of respondents:12

1) Where are you working ?

12 risposte

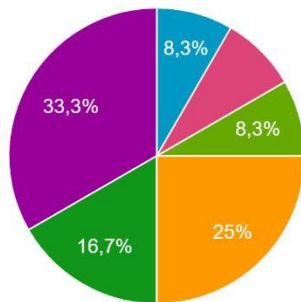


- Spain
- Italy
- Hungary
- GREECE
- POLAND
- Greece
- georgia
- France

▲ 1/2 ▼

2) What is your current occupation? Select only one

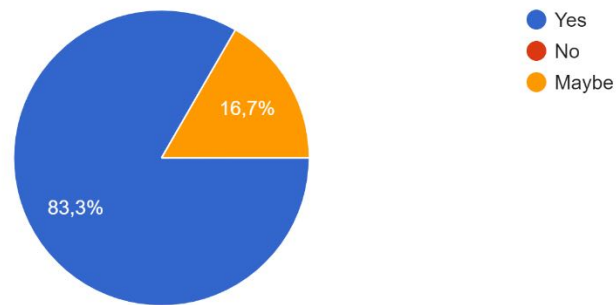
12 risposte



- Gardener
- Staff of gardeners
- Head of gardeners
- Garden Manager
- Researcher/ Expert
- landscape architect
- Landscape protection chief specialist
- President of the fondation

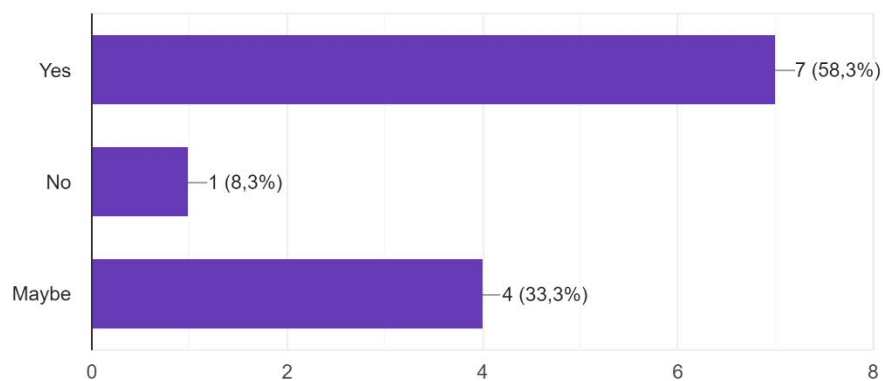
3) Are you curious about the use of drone technology in your occupation/job?

12 risposte



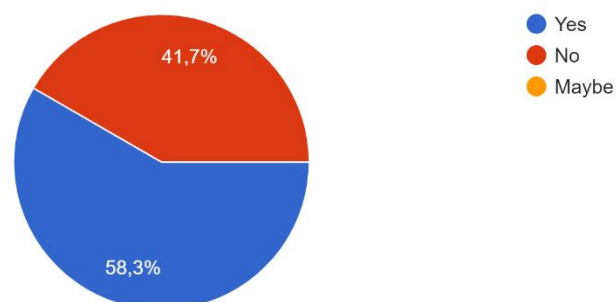
4) Are you interested in exploring the use of drone technology in your occupation/job?

12 risposte



5) Have you ever thought that the use of drone technology could be useful to improve your work condition or career?

12 risposte



6) How often does a gardener need to monitor, evaluate and report a historic garden's health?

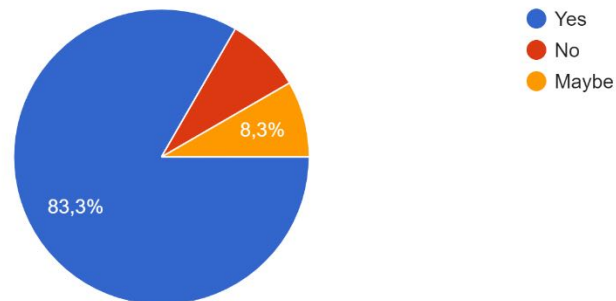
10 years' term for the whole area of the historic garden, 3-5 years for special parts like tree canopy

- At least once per week
- Twice a year

- I check it every day
- Twice a month
- I don't know because I am not in charge of a historic garden, just a reseracher interested in the topic
- It depends on the monitored item - for example, a different frequency will be for the method of irrigation of lawns, different for the health condition of trees. Nevertheless, at the end of the year, it is advisable to have a coherent summary report.
- Every six months
- Every month
- Regularly
- Once a week

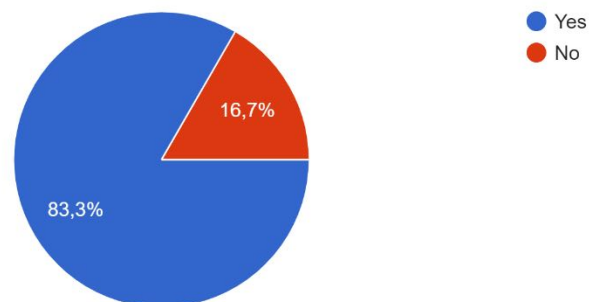
7) Does a gardener need to record or document the state of a historic garden?

12 risposte



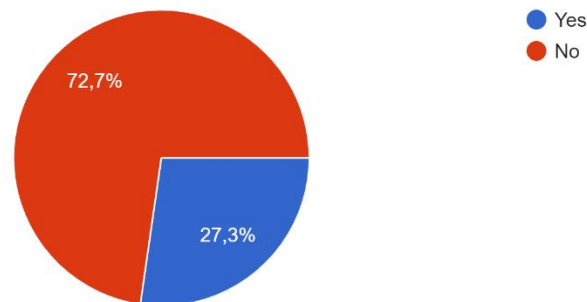
8) Do you compile photographs to record the state of the maintenance/health of the historic garden?

