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1   **Title**

2   Flooded by jargon: how the interpretation of water-related terms differs
3   between hydrology experts and the general audience

4

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16

17 **Abstract**

18 Communication about hydrology-induced hazards is important, in order to keep
19 the impact of floods, droughts et cetera as low as possible. However, sometimes
20 the boundary between specialized and non-specialized language can be vague.
21 Therefore, a close scrutiny of the use of hydrological vocabulary by both experts
22 and laypeople is necessary. In this study, we compare the expert and lay
23 definitions of 12 common water-related terms and 10 water-related pictures to
24 see where misunderstandings might arise both in text and pictures. Our primary
25 objective is to analyze the degree of agreement between experts and laypeople in
26 their definition of the used terms. In this way, we hope to contribute to
27 improving the communication between these groups in the future. Our study
28 was based on a survey completed by 34 experts and 119 laypeople.
29 Especially concerning the definition of water-related words there are some
30 profound differences between experts and laypeople: words like 'river' and
31 'river basin' turn out to have a thoroughly different interpretation between the
32 two groups. Concerning the pictures, there is much more agreement between the
33 groups.
34

35 **1. Introduction**

36 Water related natural hazards have impacted society throughout the ages.
37 Floods, droughts and changing river patterns all had their influence on where
38 and how people lived. One thing that has changed throughout the last centuries,

39 however, is the way these hazards are communicated to the general public. The
40 availability of newspapers, magazines, television, radio and the internet has
41 enabled better hydrogeocommunication, thus possibly contributing to a safer
42 society.

43 In specific, communication about hydrology-induced hazards is becoming more
44 and more important. A key aspect of increasing climate change is the expectation
45 that water-related natural hazards, like floods and levee breaches, will occur
46 more frequently in the future (IPCC, 2014).
47 Geoscientific studies (e.g. hydrological studies) are sometimes being ignored in
48 policy and public action, partly because of the fact that scientists often use
49 complicated language that is difficult to understand (Liverman, 2008). Other
50 studies show that policy makers are more willing to take action if they
51 understand why a situation could be hazardous (Forster and Freeborough,
52 2006). To be effective, early warning systems for natural hazards like floods
53 need to focus on the people exposed to risk (Basher, 2006).
54 One way to improve communication with non-experts is to avoid professional
55 jargon (Rakedzon et al., 2017). However, sometimes the boundary between
56 specialized and non-specialized language can be vague. Some terms are used
57 both by experts and by laypeople, but in a slightly different way. A term like
58 'flood' might not be considered jargon since it's quite commonly used, but could
59 still have a different meaning in the scientific lingo than in day-to-day language.

60 In the health sciences, clear communication by doctors has been linked to better
61 comprehension and recall by patients (Boyle, 1970; Hadlow and Pitts, 1991;
62 Castro et al., 2007; Blackman and Sahebjalal, 2014). Similar benefits from
63 effective communication can be expected in other scientific areas as well. An
64 important factor is the degree to which people have the capacity to understand
65 basic information – in the health sciences, this is referred to as health literacy
66 (Castro et al., 2007) and in the geo-sciences as geo literacy (Stewart and Nield,
67 2013). No studies have been done about the extent to which geoscientists use
68 jargon in interaction with the general audience (Hut et al., 2016).

69 Therefore, a close scrutiny of hydrological vocabulary and the interpretation of
70 common water related terms by both experts and laypeople is necessary. Health
71 scientific studies show that a significant difference in the interpretation of
72 specific definitions (both in text and illustration) can be found between doctors
73 and patients (Boyle, 1970). A similar difference between experts and laymen can
74 be expected in the communication in other scientific areas, e.g. hydrology.
75 Experts can be unaware of using jargon, or they may overestimate the
76 understanding of such terminology by people outside their area of expertise
77 (Castro et al., 2007).
78 Knowledge about which terms can cause misunderstanding could help
79 hydrogeoscientists in understanding how to get their message across to a broad

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80   audience and will benefit the public.

81

82   Since there is no specific definition of jargon in hydrology, we adopt the

83   definition from medical sciences (Castro et al., 2007) in which jargon is defined

84   as both (1) technical terms with only one meaning listed in a technical

85   dictionary, and (2) terms with a different meaning in lay contexts. In other

86   words, jargon has a broader definition than some scientists think. It can be

87   expected that hydrogeological terms sometimes have a less strict meaning for

88   laypeople than for experts, meaning that hydrologists should be aware of the

89   second type of jargon (Hut et al., 2016).

