# Exploring landscape preference through photo-based Q methodology. Madrid seen by suburban adolescents.

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**Compliance with Ethical Standards**

The authors declare that they have no conflict of interest.

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The needs and group practices of adolescents have great impact on public spaces. Further understanding how and why they value certain environments is instrumental to better integrate their perspective in the design and management of our landscapes, as well as in raising environmental awareness and fostering sustainable attitudes and practices. We present the findings of a workshop on landscape preference carried out with a secondary school in the suburbs of Madrid. With participants between the ages of 11 and 16, photo-based Q methodology in combination with qualitative data allowed for the identification of groups sharing similar viewpoints, general trends, as well as exploring the structure and meaning behind consensus and disagreement photographs. Findings show overall positive valorisation towards green spaces, especially those where urban greenery is combined with recognizable architectural elements. Familiarity with the landscape type seems to encourage positive rankings, and preference towards well-known cultural sites manifests at older ages. Among the wide array of photo-elicitation techniques devoted to the assessment of landscape preference, photo-based Q methodology has seldom been used. However, this intuitive, effective, and inexpensive technique can be carried out in short and enjoyable sessions, showing great potential to be applied in geographical and environmental education.

**Keywords:** landscape preference; photo-based Q methodology; adolescents; education; peri-urban; Madrid.

## 1. Introduction

Landscape perception has been subject to study from several fields, especially since the 1970s onwards (Zube, 1982). The importance of demographic characteristics, cultural values, occupation or experience in landscape preference has been noted, age being one of the main differential factors (Lyons, 1983). Familiarity with the landscapes assessed during the research can be determining as well (Miller and Rutz, 1980; Zube, 1974; Herzog, Kaplan and Kapan, 1970), with context and personal background playing a decisive role in the valorisation of certain sceneries.

According to Zube, Sell and Taylor (1982), the psychophysical paradigm involves assessment through testing general public or selected populations' evaluations of landscape properties or aesthetic qualities. It is in this framework that we propose to further explore landscape preference in young populations through photo-elicitation.

The main goal of this research is to identify what elements and landscape types do adolescents value most, analysing groups and trends against factors such as age or place of residence. We do this by studying how participants rank a selection of images of the city of Madrid, using photo-based Q methodology technique, and supplementing these findings with qualitative data gathered during workshop sessions.

This workshop was part of an educational activity in the framework of the 17$^{th}$ Edition of the Science Week, organized by Madri+d Foundation of the Autonomous Community of Madrid. The activity started with a photo-based Q-methodology workshop (detailed in this paper), followed by a guided visit to an exhibit on landscape analysis and representation. During this visit, main concepts such as 'landscape types', 'landscape character', 'environmental values', or 'sustainable development' were explained. Graphical works on the peri-urban landscape of Madrid were shown in the form of A-1 panels, drawings, maps, and videos. Lastly, a debate on landscape types,

perception, and tools for its study took place with each class group (Fig.1). The debate was prompted by the same photographs used during the Q-method exercise. Therefore, the activity became a learning process with the opportunity to revisit their first impressions on certain landscape types or features, share their thoughts with the rest of the class, and grasp both the holistic nature of landscape and the importance of our role, as humans, to preserve and work towards a more sustainable development (Meadows, 2020).

Figure 1. Photographs taken by the research team during the activity. Left: Q-method workshop. Right: Exhibit and debate.

### *1.1 Exploring landscape preference with children and adolescents*

Researchers have been interested in the perspectives of younger populations particularly since the 1980s (Cook & Hess, 2007), shifting from seeking information *about* children or adolescents to seeking information *from* them (Docherty & Sandelowski, 1999). Seldom acting as primary informants (which are typically parents or teachers), the views and experiences of children and adolescents may differ from adults who care for them (Mandleco, 2013). This calls for appropriate

techniques adapted to the child's developmental level, encouraging participant response without adult intervention.

An example of the attention towards young population's perspectives on landscape was the Land Use-UK project of 1996, which showed adolescents' concerns towards pollution, housing density and traffic increase through an array of techniques involving mapping surveys, questionnaires and interviews (Robertson, 1995; Walford, 1997 and Robertson, Walford, & Fox, 2003). Other studies have adopted graphical methods to assess these perceptions (e.g. Thommen et al., 2010).

While children are known to gain the most information about their environment between the ages of 5 and 12 (Moore, 1977; Tanner, 1980), it is during adolescence when their group practices and needs impact most on public spaces, from where they are often excluded through design practices and policies (Owens, 2002). As formative life experiences may be a significant foundation for the development of an active environmental concern (Keliher, 2010), it is our challenge as researchers and teachers to find suitable ways to listen to this age group and translate these data into an active resource for environmental management.

### *1.2 Photo-based Q methodology and its use in landscape preference studies*

In the search for tools to explore landscape preference, Q methodology becomes a useful resource to illustrate non-expert visions, as it is based on intuitively understandable and apparently enjoyable procedures (Pitt & Zube, 1979). It is a systematic, quantitative procedure for the study of subjectivity (Stephenson 1953; Brown 1980; McKeown & Thomas, 1988) and has been used in different fields given its flexibility, facilitating a significant categorisation of preferences. Its incorporation into human geographic research can be understood as a link between experimental and interpretative methods (Robbins & Krueger, 2000), where its purpose is not to check or inform

assumptions, but rather be a holistic approach to values, opinions and meanings that identifies clusters in the way people think about a subject by how they classify a set of stimuli associated to them (Milcu et al., 2014).