12 risposte



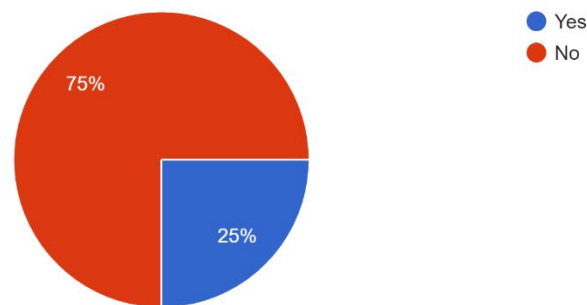
9) Does the historic garden where you work have robotic tools for garden care?

11 risposte



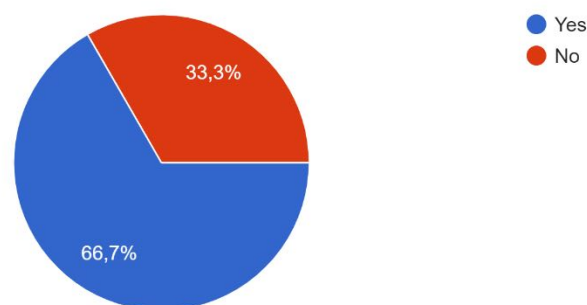
10) Does the historic garden where you work have any humidity and temperature sensors distributed along the site?

12 risposte



11) Among the staff of the garden where you work, are there any employees with digital skills, knowledge or experience?

12 risposte



12) How do you think having a high-definition aerial view of a historic garden will support the daily work of a gardener or a garden staff/manager?

12 answers

- Monitor changes through the years and through each season, monitor changes that are related to health issues

- Evaluation of overall condition and detailed health survey of tree canopy; artificial or natural water systems, lack of water, drought areas, invasive plant settlement etc
- Usually drone. In past years through aero-photographs
- By regarding any changes to the landscape and plants of the garden
- This can help monitor the health of the trees, pests and diseases.
- yes, it would definitely help all of us in efficiently working
- Yes, the aerial view can give additional information on the state of conservation and daily management
- We carried out a program of drone recordings entitled "four seasons". Its purpose was to document the state of the garden landscape, illustrate the transformations of space during the year, and use the material for promotional purposes. At the moment, we use drones to document the condition of historic buildings. We also plan to develop such elements together with linking them with other detectors in the Environmental Management System.
- We would get a more complete picture of the garden's state, and public opinion would be better if they would see the beautiful garden as it is. Many of the shapes are formed from the aerial view.
- See the health status of the trees
- Yes
- Maybe. I think it can help in planning the general maintenance works and documenting changes in the garden and surrounding landscape.

13) What kind of architectural/botanical elements in your historic garden are difficult to access for a person who needs to inspect them?

12 answers

- Historic trees
- Mature trees with crown problems
- Tall veteran trees
- Structure elements, old plants
- Part of the garden area is periodically flooded and wet.
- there are no such places in our historic gardens
- The garden is subject to a rehabilitation plan by the city
- High buildings with difficult access (e.g. relics of old buildings).
- Many of the shapes are formed from the aerial view. Mostly the allees and the difficult shapes in the forest and the yew tree.
- Mainly big trees
- Bushes, wetlands
- Nature reserve area, lakes, tree crowns

14) What are the potential benefits of using drones in the management and maintenance of historic gardens?

11 answers

- Development of vegetation cover and green intensity could be regularly detected; health and stability problems of mature trees, crown deformations etc.
- Accuracy in inspection
- Better control of the garden
- Beautiful aerial photos and films, monitoring of the area, and using drones is very useful for plant research and for the effective conduction of various works.
- The potential benefits are connected to management, conservation and services to visitors

- Quick control of elements at a height (no need to use climbing techniques, or elevations). The ability to quickly inspect a larger area. Ability to compare data from different periods.
- We would get a more complete picture of the garden's state, and the public opinion would be better if they would see the beautiful garden as it is. Many of the shapes are formed from the aerial view.
- Phytosanitary status of the plantation
- Detailed monitoring of the garden
- I think it can help in planning the general maintenance works and documenting changes in the garden and surrounding landscape.

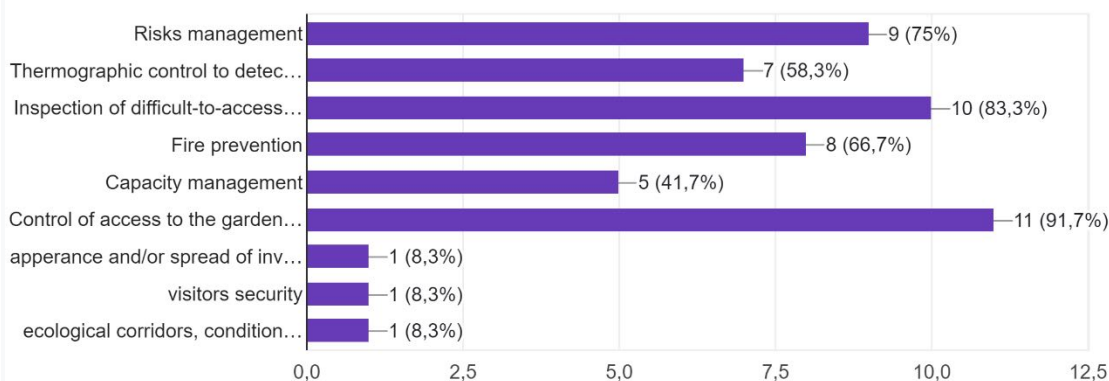
15) What could be the main benefits of using drones in historic gardens for security purposes?

9 answers

- Mature trees' stability problems, detection of health problems or lack of water
- Fire prevention, robbery prevention, anarchy violence
- Better control of the visitors
- Protection and monitoring against the intrusion of wild animals and monitoring the access of unauthorized persons.
- using drones is very useful for plant security and around the garden area.
- All kinds of degradation and monitoring of the sanitary state of the garden
- Control of the health condition of trees, soil moisture, the risk of light pollution, ecological corridors, tourist traffic and the appearance of "uninvited guests" at night
- Yes. There are many boards in the forest next to the garden and we could monitoring them, see where they are, where they are going. There is a problem with the illegal junk throwers and with drones, we could get them during illegal activities.