90   In this article, we compare the expert and lay definitions of some common water-

91   related terms, in order to assess whether or not these terms can be considered

92   jargon and to see where misunderstandings might arise. With this goal in mind,

93   we developed a questionnaire to assess the understanding of common water-

94   related words by both hydrology experts and laypeople. Our primary objective is

95   to analyze the degree of agreement between these two groups in their definition

96   of the used terms. In this way, we hope to contribute to improving the

97   communication between these groups in the future.

98   To our knowledge, no study has measured the agreement in understanding of

99   common water-related terms between hydrology experts and laypeople. A

100   common vocabulary could increase successful (hydro)geoscientific

101   communication.

102

103   **2. Methodology**

104

105   We started by analysing the hydrologic terms frequented in the twelve 'Water

106   Notes' (Europeas Commission, 2008). These Notes contain the most important

107   information from the European Water Framework Directive (European

108   Parliament, 2000), a European Union directive which commits European

109   Union member states to achieve good qualitative and quantitative status of

110   all water bodies. This was done by counting for each water related term how

111   often it appeared in the text. We chose these Notes because they are a good

112   representation of hydrogeocommunication: they are meant to inform laypeople

113   about the Framework Directive. From this list, twenty of the most frequented

114   terms were chosen (ten of these were also present in the definition list of the

115   Framework Directive itself), such as river, river basin, lake and flood. The

116   questionnaire (including the chosen terms) can be found in Appendix A.

117   Although the word 'water' was the hydrological term most frequently used in the

118   Notes, we decided to exclude this from the survey, because it is a too generic

119   term.

120   A focus group was carried out at the American Geophysical Union fall meeting in

121 San Francisco in December 2016. Eight participating hydrology experts were
122 asked to describe the above mentioned hydrologic terms on paper, and to
123 discuss the outcomes afterwards. This discussion was audio recorded, with
124 consent of the participants. This focus group was important because we wanted
125 to generate reasonable answers for our survey. Ten of the terms that turned out
126 to be too Framework Directive specific (for example 'transit waters', which was
127 not recognized as common hydrological lingo by the focus group participants)
128 were left out of the survey. The ten other terms, which generated some
129 discussion (like whether the word 'dam' only relates to man-made
130 constructions) were deemed to be fit for the survey, because they were
131 recognized as common water-related words by the experts. Two additional, less
132 frequented terms (discharge and water table) were also chosen, based on the
133 focus group. The focus was only on textual terms; the ten pictorial questions (see
134 below) were chosen by ourselves, based on water related pictures we came
135 across in various media outlets.

136 **Survey**
137 Our survey contained 22 multiple choice questions about commonly used terms
138 by water experts. Twelve of these were 'textual' questions: participants were
139 asked to choose (out of 4 options) which answer described a specific hydrologic
140 term best, in their opinion. Ten of these were pictorial questions: participants
141 were asked to choose (out of 4 options) which photo (full colour) depicted a
142 specific hydrologic term best, in their opinion. In addition, we asked some
143 background questions (gender, age, level of education, postcode area + country).
144 The complete survey can be found in appendix A.
145 Pictures were found using the Wikimedia Commons feature. An example of both
146 types of questions can be found in Figure 1.

147

(a) What is, in your opinion, the best definition of a dam?
A. Barrier constructed across a valley to store water or raise the water level
B. Barrier that prevents a river to flow into a lake
C. Man-made, giant concrete structure to regulate water flow
D. Man-made object to keep rivers or seas from overflowing land

(b) Which of the following photos is, in your opinion, the best depiction of a geyser?

148   *Figure 1:*
149 *Example of a textual multiple choice question (a) and a pictorial question (b) from*
150 *the survey*
151

152

153 **Participants**
154 We developed a flyer with a link to the survey, which we handed out to experts
155 at the international hydrology conference IAHS in South Africa in July 2017.
156 Furthermore, the link to the survey was sent via email to hydrology experts
157 around the globe: members of the hydrology division of the European
158 Geosciences Union, and professional hydrologists (studying for PhD or higher) at
159 various universities. The total number of respondents from the experts was n =
160 34.

161 The laypeople were approached in a different way. In the first week of
162 September, 2017, one researcher went to Manchester to carry out the survey on
163 various locations on the streets, to make sure that native English speaking
164 laypeople would participate. Manchester was chosen because it is a large city in
165 the UK, meaning that it would be convenient to find participants from a general
166 population who were also native English speakers. In total, the number of
167 laypeople that were incorporated in the study was n = 119. In the initial Google
168 form results, the number of laypeople was n=131, but 22 participants were

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169   excluded because they didn't fill out the electronic consent or because they
170   accidentally sent the same electronic form twice or thrice (in that case, only one
171   of their forms was incorporated in the study).