Under the broad umbrella of "discourse analysis techniques", Q methodology is generally performed with verbal statements. The replacement of statements for photographs has been deemed appropriate, for example, in assessing landscape preference and concerns in rural areas (Milcu et al., 2014), or comparing locals' and visitors' views in tourism studies (Fairweather & Swaffield, 2001; 2002; Jacobsen, 2007), making the process more intuitive and providing the researcher with "an economical means of bringing diverse landscape settings to observers in a manner that is both expeditious and provides for experimental control" (Law & Zube, 1983, pg. 22).

Despite ongoing debate over the validity of using photographs in landscape perception assessment techniques (e.g. Bishop & Leahy, 1989; Jones, 1998; Lange, 2001), the incorporation of photography have led to positive levels of coherence, whenever the pictures were properly sampled (e.g. Zube, 1974; Stamps, 1990; Fairweather & Swaffield, 2001). Sorting techniques such as Q methodology have proved to be effective in eliciting environmental conceptualizations and judgements (Canter et al. 1985; Scott & Canter, 1997; Green, 2005), revealing social perspectives and making it particularly suitable for landscape character studies (Danielson et al., 2009).

We present the findings from a workshop on perception of urban and peri-urban landscapes carried out in collaboration with a secondary school in the suburbs of Madrid. The use of photo-based Q methodology has brought up landscape meanings, personal identities, and cultural values associated to landscape features; matters of considerable curiosity for environmental education (e.g. Kin Lee & Williams, 2001; Robertson et. Al., 2003, Madden & Lian, 2016).

## 2. Materials and Methods

### *2.1 Area of study*

Madrid is the third largest European capital in terms of population in its Functional Urban Area (OECD Territorial Development Policy Committee, 2013), holding remarkably high values of population density throughout its periphery. During the last 50 years, a strong urban expansion has been characterized by an abundance of suburban housing developments and large-scale commercial and leisure facilities. This sprawl of artificial land has been possible thanks to strong investments in transportation infrastructures, especially the highway network, fostering an ever-growing peri-urban fringe and driving urban uses closer to protected sites such as Natura 2000 areas (Gallardo Beltrán & Martínez Vega, 2016). However, these changes have "brought the city closer" in terms of commuting time, making it increasingly popular for families to move to the suburbs in search of a less densified, closer-to-nature settings.

The lack of supra-municipal plans for a sustainable urban development leads to common issues in peri-urban areas of large cities, such as administrative gaps translating into spatial fragmentation, traffic congestion, social segregation (Piorr et al., 2011), and overall impact over the surrounding ecosystems. As heterogeneous mosaics of natural, productive, agricultural and urban ecosystems (Allen, 2003), these spaces around urban areas that merge with the rural landscape are predicted to grow up to four times faster than urban areas in the coming decades (Piorr et al, 2011).

This research was developed in collaboration with CEU Montepríncipe School, located in Boadilla del Monte, a municipality located 18 km west of the city centre (Fig. 2).