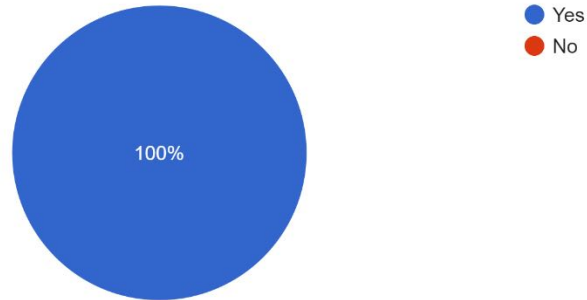
16) Can drones be used to improve the efficiency of gardeners/garden employees' tasks such as (you can select more than one)

12 risposte



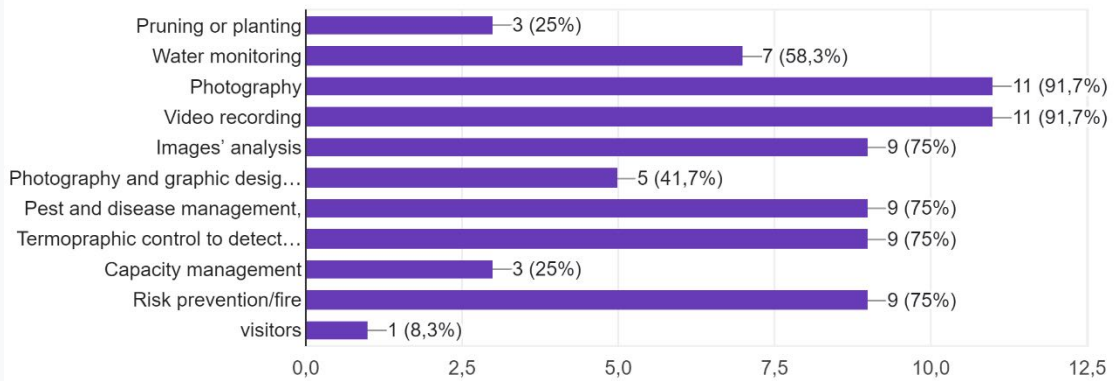
17) Do you think that capturing images with drones can improve tourism promotion?

12 risposte



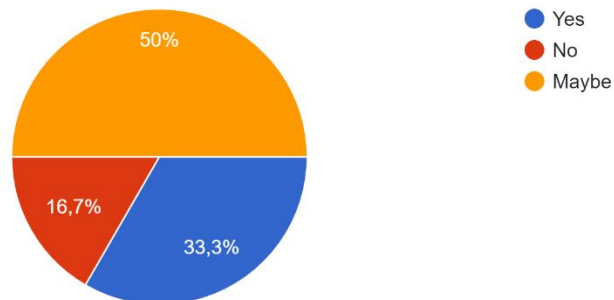
18) Which of the following skills would you like to develop using drones in historic gardens?

12 risposte



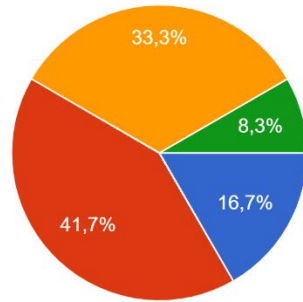
19) Is it suitable for you to attend drone lessons in e-learning format?

12 risposte



20) Please choose the phrase most relevant to your needs.

12 risposte

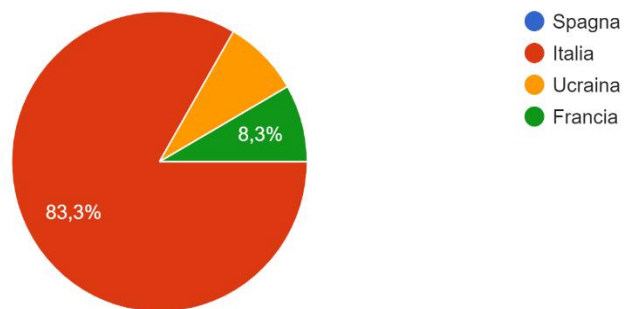


- I'm interested in upgrading my skills through technology and drones.
- The reason to use drones is to document the historic gardens.
- The reason to use drones is for operational purposes (e.g. Capacity management , security, etc.)
- IMPROVE SKILL AND TAKE MORE ARCHIVE MATERIAL

SURVEY RESULTS- Italian Language Analysis of results
Number of respondents:12

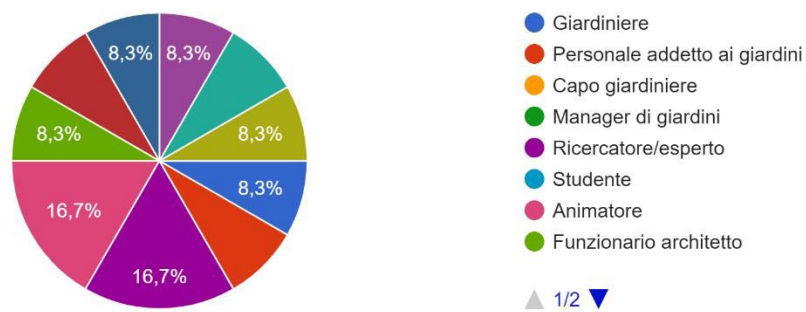
1) Dove stai lavorando ?

12 risposte



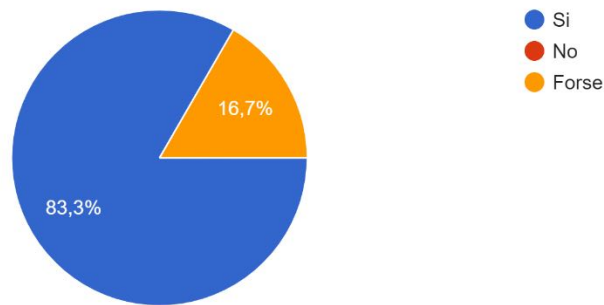
2) Quale è la tua occupazione attuale? Selezionane solo una.

