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1 **Improving nature experience in cities: what are people's preferences for vegetated**
2 **streets ?**

3

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12

13 **Abstract**

14

15 In the current context of strong urban sprawl, it becomes urgent to find urban approaches that
16 simultaneously promote ecological functions and relationships between people and nature in
17 cities. Streets are omnipresent urban elements that can deliver ecosystem services and
18 facilitate people daily interactions with nature. Promoting vegetation in streets can take
19 different forms which have to be combined with people's preferences. Based on
20 photomontages, we assessed people's perceptions and valuations for herbaceous vegetation
21 types associated to various managements and designs of pavements. Using a combination of a
22 local field survey and a French national online survey, we collected a total of 3609 responses
23 representing a large diversity of socio-demographic characteristics. The results of the field
24 survey confirmed those of the online survey. Although there was variability among people
25 valuations, we found that lowly managed pavements with spontaneous vegetation were in
26 average higher valued than highly managed pavements without vegetation. Pavements with
27 spontaneous vegetation were perceived as less kept than pavements without vegetation, but
28 more beautiful and less boring. We found a consensus of high valuations towards pavements
29 containing vegetation integrated in small design interventions (flowers seeded in foot of wall,
30 design of a meadow strip along the pavement), suggesting that people generally accept
31 vegetation with visible signs of human actions or managements. Socio-demographic
32 characteristics partly explained variabilities in photo valuations. As expected, people
33 frequently connected with nature had the highest preferences for vegetated pavements,
34 spontaneous or integrated in designs. These results show that vegetated streets can become
35 daily biodiversity-friendly urban greenspaces appreciated by urban dwellers. We provide
36 recommendations for promoting vegetation in streets that will be useful for politics, urban
37 designers and managers.

38 **1. Introduction**

39 The current strong urban sprawl causes profound changes in ecological habitats and
40 associated biodiversity (Grimm et al., 2008). However, it is now recognized that nature
41 experience is required for improving urban dweller health and well-being (Botzat et al., 2016;
42 Cox et al., 2017b) and that it can change people attitudes towards pro-environmental
43 behaviors (Soga and Gaston, 2016). In this context, it is necessary that researchers, designers
44 and managers propose urban approaches that simultaneously promote ecological functions
45 and relationships between people and nature (Aronson et al., 2017; Gaston et al., 2013; Soga
46 and Gaston, 2016).

47 Nature in cities can be promoted at various scales in multiple public or private spaces
48 (Aronson et al., 2017; Beninde et al., 2015). Land sparing and land sharing have been
49 proposed as two spatial approaches located at both opposite ends of a continuum of nature
50 conservation strategies (Lin and Fuller, 2013). Land sparing which consists in introducing
51 large green spaces (e.g. parks) within a compact urban matrix has been shown an adapted
52 strategy for hosting some large animals and uncommon plant species (Caryl et al., 2016;
53 Kendal et al., 2017; Villaseñor et al., 2017) and to develop various people uses including
54 walking, resting or jogging (Palliwoda et al., 2017). However, this approach induces a travel
55 distance between housing and parks which can be a barrier to frequent people use (Soga et al.,
56 2015; Žlender and Thompson, 2017). Moreover, this approach requires strong political and
57 economic choices in urban planning. Another approach is land sharing where a higher
58 fragmentation of green spaces dispersed through the urban matrix under diversified forms is
59 proposed (e.g. pocket parks Ikin et al., 2013, vegetated streets Säumel et al., 2016, small
60 urban grasslands Kendal et al., 2017). This approach is interesting to promote various
61 biological communities associated to different local environmental and management
62 conditions (Kendal et al. 2017) and to increase daily contact with nature (Soga et al., 2016). In

63 addition, this strategy seems particularly relevant in old cities where high urban densities can
64 limit space-consuming projects.

65 Streets are linear elements omnipresent in the whole urban matrix which are often only
66 viewed as corridors for pedestrian and vehicle traffics. By introducing vegetation, streets can
67 become multi-functional by delivering numerous ecosystem services (Säumel et al., 2016) and
68 represent opportunities to facilitate incidental people daily interactions with nature (e.g
69 looking at vegetation while walking in a street, Cox et al., 2017a). Street vegetation can take
70 different forms according to design and management practices which have to be combined
71 with people's perceptions and preferences to make effective decision-making (Bennet, 2016;
72 Ives and Kendall, 2014; Wallace et al., 2016). In the largest streets and with a relatively high
73 planning budget, planting trees can be an interesting strategy for improving people street
74 valuations (Ng et al., 2015; Todorova et al., 2004). More simply, streets can also encompass a
75 large variety of herbaceous plants, cultivated or spontaneous, by changing management
76 practices or by making small interventions (Weber et al. 2014).