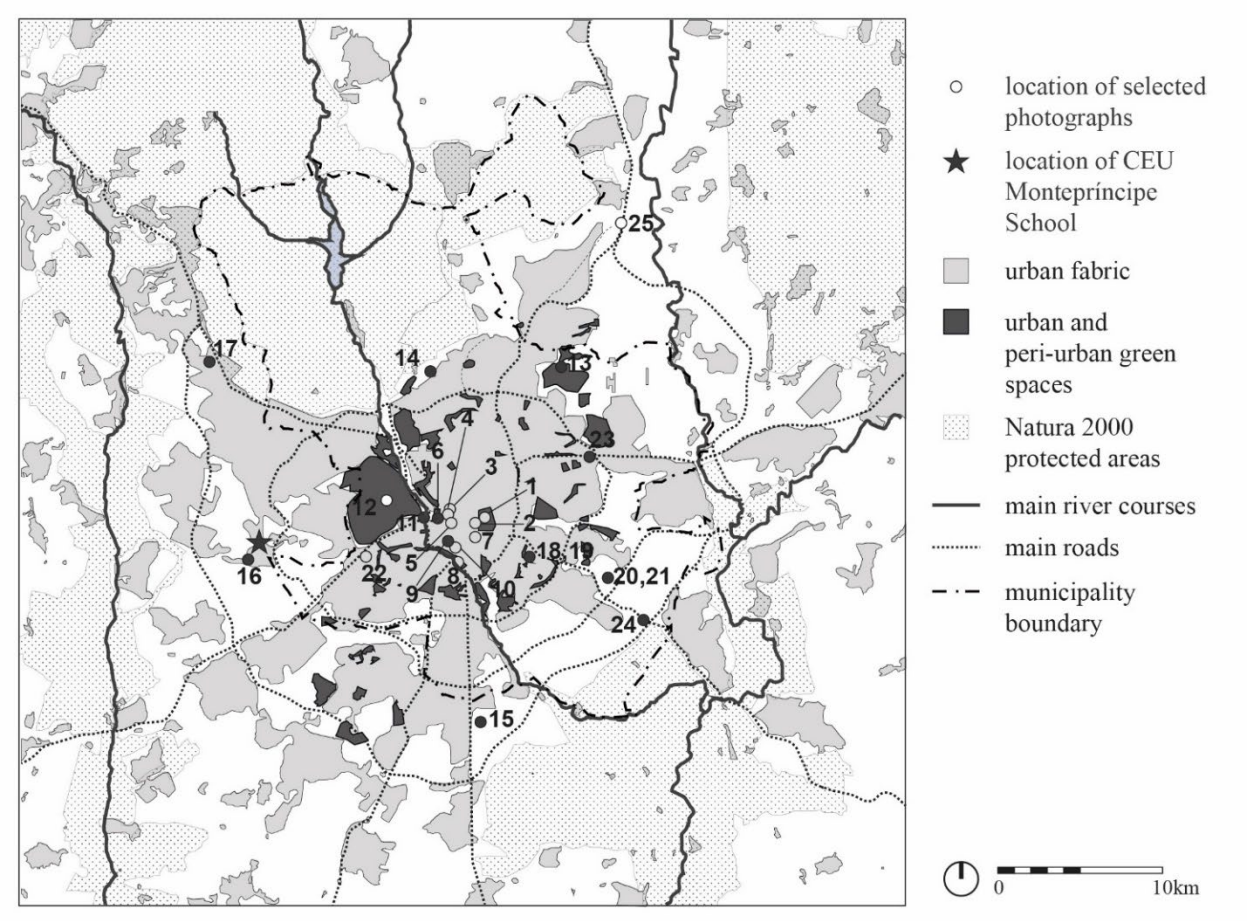


Figure 2. Location of selected photographs (Madrid).

### *2.2 Participants*

A total of 88 students between the ages of 11 and 16 participated in the study, in a proportion of 36% girls and 64% boys (gender was intentionally left out of scope of this research). The 88 participants belonged to four school groups of CEU Montepríncipe School, each group representing a different grade out of the four grades that compose the Spanish Secondary Studies. All participants are considered "adolescents", according to the term by the World Health Organization as "the stage of growth, from 10 to 19 years old, where the child starts to view the reasoning, logic and moral components of abstract thinking, and becomes capable of making rational judgements".

The following personal data were gathered for every participant: age, grade, and municipality of residence. All participants lived either in the city centre, or in west and southwest municipalities close by, as expected from the location of the school (Fig. 3).

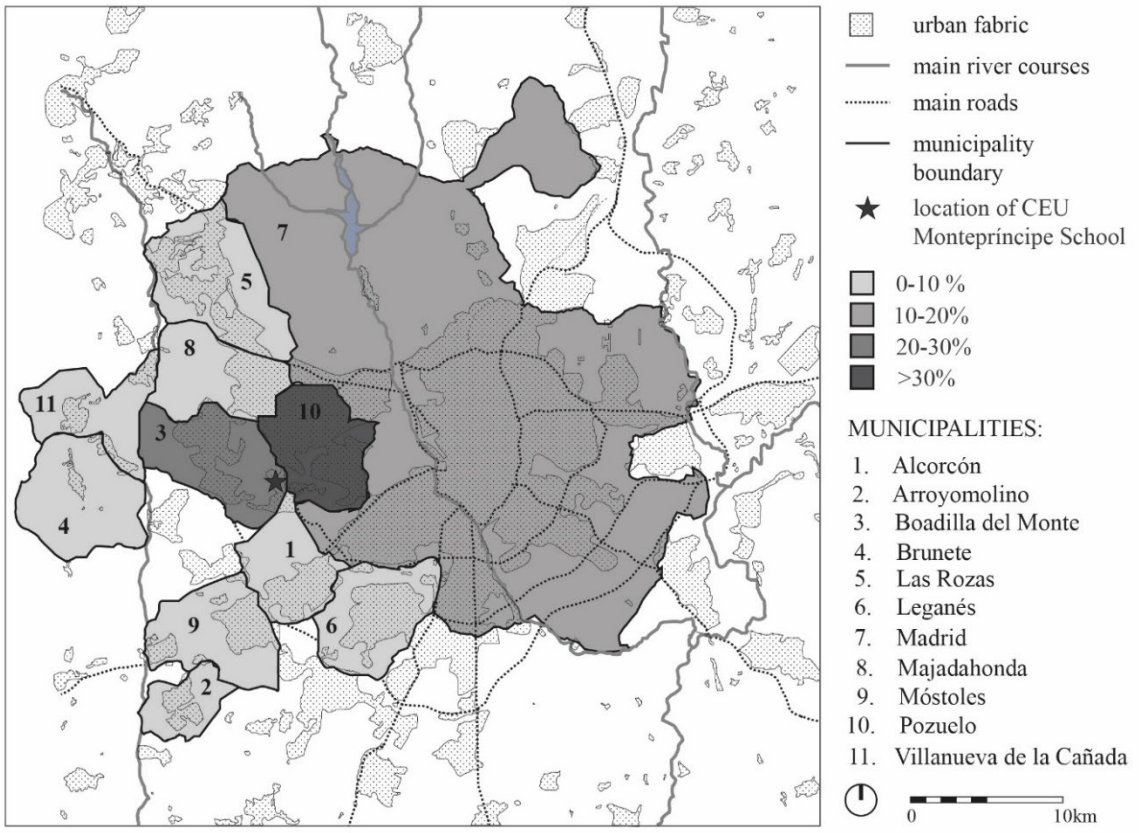


Figure 3. Distribution of participants' place of residence (municipalities). Pozuelo > 30%; Boadilla del Monte: 20-30%; Madrid: 10-20%; Alcorcón, Arroyomolino, Brunete, Las Rozas, Leganés, Majadahonda, Móstoles, Villanueva de la Cañada: 0-10%.