12 risposte



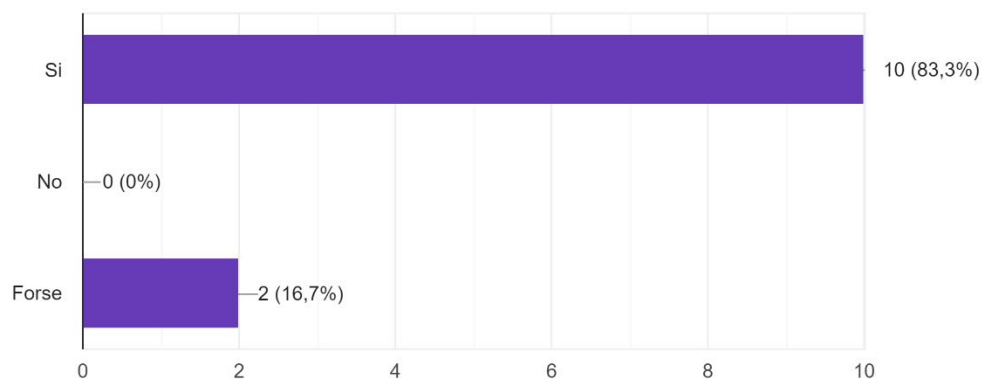
3) Sei curioso sui possibili utilizzi della tecnologia dei droni nella tuo lavoro/occupazione?

12 risposte



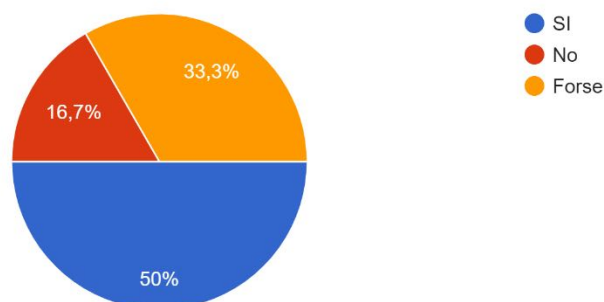
4) Saresti interessato/a a esplorare l' utilizzo dei droni nell' ambito della tua occupazione/lavoro ?

12 risposte



5) Hai mai pensato che saper utilizzare la tecnologia dei droni potrebbe servire per migliorare le condizioni del tuo lavoro e la tua carriera?

12 risposte



6) Con quale frequenza un giardiniere deve monitorare, valutare e segnalare lo stato di salute di un giardino storico?

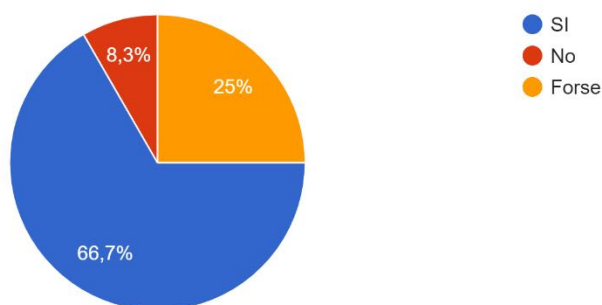
12 risposte

- Quotidianamente
- in maniera costante
- Giornaliera/ Settimanale
- Non lo so

- Ogni settimana
- Non lo so
- Giornaliera
- Una volta a settimana
- Con molta frequenza
- Quattro volte anno
- Costantemente

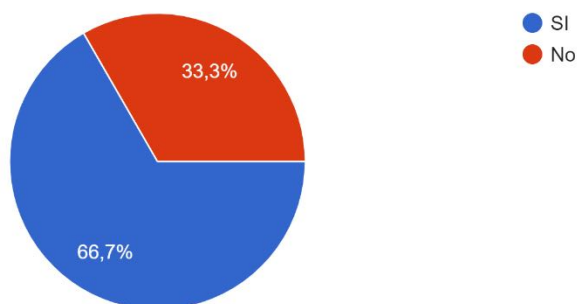
7) Un guardiniere ha bisogno di fornire regolarmente relazioni o documentazione sullo stato di un giardino storico?

12 risposte



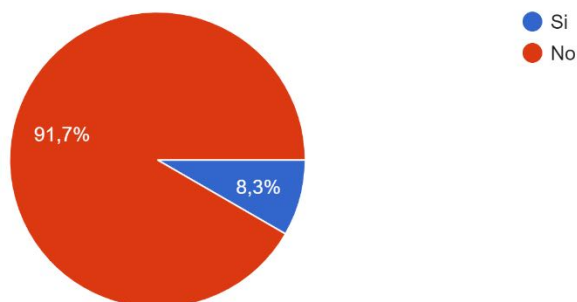
8) Assembli delle fotografie per documentare lo stato di manutenzione/salute del giardino storico?

12 risposte



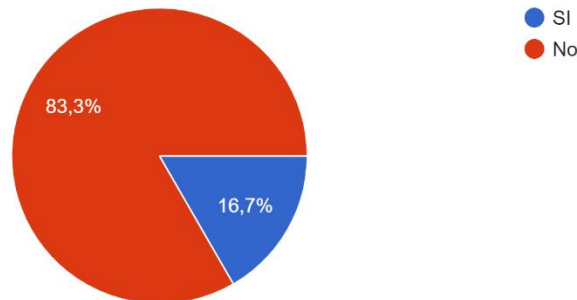
9) Il giardino storico dove lavori dispone di strumenti robotici per la cura del giardino?

12 risposte



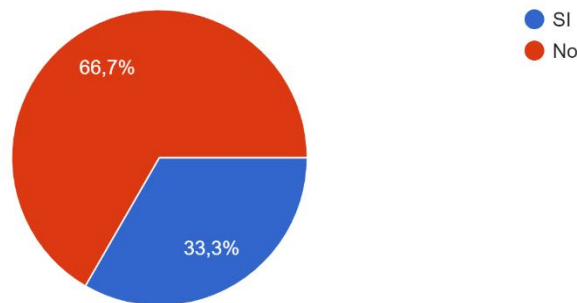
10) Il giardino storico dove lavori ha sensori di umidità e temperatura distribuiti lungo il sito?