77 In this study, we assessed people's perceptions and valuations for herbaceous vegetation types
78 associated to various managements and designs of street pavements. For that purpose, we
79 conducted two surveys (one local in the field and one online at national scale) where people
80 had to grade photomontages reflecting various management and design scenarios. Following
81 previous studies which found that people generally prefer green infrastructures compared to
82 mineral infrastructures (Botzat et al., 2016; Fischer et al., 2018; White and Gatersleben,
83 2011), we tested the hypothesis that street pavements with some vegetation are more preferred
84 than pavements highly managed with no vegetation. We also examined the relationships
85 between the valuations of our respondents and their socio-demographic characteristics.

86 2. Material and methods

87 2.1. Photomontages and valuation measures

88 We based our questionnaire on a visual method by producing photomontages representing
89 different pavement vegetation types associated to various management practices and
90 interventions (Fig. 1). We first constructed three photomontages to compare people valuations
91 among a highly managed pavement without vegetation ('Asphalt High manag.') and two types
92 of lowly managed pavements harboring spontaneous vegetation ('Asphalt Low manag.' and
93 'Sand Low manag.'). The represented vegetation on these photos reflects vegetation structure
94 and composition that spontaneously grow on pavements as observed in France (Bonthoux et
95 al. in revision). Represented dominant species are *Erigeron sp.* for 'Asphalt Low manag.' and
96 *Trifolium repens* (L.) for 'Sand Low manag.' (Fig. 1). We then added two photomontages to
97 assess people valuations for vegetation included in small designs. We first represented a
98 vegetation strip at the foot of the wall ('Asphalt Flower') with sowed species which are often
99 used in French cities for their colored flowers (e.g. *Iberis sempervirens* (L.), *Eschscholzia*
100 *californica* (Cham.)). This type of intervention is possible in existing old pavements by using
101 cracks or by removing a small asphalt strip along the wall. We also proposed an intervention
102 consisting in the creation of a grassland strip between the pedestrian path and the road ('Sand
103 Grassland'). All these photomontages reflect vegetation structure present in late spring – early
104 summer which is the period in which vegetation differences between pavement situations is
105 the highest and in which people are frequently outside and experience vegetated pavements.
106 Finally, we assessed whether people's preferences depend on the visual context by
107 incorporating the five pavement photomontages in open and closed neighborhood visual
108 contexts (Fig. 1).

109

110 We used two measures to assess valuations and perceptions of each pavement vegetation type.
111 First, the ten photos were presented individually in a random order to respondents which had
112 to grade them between 1 (do not like at all) and 10 (like a lot). Second, to measure
113 perceptions, respondents had to answer whether they found that the five pavement types
114 (pavement without the neighborhood visual context, Appendix Fig. 1) were associated or not
115 (i.e. yes or no response) to seven criteria: beautiful, boring, kept, useful for nature, natural,
116 wild, valuable for the city image. Finally, we collected information about socio-demographic
117 variables that could influence people valuations for pavement vegetation including age,
118 gender, qualification level, job or studies in the environmental field or not, frequency of
119 outdoor activities, house or apartment housing and practice of gardening (Table 1). We also
120 asked the city name of residence to know whether respondents live in rural or urban areas (by
121 informing the number of city inhabitants) and in which French region (by informing longitude
122 and latitude, Table 1).

123

124 **2.2. Surveys**

125 A combination of field and online surveys including the same photomontages and collected
126 information was realized between April and June 2017. Comparison of these two types of
127 survey was used to check the robustness of our results and limit methodological biases.

128 Field face-to-face surveys were performed in the agglomeration of Blois (105 000 inhabitants)
129 which is located in central France. Surveys were conducted in the inner Blois city and in
130 several small villages in the agglomeration. This survey approach permitted us to optimize the
131 age gradient range by interviewing teenagers and elderly persons who were only slightly
132 addressed by the online survey. It also allowed to interview people not interested in the
133 subject. The online survey was used to increase our response sample size. This latter approach

134 can show results consistent with traditional sampling approaches and allows to obtain a cheap,
135 fast and large collection of responses (Brickman Bhutta, 2012; Gosling et al., 2004; Riva et
136 al., 2003). To disseminate the online survey and optimize the respondents variability we sent a
137 web link to students, professors and administrative personnel of several universities with
138 various specialties including environmental field (e.g. ecology, landscape architecture) and
139 other disciplinary areas (e.g. mathematics, physics, computer science). We also posted the
140 link on different social networks and employed a snowballing approach by asking to forward
141 the survey to other networks.

142

143 **2.3. Analyses**

144 Grades associated to the ten photomontages were highly correlated between both field and
145 online surveys (Spearman rank correlation $Rho = 0.81$, $n=10$, Appendix Table 1). We thus
146 pooled both dataset before analyses in order to improve the robustness of results.

