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STUDY OF THE LOCATION OF A HELIPORT IN CATALONIA

Abstract: The objective of this project is to identify one or several municipalities in Catalonia that, after considering the above factors, have the potential to serve as a location for a heliport. Throughout the enterprise's site selection process, ArcMap 10.8 geographic information system (GIS) technologies are employed. All of the layers of information used, the layers of analysis, and the multiple approaches used are all described. This section of the investigation closes with an examination of three potential communities for a new heliport.

Keywords: Catalonia, Heliport, ICAO: The International Civil Aviation Organization, Catalan public services, Site

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Introduction

The helicopter serves a vital purpose. In current society, their duty is to support or enable social and economic progress. Helicopters are currently used in a wider range of situations as a result of ongoing technological and functional advancements. Helicopters are becoming increasingly popular in our culture, particularly in the fields of public service and aerial labor.

There are two trends regarding the Catalan heliport network that aim to modernize and address the needs of the different Catalan airport networks, which are the deployment of a 24-hour network and the modernization of facilities, and the modernization and renewal of the fleet of helicopters based in Catalonia.

The most important consideration is the requirement for heliports for public health, fire, security, emergency, and civil protection services. This requirement for a Catalan heliport network will be established, and it will be a problem to address because it is one of the work's objectives: the specification of the heliport to be located and the study of the heliport's location.

After the sort of heliport to be installed on the site has been selected, the indications and guidelines for the promotion of new heliports are examined. This guarantees that the qualities to be taken into account for site analysis are known.

The definition of the heliport type to be located will be addressed, a set of metrics will be defined that characterize the heliports in accordance with the standards established by the ICAO, and that will be used in subsequent sections.

This definition is important to carry out the investigation, specifically because the type of heliport to be located influences the possibility of locating it in one place compared to another.

When all the information on the type of heliport has been presented, the essential foundations will have been established to continue with the site selection study. Later, possible locations within Catalonia and under a series of parameters in which to locate the heliport will be searched, and a location that can house the heliport will be searched for.

The selection of the final site or sites for the type heliport is the main objective of this project.

Definition of heliport

The definition of the heliport to be located based on the current needs of the Catalan heliport network is as follows: "Permanent heliport of restricted use that operates 24 hours a day that serves for medical transport or emergency medical service with HEMS (Helicopter Emergency Medical Services) authorization that aims to provide urgent medical assistance. Likewise, it will provide service to search and rescue emergencies (SAR) and extinction and fight against forest fires carried out by the Fire Department of Catalonia. Also for police work by the Mossos d'Esquadra and other aerial work such as maintenance of wind farms or supervision of nature reserves".

A permanent heliport is an aerodrome or specified area on an artificial surface or elevated structure for the arrival, departure, or surface movement of helicopters, and may include fixed buildings, equipment, and service facilities. It is essential to specify that the heliport in question will be a public heliport, not of general interest.

The Government of Catalonia, in accordance with the provisions of article 140 of the Statute of Autonomy, has exclusive jurisdiction over airports and heliports located in the territory of Catalonia that do not have the legal classification of general interest.

Consequently, it is the direct obligation of the Generalitat to create, manage and plan this type of infrastructure to meet the demands of the territory, ensure connection and contribute to the economic progress of the region.

According to the previous law, the action of the Generalitat as airport administration includes two phases in the case of heliports: a first authorization prior to the establishment of the facility, which requires the formulation of the corresponding project, and a second authorization that allows the commissioning installation operation.

The criteria for the selection of the location of the facilities

The use of helicopters for emergency services or for other purposes related to public safety will not be restricted or conditioned in any way by these requirements.

Nor do they affect commercial or private heliports that are planned to be located in rural or low-density locations and that do not entail any type of disturbance for the people who live or work in the surroundings.

Additionally, private heliports that plan to conduct fewer than 350 operations per year will not be affected in any way by this change.

On the other hand, this does not mean that any plan for the location of a new heliport is exempt from taking into account all the possible repercussions that may have an effect on the noise level or the level of safety.

Accessibility. The objective must be that the number of facilities in the general network allows 95% of the citizens of Catalonia to have the possibility of accessing a heliport in less than 20 minutes by private transport. This can be achieved by ensuring that facilities are evenly distributed across the overall network.

The roads used to enter and leave the area. During entry and exit maneuvers, residential areas and any other equipment sensitive to helicopter noise in the flight path should be avoided as much as possible.

This criterion recommends, when it is feasible to do so, anticipating entry and exit maneuvers through water (such as the ocean, swamps, rivers, etc.), as well as communication facilities (highways, railways, etc.).

The shortest possible distances between other projects and residential areas.

Although the distance does not define whether or not the activities of a given heliport would generate an auditory effect, it is convenient to think that there should be no less than 400 meters of space between a heliport and a residential block.

If the heliport is located in a residential neighborhood, this distance can be reduced to 100 meters. If it is an industrial area, this distance could be reduced to 100 meters.