12 risposte



11) Tra lo staff del giardino dove lavori c'è una persona con competenze digitali, conoscenza della tecnologia o esperienza con l'elettronica?

12 risposte



12) Come pensi che una veduta aerea in alta definizione di un giardino storico possa aiutare il lavoro quotidiano di un giardiniere o di un manager di un giardino?

12 risposte

- La visione di insieme evidenzia l'opportunità di interventi mirati e dettagliati
- Potrebbe essere d'aiuto
- Valutazione delle caratteristiche tridimensionali degli esemplari, valutare le condizioni di salute dei singoli esemplari, fabbisogni idrici ed insorgenza di patologie,
- Si può controllare l'accesso al giardino lungo tutto il perimetro e al momento della chiusura si può utilizzare il drone per fare il giro del giardino e controllare che tutti i visitatori siano usciti
- Per valutare l'arredo a verde
- Penso possa essere utile per ispezionare le aree del giardino e monitorare la salute delle piante e lo stato in cui si trovano, potrebbe essere utile anche per il monitoraggio delle statue e il loro decadimento.
- Sicuramente aiuta a osservare lo stato delle piante e soprattutto degli alberi altrimenti visibili solo dal basso.
- La veduta aerea di una zona può facilitare il controllo dello stato del giardino e individuare eventuali interventi.
- Di nessun utilizzo nelle mie attività quotidiane
- Sicuramente molto
- Verifica di seccume su alberi e prati, controllo condizioni strutturali del terreno

- Permetterebbe di visualizzare un cambiamento su larga scala e notare l'impatto di cambiamenti climatici o malattie

13) Che tipo di elementi architettonici/botanici si trovano in un giardino storico che sono di difficile accesso per una persona che debba ispezionarli?

11 risposte

- Finti ruderi, alberature monumentali, serre, collezioni
- No
- Stato di conservazione di elementi di fabbricati di difficile osservazione ravvicinata e loro dispersioni energetiche, stato di salute degli esemplari arborei, arbustivi, erbacei da punti di vista differenti da quelli usuali dal piano di campagna. Verifica di situazioni di pericolosità relative ad elementi architettonici ed arborei.
- Disegni a verde, bosco
- Statue antiche e alberi
- Le coperture dei fabbricati e le piante di alto fusto.
- Alberi molto alti, fontane, siepi...
- Monitoraggio di piante e/o alberi di alto fusto, elementi architettonici di difficile accesso, simmetria delle aiuole e/o fioriture
- Vari
- Coperture di edifici e chiome di alberi ad alto fusto
- Parti boschive principalmente

14) Quali potrebbero essere i potenziali benefici dell' utilizzo dei droni nella gestione e manutenzione dei giardini storici?

11 risposte

- Conoscenza approfondita e percezione di dettagli
- Non saprei
- Migliore organizzazione della gestione intervenendo in maniera più sollecita rispetto a problematiche di manutenzione, di sicurezza, di irrigazione ed intervento solerte e mirato di fronte all' insorgenza di patologie vegetali, monitoraggio aree perimetrali del giardino, monitoraggio movimenti fauna in ingresso o transito nel giardino.
- Miglior controllo
- Per aiutare a sorvegliare le zone e per fare sopralluoghi
- La possibilità di poter capire più velocemente gli interventi da realizzare, con una spesa inferiore.
- Sicurezza nel lavoro, risparmio di energie e tempo, per verificare posti lontani o difficilmente raggiungibili
- Uso a scopo di diario da consultare negli anni
- Guadagno tempo e tempestività
- Rapidità del controllo
- Delineare più velocemente le zone d'intervento e anticipare possibili problemi

15) Quali potrebbero essere i principali benefici dell' uso dei droni nei giardini storici in relazione alla sicurezza?

12 risposte

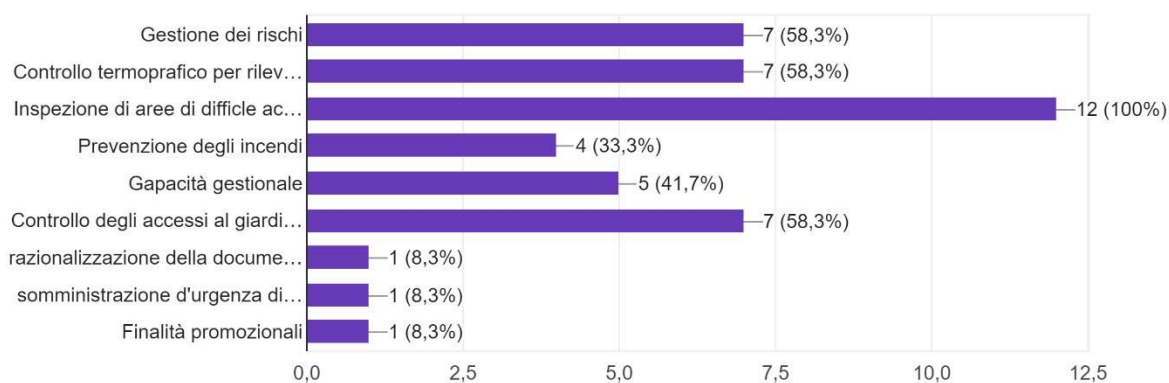
- Non saprei
- Si potrebbero evidenziare i punti di fragilità
- Monitoraggio di problemi di deterioramento parti murarie e cornicioni in zone di transito dei visitatori, monitoraggio di stati di disseccamento di branche,

monitoraggio accessibilità a zone umide o esondabili in prossimità di corsi d'acqua.