### *2.3 The Q set*

We selected 25 photographs of Madrid and its periphery, all taken by the researchers during fieldwork with a digital reflex camera (Canon EOS 5D Mark III). From well-known, iconic views of the city, to mundane scenes from the highway, the set (Fig. 4) illustrates an array of landscapes that can easily trigger different responses.


Figure 4. Photographs selected for the Q set. (See Appendix A and B for larger pictures).

Each photograph is tagged by the authors with a series of salient characteristics:

- landscape elements with high cultural value (mainly architectural)
- natural features (mainly vegetation)
- signs of agricultural land use
- noticeable presence of infrastructures (mainly for transportation).

In terms of location, we differentiate between urban and suburban contexts, not strictly attending to the administrative boundary of the Municipality of Madrid, but rather factoring in other aspects such as the stage of the development of the area, or its population and building density. Lastly, those photographs taken from public and accessible natural lookouts of the city and its metropolitan area are marked, for they often offer the wider, longer-range viewsheds, where the urban morphology of the city can be easily grasped (Rodríguez Romero et al., 2019), or a recognizable skyline may appear. These characteristics are never shown nor mentioned to the participants, who receive the Q set composed solely of 25 photographs, all printed in a 6x4cm size.

### *2.4 The workshop: when, where and how*

As stated above, this workshop was part of a broader educational activity including the Q-methodology workshop detailed here, a guided visit to an exhibit on landscape analysis and representation, and a final debate with each class group. The Q methodology workshop entailed four sessions of 45 minutes throughout two days. Each session was carried out with a group of approximately 23 students of the same class, during the school period.

The creation of a favourable atmosphere has proven instrumental in activities of this nature (Irwin & Johnson, 2005). A large, square-shaped classroom (approximately 65$m^2$), with plenty of colourful work and messages displayed on the walls, was deemed appropriate to stimulate a

"workshop feel", encouraging spontaneous participation and an active state of mind during these sessions. The activity was performed in pairs, and participants were encouraged to form these groups freely, once they entered the room. On every table, participants would find an A3 paper sheet with a diamond-shape template printed on it (Fig. 5), the Q set of photographs stacked together, and a glue stick.

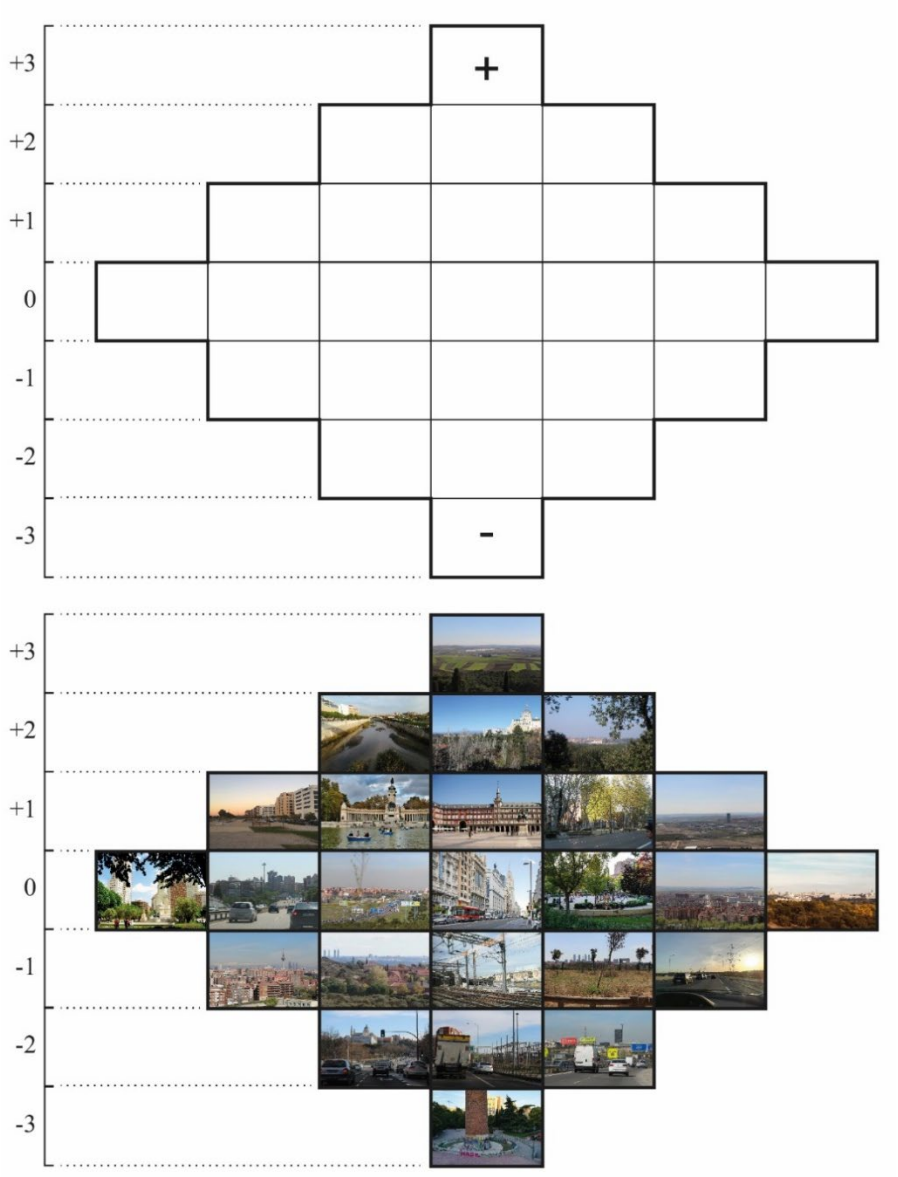


Figure 5. Above: template given to participants. Below: example of Q sort.