147 We first compared means of grades associated to the ten photos using t-tests. We also
148 calculated coefficients of variation to investigate the level of grade variability. To analyze the
149 relationships between the five pavement types and people perceptions we performed a
150 multiple component analysis (MCA) on the response (yes-no) * seven criteria matrix,
151 including in the same matrix the responses for the five pavement types.

152 To investigate the relationships between photo grades and the ten socio-demographic
153 variables (Table 1), we computed linear models for each of the ten photomontages. All socio-
154 demographic variables were lowly correlated together ($r < |0.7|$, Appendix Table 2, Dormann
155 et al., 2013) and were included in models. We standardized (mean = 0, SD = 1) the
156 quantitative explanatory variables to facilitate comparison of parameter estimates (Schielzeth,
157 2010). We used a model averaging approach to take into account the uncertainty in the model

158 selection process (Burnham & Anderson, 2003). We fitted all possible models nested within
159 the full model and ranked them on the basis of AIC and assigned them Akaike weights (w_i).
160 We then averaged the estimated parameters of the 95% confidence set of models (sum of $w_i >$
161 0.95) weighted by w_i . We considered variables as significant when confidence intervals did
162 not overlap zero. Finally, we calculated the percentage of explained variance for the most
163 parsimonious model (i.e. with the smallest AIC) of the confidence set. No spatial
164 autocorrelation was found in model residuals given that longitude and latitude of respondents'
165 municipalities were included as explanatory variables in models.

166

167

168 **3. Results**

169 **3.1. Diversity of respondents**

170 A total of 271 and 3338 respondents answered the field and online surveys respectively (n
171 total = 3609). Respondents represented a large diversity of socio-demographic groups (Table
172 1, See Appendix Fig. 2 for the distributions of quantitative variables) and their residence
173 locations were relatively evenly distributed across France as across the rural-urban gradient
174 (Fig. 2, Table 1). The age and qualification level gradients were oriented towards young
175 people and high diploma due to our questionnaire diffusion approach towards university
176 people but nevertheless the whole gradients were correctly represented and no important
177 difference between field and online survey was found.

178

179 **3.2. Grades and criteria associated to the photomontages**

180 Average respondents' grades associated to situations in open visual contexts were always
181 higher than those in closed visual contexts (Fig. 1). Despite small differences in grade orders
182 between both survey approaches (Appendix Table 1), 'Asphalt High manag.' average grade
183 was globally significantly lower than 'Asphalt Low manag.' and 'Sand Low manag.' average
184 grades in both visual contexts. For these three photo grades, variations were relatively high
185 (coefficients of variation ranging between 0.47 and 0.68, Appendix Table 1) indicating
186 divergences in respondents' valuations. Average grades were the highest for 'Asphalt Flower'
187 and 'Sand Grassland' in both visual contexts. Grade variations were relatively low
188 (coefficients of variation ranging between 0.24 and 0.36) for both situations indicating
189 convergences in respondents' valuations.

190

191 The first two axes of the MCA accounted for 45% and 26% of the total variance respectively
192 (Fig. 3). The first horizontal axis was correlated to the 'Beautiful', 'Boring', 'Useful for nature'
193 and 'Valuable for the city image' criteria and the second vertical axis was correlated to the
194 'Kept', 'Natural' and 'Wild' criteria (Fig. 3, Appendix Table 3). 'Asphalt High manag.' situation
195 had a small convex hull and was judged 'not Beautiful', 'Boring', 'Kept', 'not Useful for nature',
196 'not Natural', 'not Wild' and a mix across 'Valuable' and 'not Valuable for the city image'. The
197 'Asphalt Low manag.' and 'Sand Low manag.' situations had large convex hulls indicating
198 divergent responses and were associated to the same criteria: 'not Kept', 'quite Natural' and
199 'Wild' and a judgement mix for the 'Beautiful', 'Boring', 'Useful for nature' and 'Valuable for
200 the city image' criteria. 'Asphalt Flower' and 'Sand Grassland' situations were relatively
201 associated to the same criteria: 'Beautiful', 'not Boring', 'Kept', 'Useful for nature', 'Valuable for
202 the city image' and a judgement mixing for the 'Natural' and 'Wild' criteria (Fig. 3).

203

204 **3.3. Relationships between grades and socio-demographic variables**

205 Because results for both visual contexts were very similar, only results for the closed visual
206 context were presented in the main text (Table 2, see Appendix Table 4 for all detailed
207 results). There were numerous significant relationships between grades and socio-
208 demographic variables, but the total explained variance was low in each model ($R^2 \leq 11\%$;
209 Table 2). The 'Environment' variable had the strongest effect magnitude on respondents'
210 grades. The 'Housing', 'Population', 'Longitude', 'Latitude' variables were the least significant.
211 The 'Asphalt High manag.' grading was significantly and negatively related to 'Age',
212 'Gender.woman', 'Qualification', 'Environment.yes', 'Outdoor' and 'Gardening.yes' variables.
213 On the contrary 'Asphalt Low manag.', 'Sand Low manag.', 'Asphalt Flower' and 'Sand
214 Grassland' were globally positively related to these variables (Table 2).