- Prevenzione incendi
- Stato delle piante
- Controllare che sia tutto a posto e quindi sorvegliare le varie zone analizzando anche se sono presenti rami secchi e se opportuno intervenire con la pota e controllare lo stato delle opere architettoniche e se necessario messe a norma
- Poter registrare filmati utili ad indagini o anche localizzare velocemente persone in difficoltà.
- Si limiterebbe l'uso di scale e ponteggi
- Eviterebbe atti vandalici
- Prevenzione e monitoraggio
- Verificare più velocemente alberi caduti e rami spezzati

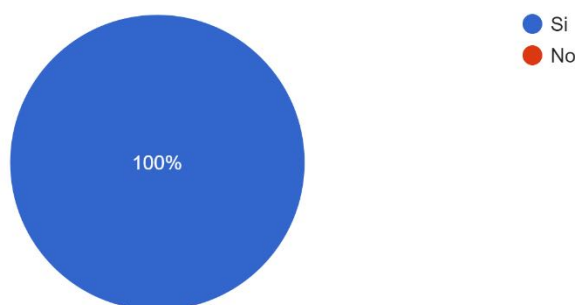
16) Pensi che i droni possano essere usati per migliorare l'efficienza del lavoro fatto dai giardinieri per: (scelta multipla)

12 risposte



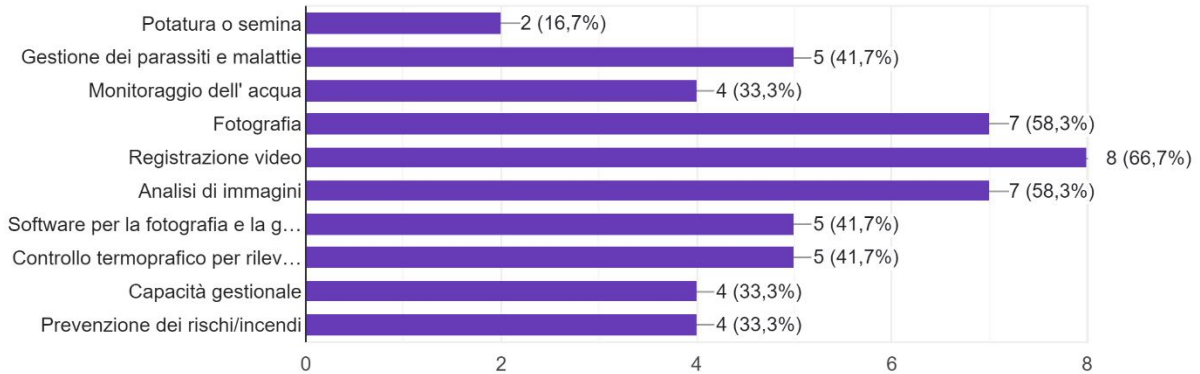
17) Pensi che le immagini ottenute con i droni possano migliorare la promozione turistica?

12 risposte



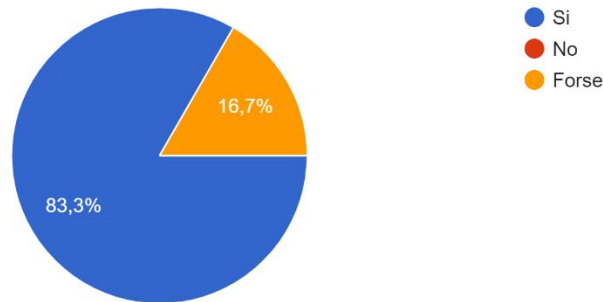
18) Quali delle seguenti abilità ti piacerebbe sviluppare attraverso l' utilizzo di droni nei giardini storici?

12 risposte



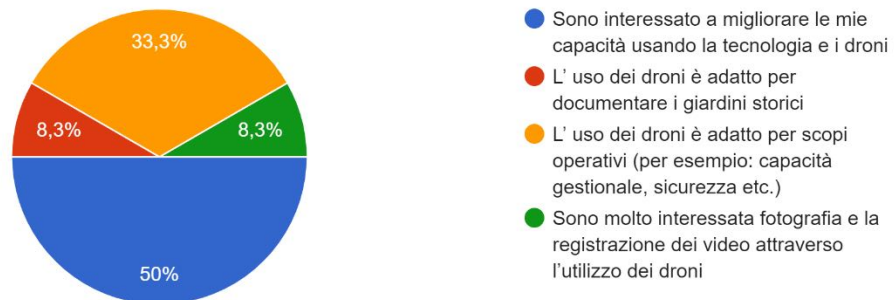
19) Puo' andare bene per te frequentare lezioni sui droni in formato e-learning (formato multimediale)?

12 risposte



20) Per favore selezione la frase che rispecchia maggiormente i tuoi bisogni.

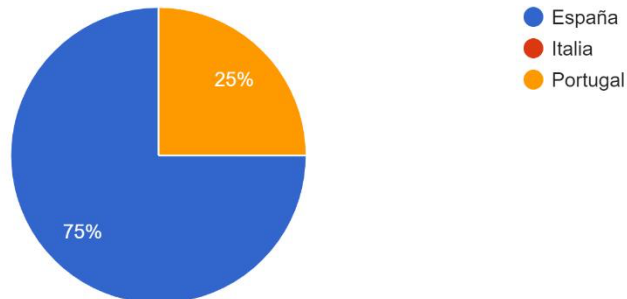
12 risposte



SURVEY RESULTS- Spanish Language Analysis of results
Number of respondents: 8

1) ¿Dónde está trabajando?