The diamond-shape template for photo-based Q methodology was first proposed by Milcu et al. (2014, pg. 414), stating that "it made intuitive sense to locals to place their most preferred pictures at the top". Compared to the traditional layout, which places the positive (most agree, or most favourite) to the right and the negative (most disagree, or least favourite) to the left, the logic in the diamond-shape distribution seemed easy for the participants to grasp and offered the possibility to fit more photographs in an A3 format.

Before carrying out the Q sort, participants were told that there is no right or wrong answer; it is an exercise of first impressions, where any reason for liking or disliking the pictures is acceptable. Ambiguity or doubt towards photographs is not an issue, as participants are expected to give their own meaning to them (Coogan & Herrington, 2011). The only thing they should do, they are told, is discuss with their partner, agree upon a certain order and glue the pictures to the assigned cell in the A3 sheet. They were given 30 minutes to do so, although there were great differences in this regard between groups, depending on their dynamic throughout the process (Fig.6).

Figure 6. Participants during the Q sort.

When groups were heading towards the end of the sorting, they were asked about their choices, particularly the most and least favourites. Members of the research team noted these answers, as well as spontaneous comments during the decision-making process. This qualitative data would be key to understand the meaning behind certain valuations, as well as introduced other determining aspects not anticipated by the research team.

### *2.5 Analysis of the Q sorts*

Data extracted from the Q sets were analysed using the web application Ken-Q Analysis version 0.11.1 (https://shawnbanasick.github.io/ken-q-analysis/#section1). By uploading an Excel file with data sorted by Q sort value, we proceeded to the generation of a correlation matrix and an extraction of eight principal components. From these eight factors, five of them showed eigenvalues larger than 1.5. After the rotation on the factors applying Varimax, further analysis and interpretation of these preliminary factors led to the selection of four factors as most distinguishable "archetypes", attending to the following:

- factor loadings (number of groups associated to the factor)
- interpretation of each idealized Q sort (appendix 1), with distinguishing photographs at $P < 0.05$ and at $P < 0.01$
- salient characteristics tagged to the photographs ranked highest, lowest, positive, and negative (as explained in section 2.3)

Lastly, we draw attention towards overall common perceptions. Z-Score variance allowed for the detection of photographs with higher levels of consensus and disagreement, and qualitative data registered reflected the most frequent themes and views brought up.

## 3. Results

### *3.1 Selection and interpretation of factors*

To characterize different perspectives related to each factor, we consider eight preliminary factors and end up identifying four "archetypes": one strongly valuing well-known cultural landscapes (F1), one appreciating natural features and greenery (F2), one rating the landscapes of transportation infrastructure positively (F3), and one where urban sites determine the highest positions (F5).

Factors 4, 6, 7 and 8 show strong similarities to one, two or three of the "archetypes", according not only (or not always) to high correlation, but also to the interpretation of the idealized Q sorts by the research team, identifying patterns in the presence or absence of the salient characteristics tagged to each photograph of the Q set. However, we identify certain singularities in these factors; not significant enough for them to become "archetypes", but nevertheless worth considering in the interpretation of the results.

*F1: the "culture-driven"*

Cultural landscapes, mostly located in urban contexts, are valued very highly by this group. In opposition, a strong presence of infrastructure, dictates the lowest valued positions. Well-known sites in the city-centre (#1, #3 and #4) are recognized by many participants at first sight (Table 1). Comments such as "I know where this is!" or "I've been there!" are made with pride when they prove to know the place shown in a photograph.

This is the most numerous group, including participants of all ages involved in the study. There is, however, a lower representation of younger participants. This could be interpreted as a

sign that cultural values, or knowledge of certain recognizable monuments, more commonly manifest at older ages.

| | photo # | CUL | NAT | INF | AGR | L | URB | SURB |
|---|---|---|---|---|---|---|---|---|
| Highest ranked photographs | 3 | | | | | | | |
| Positive photographs ranked higher in factor 1 array than in other factor arrays | 1 | | | | | | | |
| | 4 | | | | | | | |
| | 19 | | | | | | | |
| | 11 | | | | | | | |
| Negative photographs ranked lower in factor 1 array than in other factor arrays | 10 | | | | | | | |
| | 24 | | | | | | | |
| | 7 | | | | | | | |
| Lowest ranked photographs | 9 | | | | | | | |

Table 1. Relative ranking of photographs in Factor 1

*F2: the "nature lovers"*

Natural features abound in the highest rated photographs, while infrastructures determine the lowest ranked (Table 2). Urban and suburban locations intertwine without apparent predominance of one or another. Pairs from all grades appear in this group, indicating that the preference for natural features in the photographs extends throughout all ages covered in this study. It is also relevant to note that this factor holds the lowest percentage of participants living in the municipality of Madrid city-centre (about 8%) when compared to the rest of the factors. Photograph #22, the lowest ranked for this factor array, triggered the following comment during the Q sort: "I bet a bad guy drives that truck, it looks dirty and dangerous".