These distances, which are merely indicative, could be shorter depending on the relative layout of entry and exit routes and sensitive areas, the expected frequency of use of the facility, the types of helicopters and the hours of operation. In addition, these distances could be affected by the number of opening hours of the facility.

The objective of this project is to identify one or several municipalities in Catalonia that, after considering the above factors, have the potential to serve as a location for a heliport.

However, the objective of this work is to provide the responsible authority or make way for further investigations or work that can be carried out for a deeper examination of the precise site and design of the heliport. Knowing the analysis that justifies the selection of each site and the reasons why they are clearly recommended can serve as a useful tool.

Thus, in fact, this work provides that target authority or subject for a new task, the essential tool for the decision-making process, whether it be the construction or design of a heliport on the chosen sites or a study of viability of the latter.

Methodology

It will be determined why the chosen sites are the most appropriate and advantageous, and for this a methodical process of elimination or screening will be followed with the help of the ArcGIS computer program. The objective of this effort is to determine why the chosen locations are the most appropriate and advantageous.

As a result of this decision, one or more definitive sites will have been identified which, depending on the criteria considered, would be the most suitable for the economic sustainability of the heliport.

Process to find the location

For the study of potential areas for new heliport sites, the ArcGIS ArcMap 10.8 geographic information system (GIS) tools will be used. All files were downloaded from the website of the Department of the Vice Presidency and Digital Policies and Territory: https://territori.gencat.cat/es/06_territori_i_urbanisme/observatori_territori/mapa_urbanistic_de_catalunya/serveis_web_i_dades_obertes/descarrega-de-dades/format-shapefile-shp/ . And from the website of the National Geographic Information Center: <https://centrodedescargas.cnig.es/CentroDescargas/index.jsp> .

Base layers

In this first point, the layers used as the basis of the study are presented. These layers serve to delimit the work area, in this case Catalonia and the division of the Catalan territory into provinces, counties and municipalities.



Fig. 1. Representation map of the Catalan territory
Source: own elaboration



Fig. 2. Representation map of the Catalan provinces
Source: own elaboration



Fig.1. Representation map of the Catalan counties
Source: own elaboration



Fig.2. Representation map of the Catalan municipalities
Source: own elaboration

Work layers

This section shows the layers with which the study will be carried out. They are layers with geographic information related to the area of Catalonia and is suitable for finding a new location for a heliport.

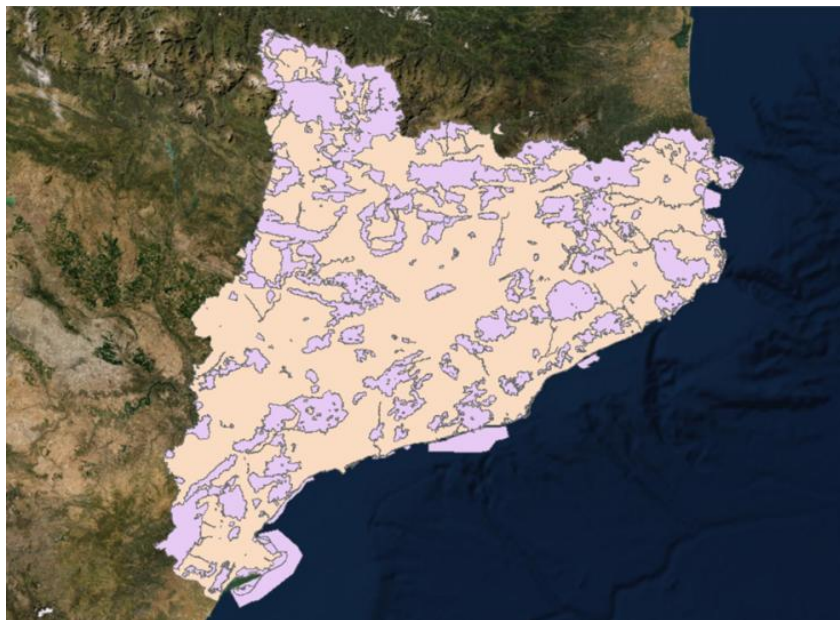


Fig. 5. Representation map of spaces of natural interest in Catalonia
Source: own elaboration

This map shows the Sistema d'Espais Naturals Protegits de Catalunya (the SENP), which is currently made up of 184 natural spaces of special ecological value protected

by the Plan for spaces of natural interest (PEIN), with an area equivalent to 32% of the Catalan territory.

Within these spaces, the so-called special protection natural spaces, declared in accordance with Law 12/1985, have a higher level of protection. They include national parks, natural parks, natural sites of national interest and nature reserves.



Fig. 6. Representation map of the population centers of Catalonia
Source: own elaboration



Fig.3. Representation map of the distribution of heliports in Catalonia
Source: own elaboration

For the study, 67 of the 70 Catalan heliport infrastructures will be taken into account, since the heliports of Hotel Juan Carlos I, Port Aventura and Sant Martí Sescrots, being private, are not considered a problem for the progress of the study.