8 risposte



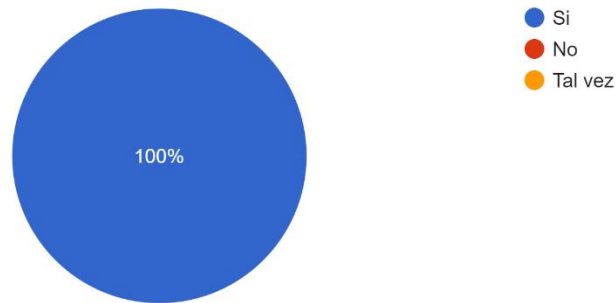
2) ¿Cuál es su ocupación actual? Seleccione solo una

8 risposte



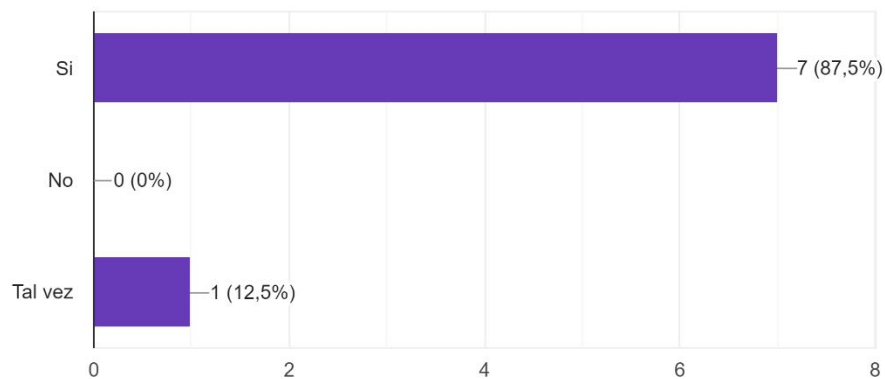
3) ¿Tiene curiosidad sobre el uso de la tecnología de drones en su ocupación/trabajo?

8 risposte



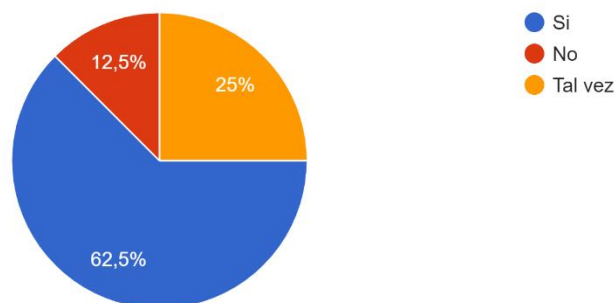
4) ¿Está interesado en explorar el uso de la tecnología de drones en su ocupación/trabajo?

8 risposte



5) ¿Alguna vez pensaste que el uso de la tecnología de drones podría ser útil para mejorar su condición de trabajo o carrera?

8 risposte



6) ¿Con qué frecuencia un jardinero necesita monitorear, evaluar e informar de la salud de un jardín histórico?

7 risposte

diariamente

3 veces al año

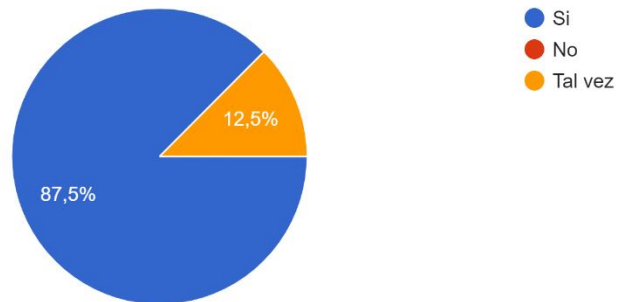
Semanalmente

Una vez a la semana

Continuamente , de forma periódica
2
Diariamente

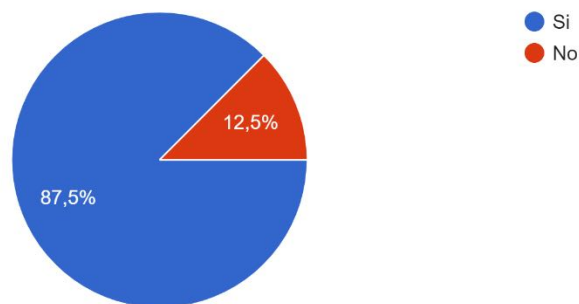
7) ¿Necesita un jardinero registrar o documentar el estado de un jardín histórico?

8 risposte



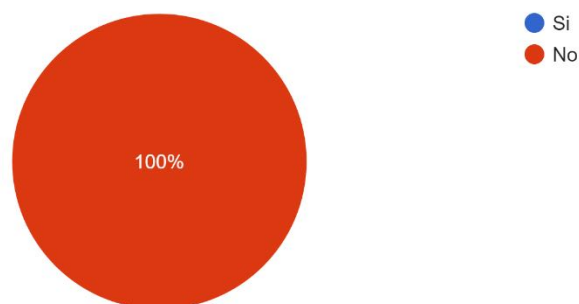
8) ¿Recopila fotografías para registrar el estado de mantenimiento/salud del jardín histórico?

8 risposte



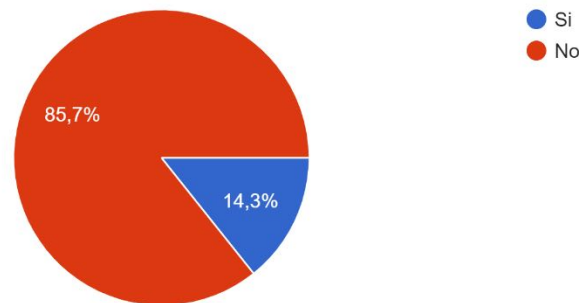
9) El jardín histórico donde trabaja, ¿tiene herramientas robóticas para el cuidado del jardín?

7 risposte



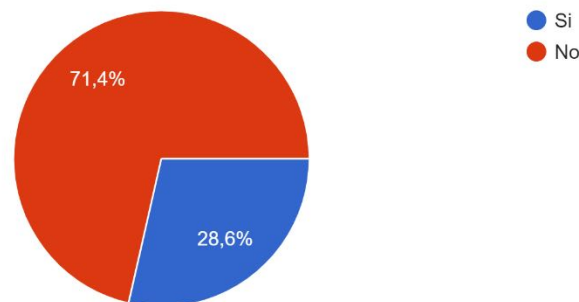
10) El jardín histórico donde trabaja ¿tiene sensores de humedad y temperatura distribuidos a lo largo del sitio?