172   The participants could fill out the survey on an iPad. If there were more
173   participants at the same time, one would fill the survey out on the iPad and the
174   other ones filled out an A4-sized printed full-colour hand-out. In this way,
175   multiple participants could fill out the survey at the same time.

176   All participants, both experts and laypeople, were asked to fill out an electronic
177   consent form stating that they were above 18 years of age and were not forced
178   into participating.The questionnaire was of the forced-choice type: participants
179   were instructed to guess if they did not know the answer.

180
181

182   **Analysis**

183   In order to detect interpretation differences between experts and laypeople, we
184   wanted to analyse to what extent their answers differed from each other for each
185   question. As pointed out before, it was not about giving the 'right' or 'wrong'
186   answer, but about analysing the match between the resemblance between the
187   answering patterns of the laypeople and the experts.
188

189   For each term, the hypotheses were as follows:
190
191   H_0: Laypeople answer the question the same as experts;

192   H_1: Laypeople answer the question differently than experts.
193

194   A statistical analysis was carried out in *R* (R Core Team, 2017), by using Bayesian
195   contingency tables. A contingency table displays the frequency distribution of
196   different variables, in this case a 2 by 4 table showing how often which definition
197   of a specific term was chosen by experts and laypeople.
198   For each term, the hypothesis is tested using a so-called Bayes Factor (BF;
199   computed using Morey & Rouder, 2015). A value BF < 1 is evidence towards H_0:
200   it is more likely that laypeople answer questions the same as experts than that
201   there are differences. A value BF > 1 is evidence towards H_1: now, differences are
202   more likely than similarities. The BF can be interpreted as the so-called
203   likelihood-ratio: a BF-score of 2 means that H_1 is twice as probable as H_0, given
204   the data. BF = ½ means that H_0 is twice as probable as H_1. An example: aquifer
205   has BF = 7801. This means it's almost 8000 times as probable with these data
206   that there is indeed a difference between laypeople and experts in defining this

207 term. As the values can become very large, one often interprets their logarithm
208 instead.

210 The Bayes Factors can be interpreted as follows:

212 * BF > 10 : strong evidence for H_1 against H_0
213 * 3 < BF < 10 : substantial evidence for H_1 against H_0
214 * 1/3 < BF < 3 : no strong evidence for either H_0 or H_1
215 * 1/10 < BF < 1/3 : substantial evidence for H_0 against H_1
216 * BF < 1/10 : strong evidence for H_0 against H_1

217 An additional benefit of the use of Bayes Factors is that, unlike their frequentist
218 counterpart, no corrections for multiple testing are necessary (Bender & Lange,
219 1999).

221 In addition to a Bayes Factor for the 'significance' of the difference, we also
222 calculated the misfit: the strength of the difference. The misfit was calculated by
223 a 'DIF' score, in which DIF = 0 means 'perfect match', and DIF = 1 means
224 maximum difference. This DIF-score was operationalised as

$$DIF = \sqrt{\frac{1}{2}\sum_{i=1}^{4}\left(p_{E,i}-p_{L,i}\right)^2}$$

225 ,

226 where $p_{E,i}$ is the proportion of experts choosing option i, and $p_{L,i}$ is the
227 proportion of laypeople making that choice. Thus, DIF is based on a sum-of-
228 squares comparison between the answer patterns of laypeople and experts.

229 Subsequently, we plotted the posterior distribution of DIF, for each term. This
230 posterior distribution indicates the likelihood for a range of DIF-scores, based on
231 the observed data.

233 For example, if the answering pattern would be A: 50%, B: 50%, C: 0% and D: 0%
234 for both the experts and the laypeople, there would be a perfect match (DIF = 0).
235 The misfit was plotted in graphs, ranging from the largest to the smallest misfit.
236 The higher the misfit, and the higher the BF, the more meaningful a difference
237 between laypeople and experts. Low values of misfit indicate agreement
238 between laypeople and experts. The R-code and data used for the analyses is
239 available from https://osf.io/wk9s6/.

241 **3. Results**

242 For the overall view of all the 22 terms (both texts and illustrations), there is
243 extreme evidence for differences between laypeople and experts. This can be
244 quantified by multiplying the BF's with each other, leading to a 10 log-value of
245 33.50 (H_1 is approximately $3*10^{33}$ more probable than H_0).

246

247 However, this difference is only visible when looking at the textual questions,
248 with a combined 10 log-value of 46.14 . For the pictorial questions, there is a
249 very strong evidence for the *absence of differences*, with a negative 10 log-value -
250 12.63.