Initial approaches

Once the layers with which to work have been exposed, it is time to begin the search for favorable areas for the location of our heliport. For this, certain considerations must be taken into account.

Catalonia has 7,722,037 inhabitants, according to the 2020 population census, spread over the 947 Catalan municipalities. The majority of citizens (close to 95%) are concentrated in some 300 municipalities with more than 2,000 inhabitants and are therefore considered an urban population.

Therefore, the recommendation on the location of new heliports regarding accessibility is where the objective is established that the heliport network allows 95% of Catalan citizens to have the possibility of accessing a heliport in less than 20 minutes by private transport, will be the first parameter for our study).

For this, the municipalities with more than 2000 inhabitants will be selected, which will be called populated municipalities. And all those municipalities that contain a heliport in their vicinity will be eliminated.



Fig.4. Map of the Catalan populated municipalities without a heliport
Source: own elaboration

The next step has been to locate the population centers of the inhabited municipalities and create an area of influence (Buffer) around them of 15 km, which is the distance that has been taken as optimal by the provisions of the recommendation of the possibility access to a heliport in less than 20 minutes by private transport.

And once the buffers have been prepared from the population centers of the populated municipalities without a heliport, all those areas of influence in which there is no heliport within them are selected.

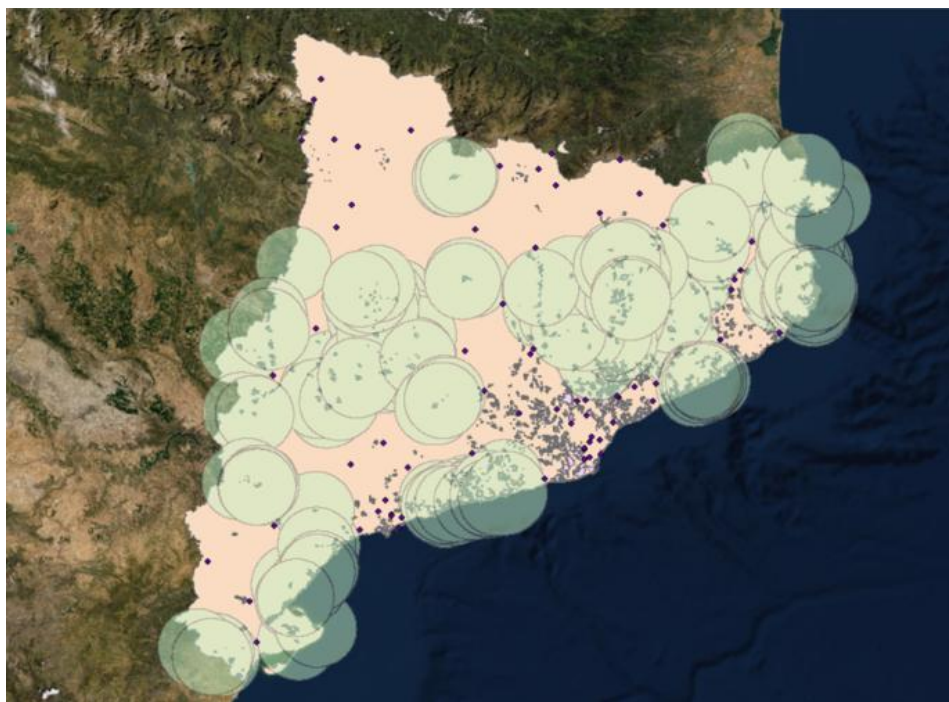


Fig.5. Map of the areas of influence of the selected municipalities
Source: own elaboration

Map with the representation of the areas of influence or buffers (green circles) of the population centers of the populated municipalities without a heliport, and that do not have any heliport within a radius of 15km.

Initial analysis

What has been obtained so far are the population centers that are found among the populated municipalities that do not contain a heliport and are more than 15 km from the nearest heliport. There are more than 300 population centers. So the next step is the analysis of the areas of influence. This will be done by counting buffer intersections, since each population nucleus generates its own buffer.