215 **4. Discussion**

216 Promoting nature in cities is challenging for scientists, designers and managers, because it
217 requires to find urban designs improving trade-offs and synergies between biodiversity
218 conservation, associated ecosystem services and people acceptance of spontaneous nature
219 (Threlfall and Kendal 2017, Kowarik 2017, Botzat 2016). In addition to traditionally
220 acknowledge green spaces, streets, which are ubiquitous at the city scale, represent a good
221 opportunity to simultaneously promote biodiversity and enhance nature daily experience
222 (Bonthoux et al. in revision). Based on a large collection of data, we showed that people have
223 more preferences for vegetated than for mineral street pavements, regardless of the
224 neighborhood visual context. However, the appreciation of vegetation strongly depends on the
225 way it is promoted.

226

227 Our study was based on complementary field and online surveys, strengthening the robustness
228 of the results. In fact, we found that results of field survey confirm the nationwide online
229 survey. Field survey is an interesting method to control and maximize the variability of people
230 surveyed. However, this technique is time consuming and generally leads to modest sample
231 sizes which are geographically restricted, with potential impacts on results robustness and
232 transferability. Online survey can be oriented towards certain people (highly qualified people
233 in this study) but has the advantage of covering large areas and obtaining a high response
234 amount. In the questionnaire we used a moderate number of photos to limit survey duration
235 and to avoid people demotivation. We chose to compare preferences for vegetation pavement
236 reflecting late spring-early summer period when vegetation is the most developed and people
237 are most often outside. In late summer and in autumn, vegetation with a drier or a degraded
238 aspect may be less appreciated. This effect could be reduced by mowing at this time, the

239 vegetation structure would be more homogeneous between pavement vegetation types and we
240 can expect a low variability of people valuations at this period.

241

242 Although there was a high variability among people preferences, we found that lowly
243 managed pavements with spontaneous vegetation were in average higher valued than highly
244 managed pavements without vegetation. This result is in accordance with other studies
245 showing that people prefer vegetated to mineral urban elements (e.g. pavement tree pits,
246 Fischer et al. 2018; house facades and roofs, White and Gatersleben 2011). Our criteria
247 analysis showed that pavements with spontaneous vegetation were perceived as less kept than
248 pavements without vegetation, but more beautiful and less boring. This finding goes against
249 conveyed ideas in municipalities and technical services (in France at least) that strong
250 management is important for urban dwellers. This point highlights the importance of
251 conducting studies like this one to avoid a truncated overview of people preferences. Our
252 results indicate a wide acceptance of spontaneous vegetation in cities that occur among
253 inhabitants but also local decision-makers and managers (unpublished interviews with 11
254 municipality mayors or technical service leaders conducted in the agglomeration of Blois). In
255 response to the increasing regulatory ban of pesticide use (e.g. prohibition since 2017 in
256 public spaces in France), alternative methods of vegetation management used by technical
257 agents (hand weeding or thermal/steam weeding) are often moderately effective (Bonthoux et
258 al. in revision) and physically difficult. This forces municipalities to change their attitudes on
259 the presence of spontaneous vegetation in public spaces.

260

261 Our results showed a strong people consensus of appreciations towards pavements containing
262 vegetation integrated in small design interventions. This is supported by the study of Weber et

263 al. (2014) who found a higher approval for maintained roadside vegetation compared to
264 spontaneous vegetation in Berlin, and with the fact that people generally accept vegetation
265 with visible signs of human actions or managements (Nassauer 1995, Van den Berg and van
266 Winsum-Westra 2010). Including vegetation in designs also lead to homogeneous plant
267 covers which are often visually preferred compared to scattered patches of vegetation, as it
268 has been shown in other urban habitats like wastelands in which pioneer vegetation is less
269 appreciated than grassland vegetation (Brun et al. 2017, Mathey et al. 2018). Interestingly, the
270 grassland strip ('Sand Grassland') which can be composed of a mix of native grasses and forbs
271 was as much appreciated than the flower strip ('Asphalt Flower') which is generally composed
272 of exotic and/or horticultural species. This legitimates the fact of designing urban grasslands
273 (Klaus 2013) that can favor people experience with nature but also other ecosystem services
274 such as plant and animal biodiversity conservation and the maintenance of pollination
275 (Blackmore and Goulson 2014).