251

252 Interestingly enough, there was a lot of internal disagreement for both experts
253 and laypeople on the term stream (47% agreement of experts on the most
254 chosen answer, C: 'Small river with water moving fast enough to be visible with
255 the naked eye', 37% agreement of laypeople on the most chosen answer, D:
256 'General term for any body of flowing water') and on the picture of a sewer (56%
257 agreement of experts on answer D*, 55% agreement of laypeople on answer D). -
258 * see Appendix A for the picture

259

260 Concerning the text questions, there was no internal disagreement at all between
261 the experts on 'discharge' (100% agreement, N = 33 answered B, N = 1 answered
262 blank) and hardly any disagreement on 'downstream' (97% agreement, N = 33
263 answered D).

264

265 Concerning the pictures, there was no disagreement at all between the experts
266 on 'geyser' (100% agreement, N = 34 answered B) and on 'river' (100%
267 agreement, N = 34 answered B). Hardly any disagreement was found on the
268 pictures 'flood' (97% agreement, N = 33 answered C), 'hydro power' (97%
269 agreement, N = 33 answered D). and 'reservoir' (97% agreement, N = 33
270 answered D). The complete table with an overview of the multiple choice
271 answers (and the number of laypeople and experts that chose that specific
272 answer) can be found in Table 1.

273

274 *Table 1: Answer distribution for textual questions*

Term with possible definitions	Answer distribution (%)	
	Lay people[a]	Experts[b]
1. River		

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A. Path of fresh water flowing into the ocean	**71**	9
B. Water flowing only on the surface of the land and never underground	4	3
C. Large stream which serves as the natural drainage for a basin	15	**88**
D. Flow of surface water within a straight channel	10	0
2. River basin		
A. Area having a common outlet for its surface runoff	13	**94**
B. Dry river channel which may be flooded during high water events	13	0
C. Catchment which a river flows into	**47**	6
D. Body of water (lake, sea, ocean) a river flows into	27	0
3. Groundwater		
A. All water stored in the ground	28	15
B. All water which is in direct contact with the ground	21	0
C. Water flowing under ground	15	6
D. Subsurface water occupying the saturated zone	**36**	**79**
4. Aquifer		
A. Subsurface water body	11	24
B. Groundwater that reaches the surface through a permeable rock layer	25	0
C. Geological formation capable of storing, transmitting and yielding water	**47**	**76**

	D. Man-made structure first built by the Romans to transport water	17	0
5. Lake			
	A. Man-made body of standing surface water of significant extent	6	0
	B. Inland body of standing surface water of significant extent	**53**	**85**
	C. Small body of water encompassed by high mountains	10	0
	D. Area of variable size filled with water	31	15
6. Dam			
	A. Barrier constructed across a valley to store water or raise the water level	**47**	**62**
	B. Barrier that prevents a river to flow into a lake	9	3
	C. Man-made, giant concrete structure to regulate water flow	33	15
	D. Man-made object to keep rivers or seas from overflowing land	11	20
7. Delta			
	A. Feature resulting from an alluvial deposit at a rivermouth	25	**61**
	B. River mouth that spreads out a little bit, like the shape of a Greek letter Delta	**35**	15
	C. Triangular shaped island in a river	12	0
	D. Landform that forms from deposition of sediment carried by a river	28	24
8. Downstream			
	A. Heavy intensity rain water falling down	12	0

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B. Direction from which a fluid is moving		26	3
C. Stream that branches off from the main stream		4	0
D. Direction in which a fluid is moving		**58**	**97**
9. Flood			
A. Large wave of moving water		2	0
B. Overflow of water onto lands that are not normally covered by water		**88**	**76**
C. Rise in the water level to a peak from which it recedes at a slower rate		5	18
D. Unusually large run-off event that leads to economic damage		5	6
10. Stream			
A. River that drains into another river and not into a lake, sea or ocean		11	3
B. Watercourse that flows into a larger watercourse or into a lake		34	24
C. Small river with water moving fast enough to be visible with the naked eye		**37**	26
D. General term for any body of flowing water		18	**47**
11. Discharge			
A. Volume of water that passes through the whole river in one day		29	0
B. Volume of water flowing through a river cross-section per unit time		**45**	**100**
C. Water with enough sediment in it to limit visibility to less than 1 feet		13	0

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D. Flowing water in a reservoir used to generate electricity	13	0
12. Water table		
A. Top surface of the zone of saturation	**56**	**82**
B. Saturated part of an aquifer	15	3
C. Tide table kept at water authority	16	0
D. Height to which water raises in a well	13	15

275 [a] The number of lay respondents varied from 115 to 119: N=115 for aquifer, water table; N=116
276 for lake, delta; N=117 for stream; N=118 for river basin, groundwater, dam, downstream, flood,
277 discharge; N=119 for river. [b] The number of experts respondents was N=33 for delta and
278 discharge and N=34 for all other terms.
279

280 *Figure 2: Answer distribution of pictorial questions*[a]

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282 ª The number of lay respondents was 115 to 117: N=115 for hydro power, reservoir; N=116 for
283 geyser, pond, swamp, dike, dew; N=117 for sewer, flood, river. ᵇThe number of expert
284 respondents was N=34 for all terms.