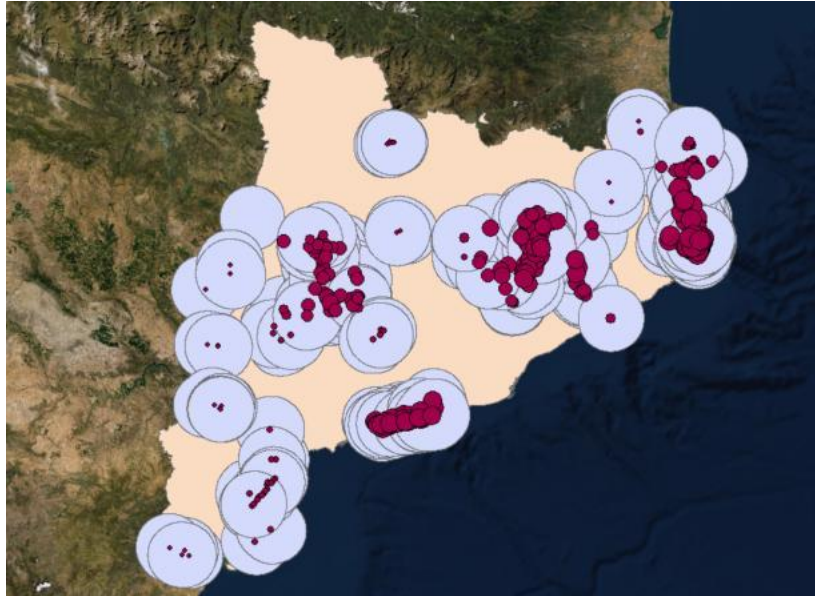


Fig.6. Density map of the areas of influence of the selected municipalities
Source: own elaboration

This map graphically represents the zones of influence explained above and the smaller maroon circles represent the number of intersections between zones of influence. The larger the garnet circle and the more garnet circles there are in the same area, it means that a large number of contiguous population centers meet the conditions stated above. We differentiate four zones that we will analyze separately:

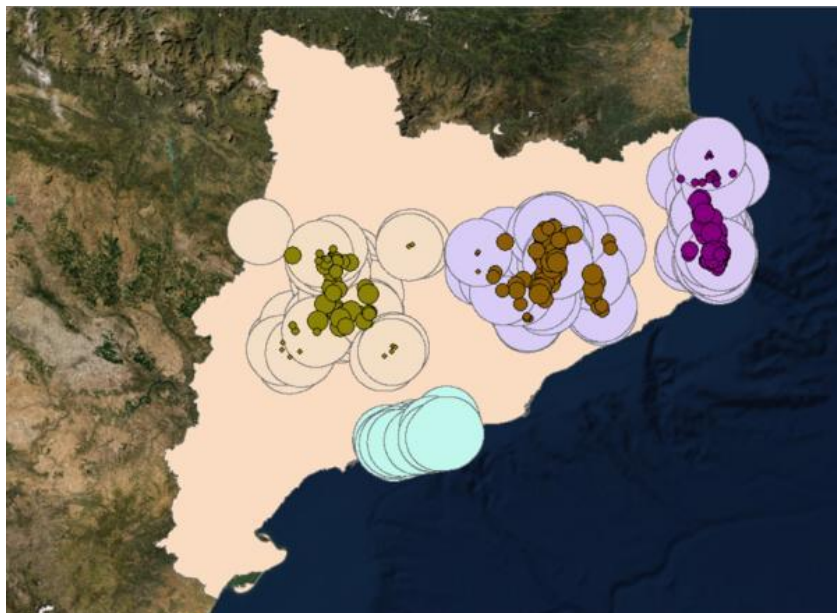


Fig. 11. Map of the 4 selected areas
Source: own elaboration

The areas to be analyzed in depth have been isolated, eliminating small population centers that were far from these areas.

The four areas demarcated by the areas of influence are going to be located according to the municipalities that are contending under these areas, to facilitate the analysis.

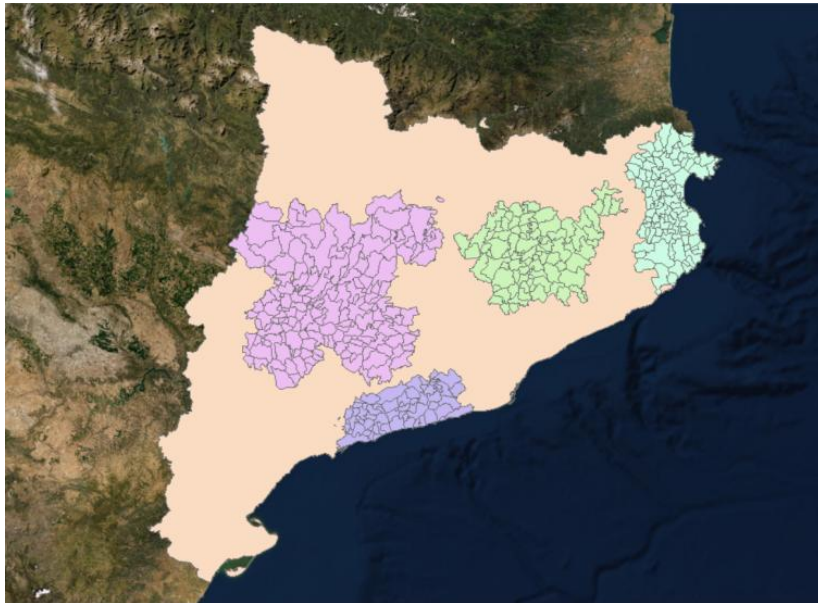


Fig. 12. Map of the representation of the municipalities of the selected areas
Source: own elaboration

The four different groups of municipalities represent the different potential areas for the location of a new heliport.