276

277 We found that socio-demographic parameters partly explained variability in photo
278 appreciations. As expected, people frequently connected with nature had the highest
279 preferences for vegetated pavements, spontaneous or integrated in designs. This effect
280 predominated for people working or doing studies in the environmental field. These results
281 are in accordance with another study showing that people who have high nature relatedness
282 spend more time in public or private green spaces (Lin et al. 2017). As other studies, we
283 found that females, people with a high qualification level and older people, who generally
284 have more leisure times in gardens, had the highest preferences for vegetation (Cox et al.
285 2017a, Fischer et al. 2018). Nevertheless, despite the various socio-demographic variables
286 integrated in models a high part of grade variability remained not explained, indicating that

287 other determinants such as childhood experience or education would be important to consider
288 (Rupprecht et al. 2016).

289

290 **5. Conclusion**

291 The results of this study suggest that vegetated streets can become daily biodiversity-friendly
292 urban greenspaces appreciated by urban dwellers. They should be taken into account by
293 politics, urban designers and managers in different ways. In already built-up areas, we suggest
294 to globally reduce management pressure allowing the appearance of moderate spontaneous
295 vegetation, what should be beneficial for biodiversity and not rejected by people. In future
296 constructions, we suggest that civil engineers and architects integrate local vegetation on
297 pavements through innovative designs.

298

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303

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413 **Table 1** Socio-demographic characteristics of respondents used as explanatory variables in
 414 models to explain photos grades
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Variable name	Description	Mean \pm SD	Range
Age		37.80 \pm 15.36	12 – 92
Gender	Two classes: man (n=1455), woman (n=2154)		
Qualification	Level of qualification (0=no diploma to 5=master level or more)	3.56 \pm 1.61	0 - 5
Environment	Job or studies in the environmental field, 2 classes: yes (n=1036), no (n=2573)		
Outdoor	Frequency of outdoor activities (0=no activities to 3=more than once a week)	2.31 \pm 0.85	0 – 3
Housing	Two classes: house (n=1909), apartment (n=1700)		
Gardening	Gardening practice, 2 classes: yes (n=2768), no (n=841)		
Population	Number of inhabitants living in the respondent's municipality (/ 1000 inhabitants)	610.33 \pm 2362.64	0.1 – 12475
Longitude	Longitude of the respondent's municipality (Lambert 93 coordinates, in metre)	6366 \pm 2191	1455 – 12354
Latitude	Latitude of the respondent's municipality (Lambert 93 coordinates, in metre)	66608 \pm 2087	61097 – 70945

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421 **Table 2** Influence of socio-demographic variables on respondents' grades for the five
 422 pavement types in the closed visual context. Linear models (n=3609) followed by model
 423 averaging procedures were computed for each pavement type. %R² is the total explained
 424 variance of the best model of the confidence set. Arrow presences indicate significant
 425 relationships and 'ns' no significant relationships. Up and down arrows indicate positive and
 426 negative effects respectively. Arrow numbers are proportional to the effect magnitude (one
 427 arrow, for 0<estimate≤0.5, two arrows for 0.5<estimate≤1 and three arrows for estimate>1).
 428 See Appendix Table 4 for all estimates.

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	Asphalt High manag. R ² =7%	Asphalt Low manag. R ² =7%	Sand Low manag. R ² =10%	Asphalt Flower R ² =11%	Sand Grassland R ² =8%
Age	↘	↗	ns	↗↗	↗
Genre.woman	↘	↗	ns	↗↗	↗
Qualification	↘	↗	↗	↗	↗
Environment.yes	↘↘	↗↗	↗↗↗	↗↗	↗↗↗
Outdoor	↘	↗	↗	ns	↗
Housing.house	ns	↘	↘	ns	↘
Gardening.yes	↘	↗	↗	↗	↗↗
Population	↘	ns	ns	ns	ns
Longitude	ns	ns	↘	↘	↘
Latitude	ns	ns	ns	ns	↗

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432 **Appendix**

433

434 **Table 1** Comparison (mean and coefficient of variation in brackets) of respondents' grades
 435 between the field survey (n=271), the online survey (n=3338) and the whole dataset (n=3609).