7 risposte



11) Entre el personal del jardín donde trabaja, ¿hay empleados con habilidades, conocimientos o experiencia digital?

7 risposte



12) ¿En qué medida cree que la posibilidad de tener una vista aérea de alta definición de su jardín histórico puede apoyar el trabajo diario de un jardinero o del personal/gerente del jardín?

7 answers

- Não sei
- Media-baja
- De gran ayuda
- Puede ayudar
- Es una herramienta imprescindible
- 8 en escala de 1 a 10
- É importante para trabalho diário do jardim. Bem como proteção futura desse património botânico e cultura

13) ¿Qué tipo de elementos arquitectónicos/botánicos son de difícil acceso en su jardín histórico para una persona que necesita inspeccionarlos?

6 answers

- arbolado de grandes dimensiones
- taludes
- Pocos
- Copas altas y tejados
- arbolado

- mais exigente em cuidados são as sebes de buxus sempervirens

14) ¿Cuáles son los beneficios potenciales del uso de drones en la gestión y mantenimiento de jardines históricos?

8 answers

- Riesgo de arbolado
- Não sei
- Todo depende del accesorio que lleve el dron, por ejemplo algún sensor que capte la humedad en el suelo para evaluar la homogeneidad del riego y así poder ver claramente las carencias de este.
- Conseguir una perspectiva diferente y gestionar de manera eficiente el espacio
- Imágenes de alta definición, prevención plagas, control aforo
- Facilitarían mucho la recogida de datos, inspección, y otras tareas como fumigación, etc
- sanidad vegetal
- Aplicar os tratamientos fitossanitarios. Registro fotográfico para monitorizar e registrar para intervenções futuras.

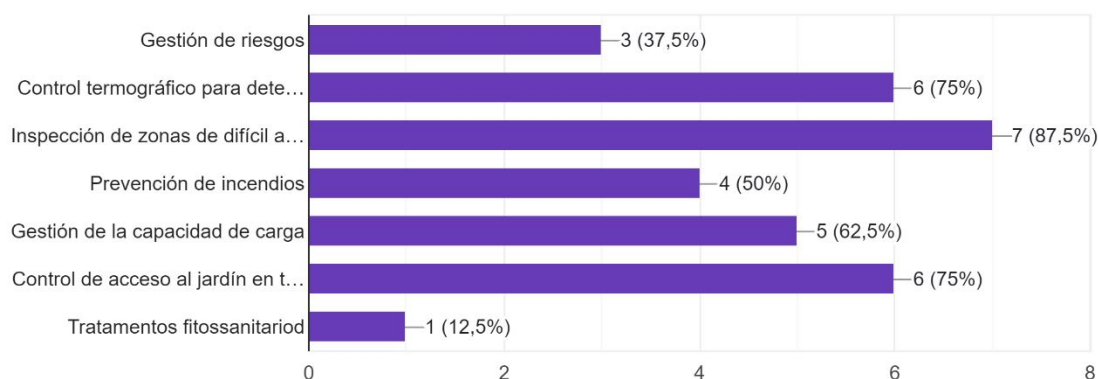
15) ¿Cuáles podrían ser los principales beneficios de utilizar drones en jardines históricos con fines de seguridad?

7 answers

- Não sei
- El poder monitorear a los clientes desde el cielo.
- Control perimetral y detección de brechas de seguridad
- Control de copas de árboles, vigilancia acantilados,
- Servirían para aumentar considerablemente la seguridad al ofrecer perspectivas, tomas de datos imposibles de conseguir de otra forma,
- sanidad vegetal
- Para vigilância dos visitantes

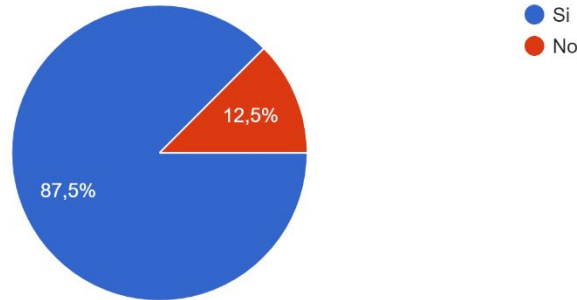
16) ¿Se pueden usar drones para mejorar la eficiencia de las tareas de los jardineros/empleados de jardinería como las que se enumeran a continuación? (Puede seleccionar más de uno).

8 risposte



17) ¿Cree que la captura de imágenes con drones puede mejorar la promoción turística?

8 risposte



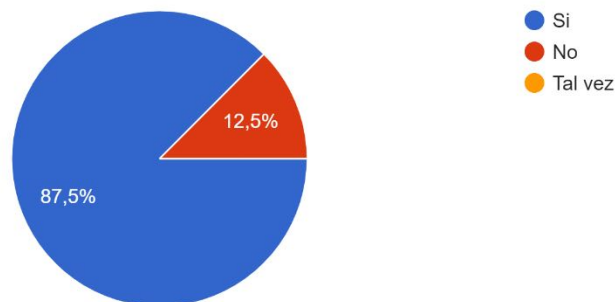
18) ¿Cuál de las siguientes habilidades le gustaría desarrollar utilizando drones en jardines históricos?

8 risposte



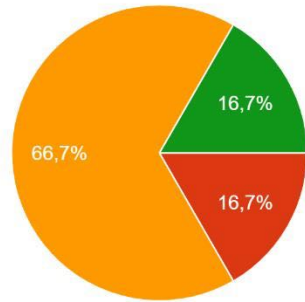
19) ¿Le gustaría recibir formación sobre el uso de drones para el mantenimiento y gestión de jardines históricos en formato e-learning?

8 risposte



20) Elija la frase más relevante para sus necesidades:

6 risposte



- Estoy interesado en mejorar mis habilidades a través de la tecnología y los drones.
- La razón por la que utilizaría drones es la de documentar los jardines históricos.
- La razón por la que utilizaría drones es la de facilitar la gestión operativa del jardín (por ejemplo, gestión de capacidades, seguridad, etc.,)
- Sanidad Vegetal



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