To finalize the search, the next step has been to generate areas of influence of 15km from the existing heliports and eliminate all those municipalities that were included in the areas of influence of the heliports.

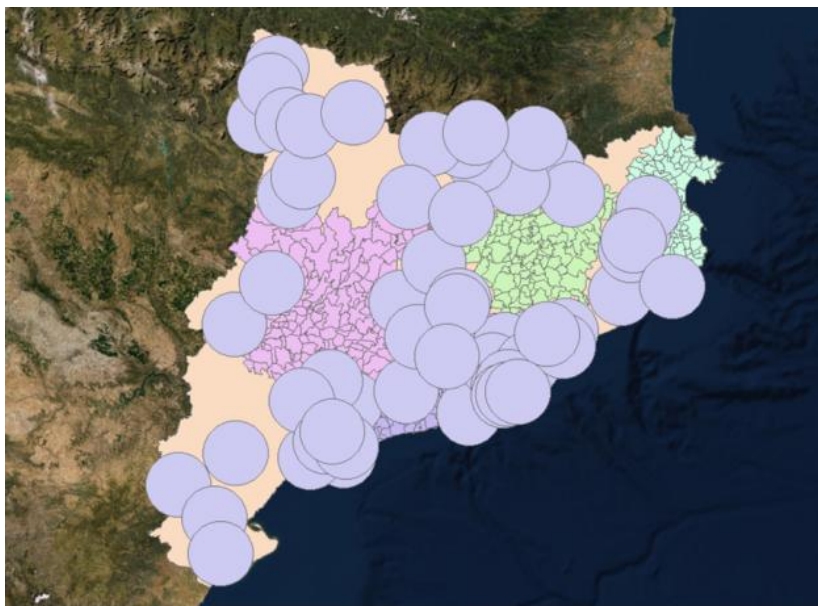


Fig. 7. Map of the representation of the selected zones and the zones of influence of the existing heliports
Source: own elaboration

As can be seen in the last illustration, the purple southern zone that had been selected for the analysis will be discarded at this time since, as we can see, most of the selected municipalities are included in the area of influence of some heliport, so we dismissed this area for the location of a new heliport.

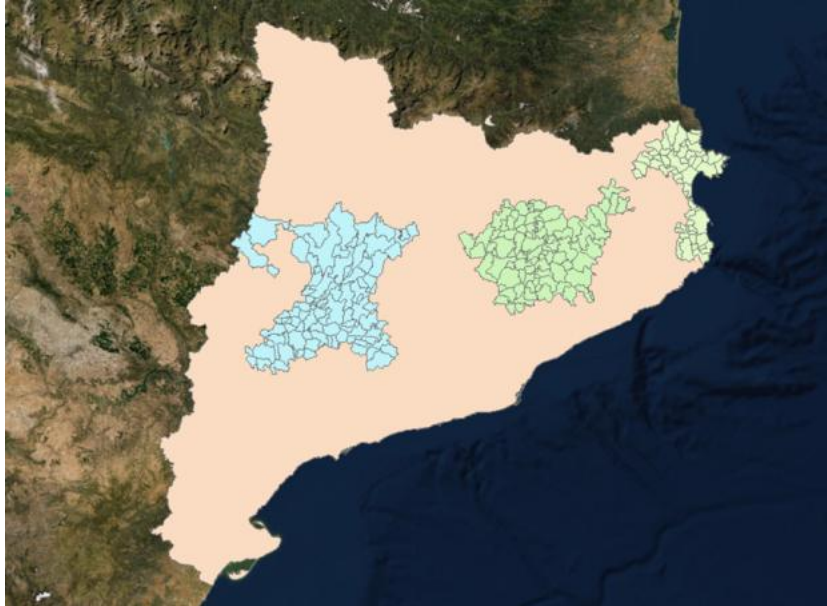


Fig. 8. Map of the final selection of the selected areas
Source: own elaboration

In this image we can see the three areas with which we will continue the analysis. The result, after applying the zones of influence of the existing heliports in Catalonia, and eliminating the set of municipalities that were to the south (purple) for reasons of size, is that of three clearly differentiated zones, zone A (blue) composed of 86 municipalities, mostly belonging to the province of Lleida, zone B (green) made up of 82 municipalities, the majority belonging to the province of Barcelona and zone C (yellow) made up of 54 municipalities, located in the province of Gerona.

In order to find an optimal location area, which in this study will be a municipality, a central municipality has been selected, which is at an average distance from the rest of the neighboring municipalities.

In addition, for the selection of the municipalities, the spaces of natural interest in Catalonia will also be taken into account, so the municipality to be chosen is a municipality that meets the characteristics and requirements that we have been explaining throughout the analysis, and that in the final approximation, it is located at a medium distance from the rest of the municipalities of the designated areas and that it is not located in its majority in any of the areas of the spaces of natural interest.