	Asphalt High manag. Closed	Asphalt High manag. Open	Asphalt Low manag. Closed	Asphalt Low manag. Open	Sand Low manag. Closed	Sand Low manag. Open	Asphalt Flower Closed	Asphalt Flower Open	Sand Grassland Closed	Sand Grassland Open
Field survey	4.01 (0.63)	5.25 (0.40)	2.99 (0.62)	3.94 (0.51)	3.29 (0.63)	4.49 (0.47)	5.36 (0.49)	5.97 (0.42)	5.29 (0.46)	6.75 (0.32)
Internet survey	3.53 (0.68)	4.55 (0.53)	4.33 (0.53)	5.23 (0.48)	4.85 (0.51)	5.05 (0.47)	7.22 (0.32)	7.79 (0.23)	6.78 (0.35)	7.94 (0.23)
Both surveys	3.56 (0.68)	4.60 (0.52)	4.23 (0.54)	5.13 (0.49)	4.73 (0.53)	5.01 (0.47)	7.08 (0.34)	7.65 (0.25)	6.67 (0.36)	7.85 (0.24)

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443 **Table 2** Correlations between socio-demographic characteristics. a) Correlation (η^2) between
 444 a quantitative and a qualitative variable b) Cramer's V correlation between each pair of
 445 qualitative variables and c) Pearson correlation between each pair of quantitative variables.

446

	Age	Genre	Qualification	Environment	Outdoor	Housing	Gardening	Population	Longitude
Genre	a) 0.00								
Qualification	c) -0.02	a) 0.00							
Environment	a) 0.06	b) 0.01	a) 0.06						
Outdoor	c) 0.01	a) 0.00	c) 0.09	a) 0.01					
Housing	a) 0.11	b) 0.00	a) 0.01	b) 0.11	a) 0.00				
Gardening	a) 0.04	b) 0.04	a) 0.00	b) 0.02	a) 0.01	b) 0.35			
Population	c) 0.00	a) 0.00	c) 0.12	a) 0.00	c) 0.01	a) 0.06	a) 0.01		
Longitude	c) -0.11	a) 0.00	c) 0.05	a) 0.00	c) 0.04	a) 0.04	a) 0.01	c) 0.04	
Latitude	c) 0.00	a) 0.00	c) -0.09	a) 0.00	c) -0.04	a) 0.00	a) 0.00	c) 0.14	c) -0.21

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454 **Table 3** Correlation between the two first axes of the Multiple Component Analysis and the
455 seven criteria

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	Axis 1	Axis 2
Beautiful	0.71	0.07
Boring	0.59	0.00
Kept	0.16	0.54
Useful for nature	0.65	0.04
Natural	0.29	0.42
Wild	0.10	0.61
Valuable for the city	0.64	0.14

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458 **Table 4** Influence of socio-demographic characteristics on respondents' grades for the five
 459 pavement types in both visual contexts. Linear models (n=3609) followed by model averaging
 460 procedures were computed for each pavement type. The estimated coefficients and standard
 461 deviations are indicated for each variable. The significant coefficients are in bold. %R² is the
 462 total explained variance of the best model of the confidence set.

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<i>Closed visual context</i>	Asphalt High manag. R ² =7%			Asphalt Low manag. R ² =7%			Sand Low manag. R ² =10%			Asphalt Flower R ² =11%			Sand Grassland R ² =8%		
	Estimate ±SE		P-value	Estimate ±SE		P-value	Estimate ±SE		P-value	Estimate ±SE		P-value	Estimate ±SE		P-value
Intercept	4.38	±0.09	< 0.001	3.85	±0.10	< 0.001	4.20	±0.09	< 0.001	6.25	±0.10	< 0.001	5.91	±0.10	< 0.001
Age	-0.12	±0.04	< 0.01	0.20	±0.04	< 0.001	0.05	±0.04	0.29	0.55	±0.04	< 0.001	0.14	±0.04	< 0.001
Genre.woman	-0.44	±0.08	< 0.001	0.19	±0.08	< 0.05	0.03	±0.08	0.67	0.47	±0.08	< 0.001	0.16	±0.08	< 0.05
Qualification	-0.17	±0.04	< 0.001	0.21	±0.04	< 0.001	0.27	±0.04	< 0.001	0.26	±0.04	< 0.001	0.17	±0.04	< 0.001
Environment.yes	-0.98	±0.09	< 0.001	0.91	±0.09	< 0.001	1.32	±0.09	< 0.001	0.82	±0.09	< 0.001	1.16	±0.09	< 0.001
Outdoor	-0.16	±0.04	< 0.001	0.15	±0.04	< 0.001	0.15	±0.04	< 0.001	0.07	±0.04	0.07	0.15	±0.04	< 0.001
Housing.house	0.14	±0.09	0.13	-0.34	±0.08	< 0.001	-0.35	±0.09	< 0.001	-0.15	±0.09	0.08	-0.20	±0.09	0.02
Gardening.yes	-0.41	±0.10	< 0.001	0.27	±0.09	< 0.01	0.44	±0.10	< 0.001	0.49	±0.10	< 0.001	0.57	±0.10	< 0.001
Population	-0.14	±0.04	< 0.001	0.00	±0.04	0.95	0.05	±0.04	0.20	0.01	±0.04	0.79	0.03	±0.04	0.49
Longitude	0.01	±0.04	0.77	-0.02	±0.04	0.64	-0.12	±0.04	< 0.01	-0.15	±0.04	< 0.001	-0.09	±0.04	0.02
Latitude	0.06	±0.04	0.15	0.05	±0.04	0.20	-0.01	±0.04	0.71	0.02	±0.04	0.58	0.08	±0.04	0.04