| | photo # | CUL | NAT | INF | AGR | L | URB | SURB |
|---|---|---|---|---|---|---|---|---|
| Highest ranked photographs | 5 | | | | | | | |
| Positive photographs ranked higher in factor 2 array than in other factor arrays | 12 | | | | | | | |
| | 1 | | | | | | | |
| | 16 | | | | | | | |
| | 19 | | | | | | | |
| Negative photographs ranked lower in factor 2 array than in other factor arrays | 3 | | | | | | | |
| | 23 | | | | | | | |
| | 11 | | | | | | | |
| | 24 | | | | | | | |
| Lowest ranked photographs | 22 | | | | | | | |

Table 2. Relative ranking of photographs in Factor 2

*F3: the "city gears enthusiasts"*

The presence of infrastructure is well valued by participants in this factor, while natural features are generally ranked lower than in other factor arrays (despite the greenery shown in photograph #10, the highest ranked in this factor). Urban and suburban locations alternate without apparent predominance of one or another (Table 3).

Views "in motion", from the road (#22, #23) or from the train (#7), are valued quite positively in this factor, showing that participants are driven towards the transportation gear and its associated landscapes. High speed is patent in these photographs, and the recognition of the activity (car or train ride) encouraged positive comments and rankings for this group, which is represented by participants in the younger groups.

| | photo # | CUL | NAT | INF | AGR | L | URB | SURB |
|---|---|---|---|---|---|---|---|---|
| Highest ranked photographs | 10 | | | | | | | |
| Positive photographs ranked higher in factor 3 array than in other factor arrays | 1 | | | | | | | |
| | 7 | | | | | | | |
| | 22 | | | | | | | |
| | 19 | | | | | | | |
| | 23 | | | | | | | |
| | 18 | | | | | | | |
| Negative photographs ranked lower in factor 3 array than in other factor arrays | 5 | | | | | | | |
| | 12 | | | | | | | |
| | 17 | | | | | | | |
| | 4 | | | | | | | |
| | 8 | | | | | | | |
| | 15 | | | | | | | |
| Lowest ranked photographs | 2 | | | | | | | |

Table 3. Relative ranking of photographs in Factor 3

*F5: the "urbanites"*

While natural features appear in both highest and lowest ranked photographs, the most positive values are given mainly to cultural landscapes in urban contexts, and the most negative are given to views of suburban locations (Table 4). Demographic data show that this factor contains the highest percentage of participants from the municipality of Madrid city-centre (21,4%), and it is most strongly represented by participants from the younger groups (ages 11 to 14).

| | photo # | CUL | NAT | INF | AGR | L | URB | SURB |
|---|---|---|---|---|---|---|---|---|
| Highest ranked photographs | 5 | | | | | | | |
| Positive photographs ranked higher in factor 5 array than in other factor arrays | 1 | | | | | | | |
| | 2 | | | | | | | |
| | 19 | | | | | | | |
| Negative photographs ranked lower in factor 5 array than in other factor arrays | 12 | | | | | | | |
| | 17 | | | | | | | |
| | 18 | | | | | | | |
| | 14 | | | | | | | |
| Lowest ranked photographs | 9 | | | | | | | |

Table 4. Relative ranking of photographs in Factor 5

*Other factors: similarities and singularities*

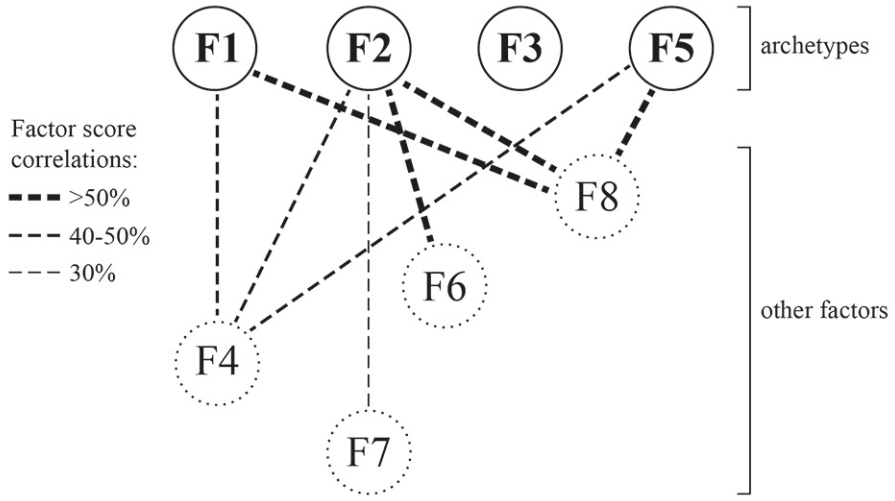


Figure 7. Relation between factors and selection of "archetypes"

As shown in Figure 7, factor 4 is strongly linked to factors 1, 2 and 5: with F1 and F5 in terms of valuing urban over suburban settings, and with F2 in terms of valuing the presence of natural features positively. A distinct nuance of this group is the importance given to the aspect of

the sky element: clear and blue skies are ranked positively, while skies showing signs of pollution are ranked negatively.

Factor 6 is strongly linked to Factor 2 (the "nature lovers"). Infrastructures in suburban contexts receive negative values while natural features, in both urban and suburban locations, are positively ranked. This factor includes only two pairs of participants. Factor 7 is also linked to Factor 2 (the "nature lovers"), though not in terms of correlation among factors. After the analysis of the idealized Q sort, we determine that participants in Factor 7 value the same concepts as those in Factor 2 but using different photographs to express these common preferences. The distinct nuance in the case of this group is the positive ranking of photographs showing open spaces and lack of cars and traffic.