Approach and final analysis

In this final section, the candidate municipality for the location of a new heliport will be selected, as a result of the analysis carried out.

And finally, the optimal areas for locating the heliport will be marked, away from spaces of natural interest and away from population centers, at least 400 meters as indicated in the reminders for the location of new heliports.

- ZONE A:

With the above, it is concluded that the optimal municipality to establish a new heliport in the first zone is the municipality of Agramunt:

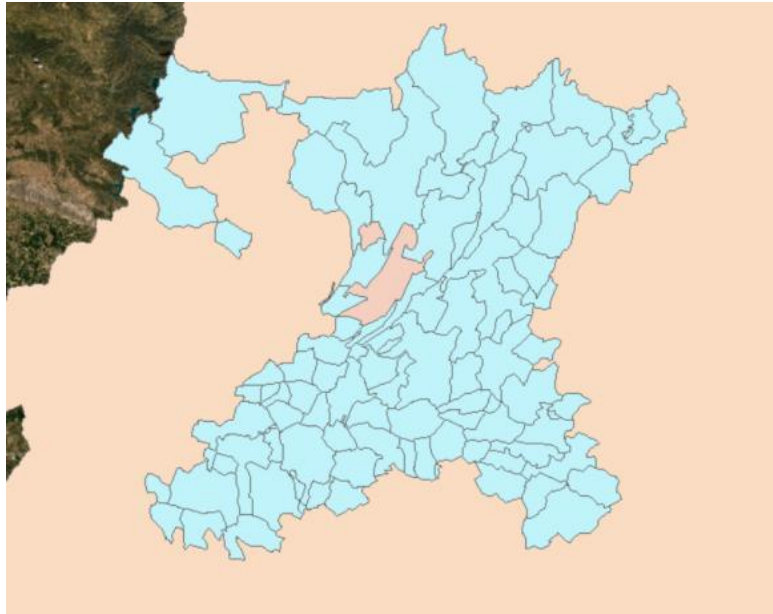


Fig. 9. Representation map of the municipality of Agramunt
Source: own elaboration

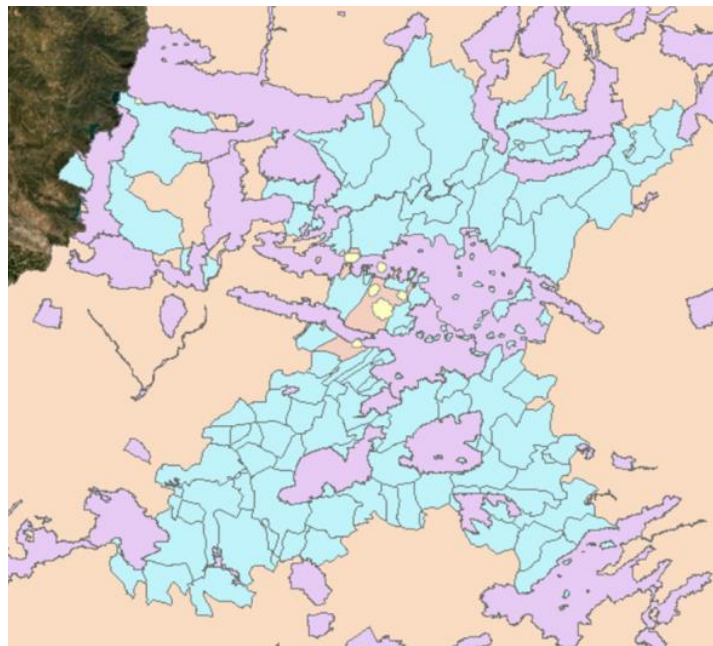


Fig. 10. Representation map of the municipality of Agramunt, the population centers
and the spaces of natural interest
Source: own elaboration

This image shows the area of influence of the population centers in yellow, the spaces of general interest in pink, and the rest of the municipality of Agramunt in orange, in which it has been concluded that the location of a new heliport is of interest.

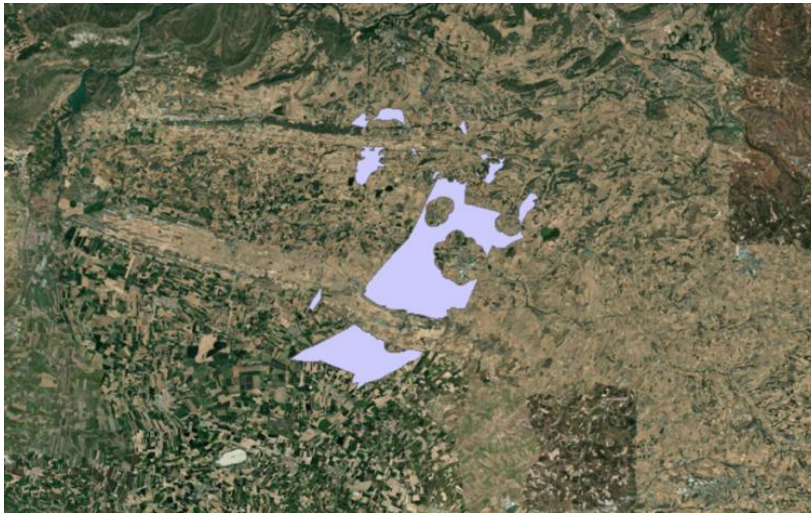


Fig. 11. Representation map of the potential areas of Agramunt for the location of the heliport
Source: own elaboration