<i>Open visual context</i>	Asphalt High manag. R ² =8%			Asphalt Low manag. R ² =9%			Sand Low manag. R ² =8%			Asphalt Flower R ² =5%			Sand Grassland R ² =5%		
	Estimate ±SE		P-value	Estimate ±SE		P-value	Estimate ±SE		P-value	Estimate ±SE		P-value	Estimate ±SE		P-value
Intercept	5.29	±0.09	< 0.001	4.69	±0.11	< 0.001	4.74	±0.09	< 0.001	7.18	±0.08	< 0.001	7.30	±0.08	< 0.001
Age	-0.19	±0.04	< 0.001	0.02	±0.04	0.66	-0.07	±0.04	0.08	0.23	±0.04	< 0.001	0.03	±0.03	0.39
Genre.woman	-0.06	±0.08	0.39	0.30	±0.08	< 0.001	0.03	±0.08	0.66	0.45	±0.06	< 0.001	0.23	±0.06	< 0.001
Qualification	-0.15	±0.04	< 0.001	0.28	±0.04	< 0.001	0.21	±0.04	< 0.001	0.23	±0.03	< 0.001	0.12	±0.03	< 0.001
Environment.yes	-1.21	±0.09	< 0.001	1.06	±0.11	< 0.001	1.07	±0.09	< 0.001	0.30	±0.07	< 0.001	0.50	±0.07	< 0.001
Outdoor	-0.08	±0.04	0.05	0.18	±0.04	< 0.001	0.15	±0.04	< 0.001	0.03	±0.03	0.40	0.15	±0.03	< 0.001
Housing.house	0.14	±0.09	0.12	-0.37	±0.09	< 0.001	-0.22	±0.09	0.01	-0.12	±0.07	0.10	-0.06	±0.07	0.41
Gardening.yes	-0.48	±0.10	< 0.001	0.23	±0.10	< 0.001	0.16	±0.10	0.11	0.21	±0.08	< 0.01	0.37	±0.08	< 0.001
Population	-0.06	±0.04	0.11	0.10	0.04	0.01	0.02	±0.04	0.65	-0.05	±0.03	0.10	0.01	±0.03	0.78
Longitude	0.07	±0.04	0.08	0.02	0.04	0.65	-0.11	±0.04	< 0.01	-0.01	±0.03	0.85	-0.08	±0.03	0.01
Latitude	0.00	±0.04	0.95	-0.05	0.04	0.20	-0.06	±0.04	0.10	0.00	±0.03	0.93	0.07	±0.03	0.04

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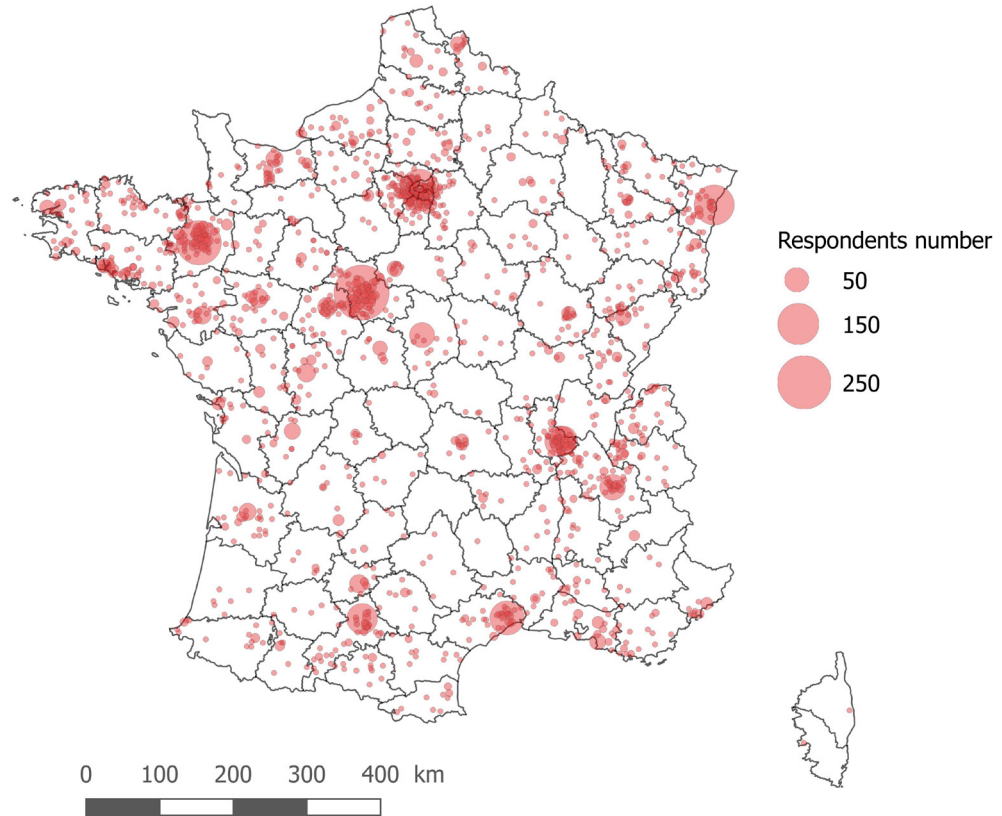
468 **Figure 1** Photomontages used in the questionnaire for the five pavement types and both visual
469 contexts. Below are presented the associated distributions of respondents' grades (from
470 1=lowest valuation to 10=highest valuation, closed and open visual contexts represented in
471 grey and white respectively, for each photo n=3609). Horizontal black bars are average
472 grades. Average grade values are indicated above grade distributions. Different letters indicate
473 that the average grades are significantly different between situations. Abbreviation:
474 management (manag.)