Factor 8 shows relatively high correlation values with Factors 1, 2 and 5 (67%, 54% and 61% respectively). It values urban settings and sunset light in the pictures and tends to value positively the cultural and natural aspects, while negatively assessing the dominance of infrastructure.

### *3.2 Consensus and disagreement*

The highest levels of consensus were shown in the low ratings of photographs #24 and #18 (Fig. 8), with Z-Score variances of 0.121 and 0.127 respectively. Idealized Q sorts for every factor place these photographs in the inferior rows of the diamond-shape template, or (in fewer cases) in the middle row, indicating that they are mainly perceived negatively or with indifference. Both photographs show views in suburban locations (in the south-eastern peri-urban area), where the road has a predominant role. Additionally, these photographs are the only ones in the Q set showing billboards.


Figure 8. Consensus photographs (left: #24; right: #18)

The lowest levels of consensus were shown in the ratings of photographs #9, #6, and #7 (Fig. 9). These photographs are the only ones showing Z-Score variances over 1 point (1.375, 1.204 and 1.201 respectively), and are all located in urban settings.

Figure 9. Disagreement photographs (from left to right: #9, #6 and #7)

Photographs #9 and #6 show elements with very different characteristics within the same frame. Photograph #6 triggered negative comments such as “it’s ugly! It looks dry and has no leaves” (referring to the vegetation in the foreground), as well as positive comments such as “I like this one because of the clear blue sky” or “I recognize that buildings, it’s the Almudena Cathedral”.

The Gasometer Park (#9) shows the base of a brick chimney remaining from a former gas plant. The tagging and graffiti throughout the concrete surfaces gave some participants the impression of a run-down area, and not recognizing the element of the chimney seemed to reinforce

the negative valorisation, triggering comments such as: “It looks abandoned, and I don’t know what that thing in the middle is for. What is it doing there?”. However, other participants saw positives in this aesthetics and the ramps as a suitable place for skateboarding.

Overall, cultural landscapes in urban contexts showing both well-known architectural elements and natural features are ranked the highest (the five photographs ranked highest overall are #1, #5, #3, #4 and #10). In the case of *El Retiro* site (#1), the best ranked photograph, the rowing boats in the lake were identified by many participants as an activity that they had experienced before. It is, indeed, a popular leisure activity among the citizens of Madrid, which will usually take place on a sunny weekend or vacation day. On the other hand, the worst ranked photos are the views from the road and those showing industrial premises in barren landscapes (#24, #22, #18, #20 and #23).

## 4. Discussion

Results show overall predominant positive valorisation towards green spaces, especially those photographs in which urban greenery is combined with recognizable architectural elements (#1 and #5). While overall tendency towards well-known cultural sites and lush vegetation may not come as a surprise, the characterization of “archetypes” in combination with qualitative data illustrates four distinguishable patterns of landscape preference:

- F1 strongly valuing well-known cultural landscapes, represented by older participants and suggesting that cultural values more commonly manifest at older ages
- F2 appreciating especially natural features and greenery, with the largest number of suburban residents, suggesting that familiarity with less urbanized environments encourages positive ranking of photographs showing abundant vegetation

- F3 rating the landscapes of transportation infrastructure positively, represented by few and young participants, and
- F5 where urban sites determine the highest positions, holding the largest percentage of city-centre residents and suggesting, again, that familiarity is a determining factor for positive ranking of photographs.

Factor analysis also revealed other important aspects influencing the valorisation of certain photographs, such as appreciation for sunset light, concern towards signs of pollution in the air or preference for open spaces and lack of cars in the photographs. Consensus is shown in the negative valorisation of views from the road, particularly those with a strong presence of roadside billboards. These views correspond to the south-eastern peri-urban area of Madrid; a somewhat dry and barren landscape characterized by heavy traffic, large-scale road infrastructure and recent housing developments. Urban settings are generally ranked higher than suburban ones, though landscaped vegetation in both cases prompts positive rankings.

Disagreement photos confirm that the presence within the same photograph of two contrasting features can trigger different responses. This depends on what the participant is focusing on, hence the high Z-score variances in #9 and #6.

Recognizable elements (not only iconic monuments, but also familiar elements with a clear function) have proven to foster higher rankings. More so in the case of photographs showing settings for recreational activities such as hanging out in a park or shopping; probably two of the most common activities for teenagers to do during the weekend.

The “tagging” of salient characteristics in photographs reflected not only objective data, but also concepts such as character or predominant landscape features, strongly influenced by the

views and interpretation of the researchers. However, these were never mentioned to participants in order to avoid influencing the Q sort and proved to be highly useful in the interpretation of these results, providing legible patterns of presence (or lack) of certain features in the relative ranking of the photographs for each factor.

Different dynamics that appeared among pairs of participants during the sorting made some decide on the ranking faster than others. Generally, participants would spread their photographs of the Q set on the table and start by picking their most and least favourites. They would then scale up (or down), choosing those photographs they did not feel so strongly about. The middle row would frequently be the last to be completed, composed by those images that have been ruled out of the "positive" and the "negative" positions. Rows in the diamond-shape layout acted as "steps" in the decision-making process, and helped participants organize the Q set in smaller groups and discuss with their partner in terms of "upgrading" or "downgrading" photographs to and from specific rows, without necessarily having to question the whole set.