In this last representation, the areas of the municipality of Agramunt which are of interest for the location of the heliport can be seen in purple

- ZONE B:

In the second zone, it is concluded that the optimal municipality for the location of a new heliport is the municipality of Santa Eugenia de Berga.

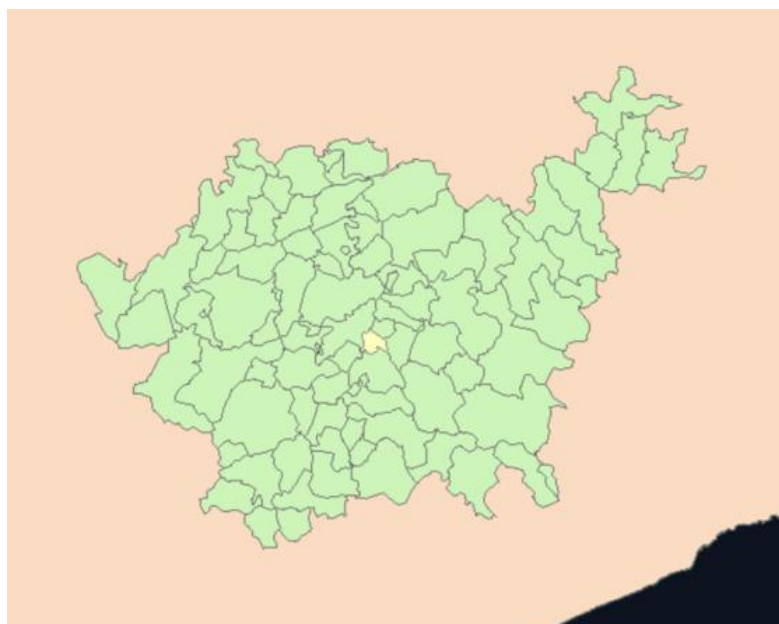


Fig. 12. Representation map of the municipality of Santa Eugenia de Berga
Source: own elaboration

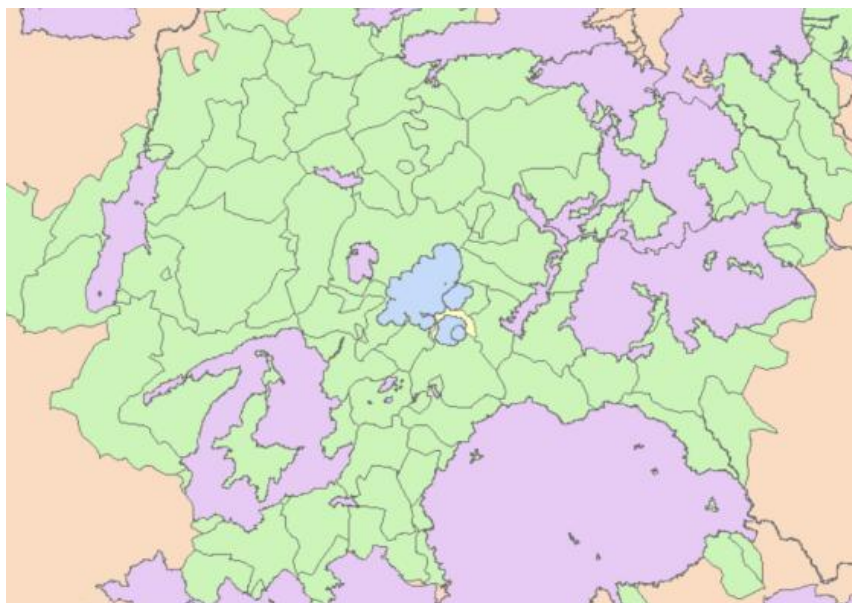


Fig. 13. Representation map of the municipality of Santa Eugenia de Berga, population centers and spaces of natural interest
Source: own elaboration

In this image it can be seen that the yellow zone is the appropriate one for the location of a new heliport, far from the zone of influence of the population centers (blue) and of the spaces of natural interest.



Fig. 14. Representation map of the potential areas of Santa Eugenia de Berga for the location of the heliport
Source: own elaboration

In this last representation, the areas of the municipality of Santa Eugenia de Berga are shown in purple, which are of interest for the location of the heliport.

- ZONE C:

In the last area of the study, it is concluded that the optimal municipality for the location of a new heliport would be the municipality of L'Escala.