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477 **Figure 2** National distribution of respondents' locations (n=3609)

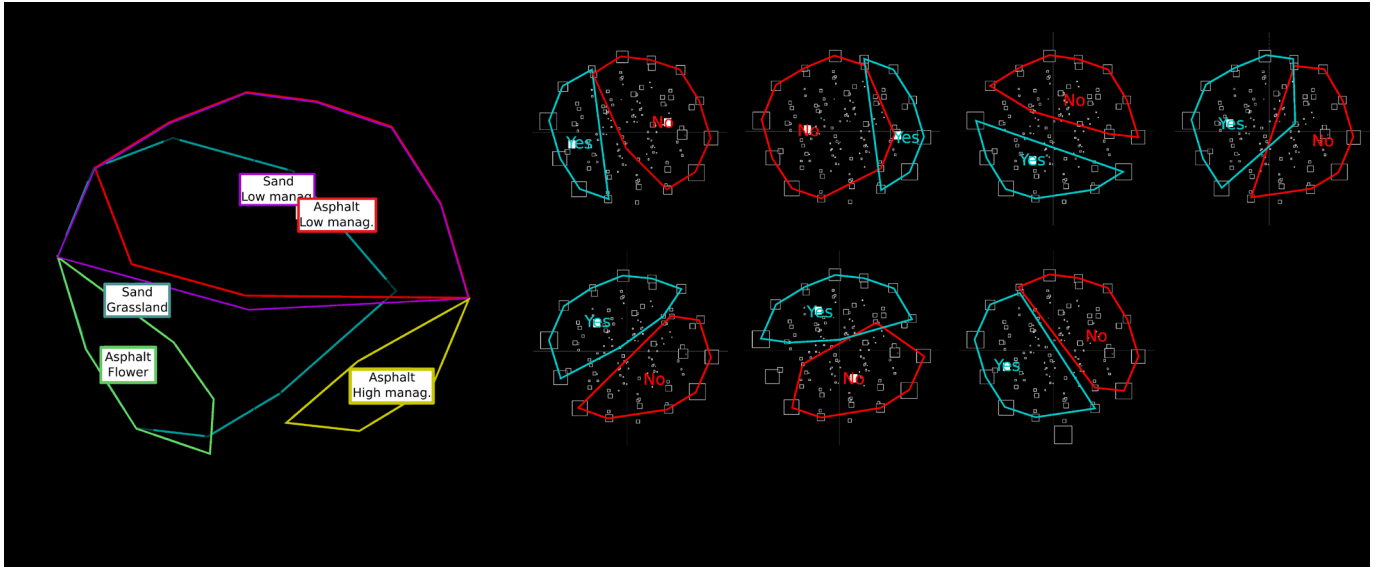
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480 **Figure 3** Factorial map of the multiple correspondence analysis (MCA) computed with the
481 Response (yes-no) * Criteria (n=7) matrix grouping the responses of the five pavement types
482 (row numbers = 5 X 3609 responses). Axes 1 and 2 explain 45% and 26% of the total
483 variance respectively. Dot sizes are proportional to the overlaid dot numbers. Pavement
484 names labels and response 'Yes' and 'No' labels are located on the centroids. Convex hulls
485 include 75% of responses.

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489 **Appendix**

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491 **Figure 1** Photomontages used in the surveys to explore relationships between the five
492 pavement types and seven items (beautiful, boring, kept, useful for nature, natural, wild,
493 valuable for the city image).

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496 **Figure 2** Distribution of the quantitative socio-demographic variables (n=3609)

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