While some groups would take turns choosing the position of certain photographs, others would discuss them one by one and would not place the photograph on a cell until it was agreed upon by both parties. Other groups would combine these two dynamics throughout the exercise. While discussing and agreeing on the position of each photograph would take more time, it would also raise more comments by participants justifying their point of view, hence providing more opportunities for researchers to capture these qualitative data which have proven to be crucial in the interpretation of their results.

Though arranging the exercise in pairs did seem to favour comments on these photographs and keep participants active, "forcing" them to defend their preference of a certain photo, we recognize this has been at a risk of not hearing all voices equally, not considering the individual

participant in his or her time to process and decide, as well as somehow disregarding the fact that one of the partners may tend to dominate the decision-making, while the other may remain submissive and therefore not be fairly represented in the Q sorts.

Limitations in terms of the size of the photographs (6x4cm) should also be noted. While an A3 sheet per group was logistically advantageous for the researchers, photographs could have been too small to see certain details contained in the frame. Nevertheless, participants made no mention of this throughout the workshop. The 1,5:1 proportion could also be revised, for some research supports the use panoramic images to better represent the character of landscapes (Palmer & Hoffman, 2001; Sevenant & Antrop, 2011).

A deeper understanding of the viewpoints and reasoning could help in the interpretation of these factors, as well as in coming up with concrete ideas to consider in the design and management of our environment. This could be done by recording all comments made by participants during the Q sort process, or carrying out interviews right after the sorting where participants can explain their choices (Milcu et al., 2014).

Photo-based Q methodology stems from the idea that photographs can represent landscapes, and therefore the perception of the photograph implies that the landscape would be perceived that same way. This assumption relies strongly on the visual component, perhaps at the expense of disregarding other factors inherent to the "embodied" experience of the landscape (Jones & Evans, 2012). Further research on the "validity issues" linked to the use of photo-based Q methodology to assess landscape preference (Dunn, 1976; Stewart et al., 1984; Scott & Canter, 1997) could benefit from contrasting these results with the on-site experience of participants in the landscapes shown in these photographs. This would inevitably introduce other environmental

factors; however, it would address the ongoing question of whether photography is a valid landscape presentation medium.

## 5. Conclusion

Among the wide spectrum of approaches to promoting sustainability through geographical education (Haubrich, Reinfried, & Schleicher, 2008; Meadows, 2020), photo-based Q methodology has proven to be an intuitive, effective and inexpensive technique to explore the views of adolescents towards different landscape types. Paired with other related activities (such as guided visits to exhibits, explanation of key concepts, and debates among the class groups), it can also become a stimulant resource to build awareness on landscape issues, help acquire stronger environmental values, and motivate the younger population towards geographic knowledge and participation processes. This is often far from what is contained in the Spanish curriculum (Souto, 2018), which tends to reward rote learning and often fails to engage the younger population in a more committed attitude towards their everyday environment (Marrón Gaite, 2011).

Photo elicitation made for enjoyable sessions (Epstein et al., 2006) and stimulated spontaneous comments by these participants, allowing for both quantitative and qualitative data gathering. Carried out in pairs, the diamond-shape layout for the Q sort proved to be an intuitive format for participants to arrange their thoughts and preferences (Milcu et al., 2014) and to discuss with their partner over the value put to each photograph in relation to the rest of the set. The combination of quantitative data from the factor analysis and the qualitative data gathered by researchers during the workshop was crucial for the interpretation of these results, detecting four clusters or “archetypes”, as well as exploring the structure and meaning behind the consensus and disagreement photographs.

Findings show overall predominant positive valorisation towards green spaces, especially those where urban greenery is combined with recognizable architectural elements. In general, familiarity with the landscape type seems to encourage positive rankings, and preference towards well-known cultural sites manifests at older ages. Consensus is shown in the negative valorisation of peri-urban views from the road with abundant roadside billboards, while the highest levels of disagreement are shown in photographs of urban sceneries showing two contrasting features. The method also allowed for concerns of current and prospective landscapes such as pollution, safety or landscape degradation to come up during the Q sorting.

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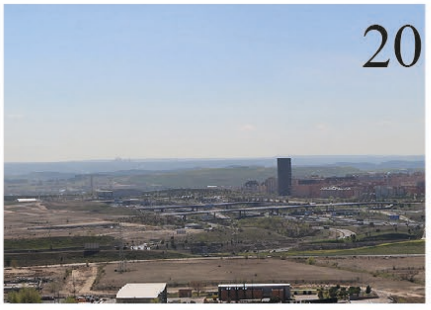
***Appendix B:*** Set of photographs 16-25

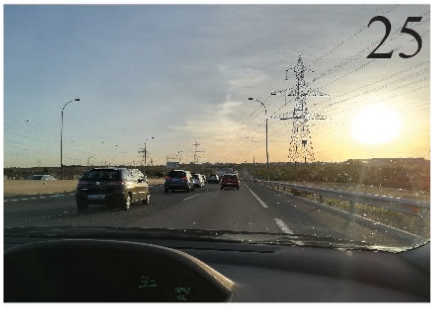










***Appendix C:*** Idealized Q sort (Factor 1)

***Appendix D:*** Idealized Q sort (Factor 2)

***Appendix E:*** Idealized Q sort (Factor 3)

***Appendix F:*** Idealized Q sort (Factor 5)