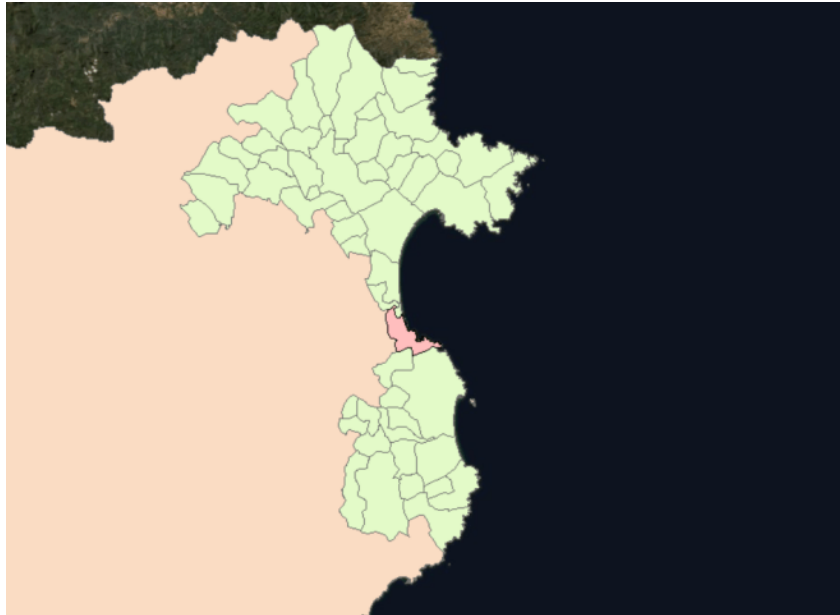


Fig. 15. Representation map of the municipality of L'Escala
Source: own elaboration

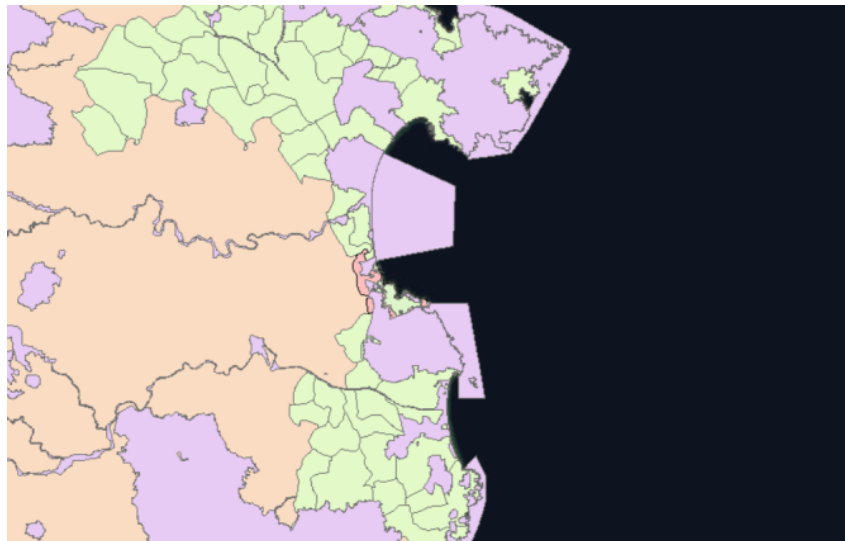


Fig. 16. Representation map of the municipality of L'Escala,
population centers and spaces of natural interest
Source: own elaboration

In salmon color would be the final area for a possible location of a new heliport in Catalonia, since the rest of the municipality is under the area of influence of the population centers or in a space of natural interest.



Fig. 17. Representation map of the potential areas of L'Escala for the location of the heliport
Source: own elaboration

In this last representation, the areas of the municipality of L'Escala are shown in purple, which are of interest for the location of the heliport.

Conclusion

With the premise of the need for a heliport oriented to Catalan public services, it was decided that a permanent heliport for restricted use 24 hours would be located to provide services to the Catalan public services.

To begin the siting study, it was considered essential to carry out the first two objectives to contextualize the reason for the siting study and the type of heliport to be sited.

The methodology used for the development of this study was the elimination or screening of less appropriate or less advantageous locations with the help of the ArcGIS computer program. And finally, after the work carried out with the program's tools, the result is 3 potential areas for the location of a new permanent restricted-use heliport to support Catalan public services.

The reason why a specific location is not offered is because it is not the objective of this work. None of the objectives of the work is the design of the heliport, so the procedures for the design of the heliport have not been carried out.

This work is understood as the study of the location of a heliport in Catalonia based on the needs of the heliport network. Serving this work as a guide for future studies in which you want to locate a heliport in the Catalan terrain. This work offers the most favorable locations according to the needs not only of Catalonia but of society.

This work opens the door to new studies by the authority or other entity for both educational or corporate purposes, in which the objective topic is provided. The tool is

supplied for the design or construction study in the chosen locations as well as the feasibility study.

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