285

286

287 *3.1 Misfits between laypeople and experts*

288 The biggest misfit between laypeople and experts was found in the textual
289 questions, for subsequently river basin (log-10 BF 14.9), river (log-10 BF 11.9),
290 discharge (log-10 BF 6.2), aquifer (log-10 BF 3.9) and groundwater (log-10 3.4)
291 (for more BF-values, see table in appendix B).

292

293 For these words, we have clear proof that there is disagreement between experts
294 and laypeople on the interpretation. This can be seen in Figure 3. The pictorial
295 questions are marked with an asterisk. None of these pictorial questions made it
296 to the 'top 10' of biggest misfits. The pictorial questions that lead to the biggest
297 misfits were subsequently hydro power, reservoir, dike, sewer and swamp.

298

299 *Figure 3: Graph showing the posterior distribution of the misfit between laypeople*
300 *and experts.*
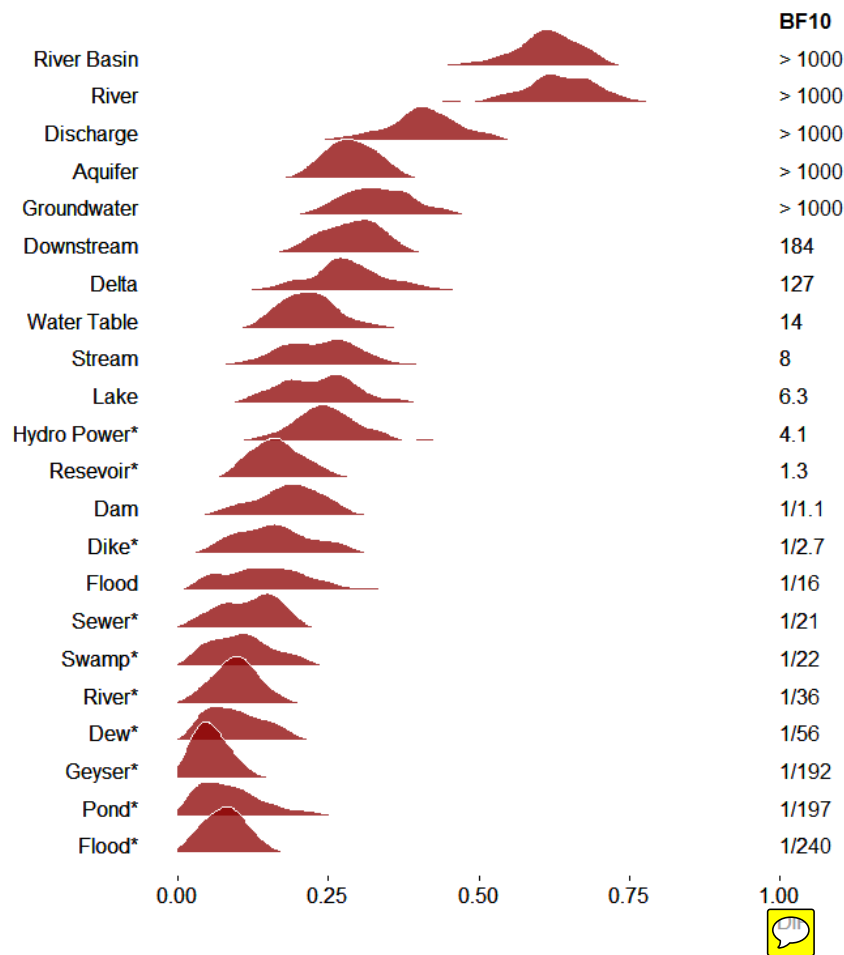
The broader and flatter the distribution, the stronger the Bayes Factor. If both
experts and laypeople have a high internal agreement (above 90%) the misfit is
smaller than if there's a lot of internal disagreement.

This can be seen in the graph: the posterior distribution of the 'misfit' parameter
is visible. It is important to note that under H_0, the misfit is not exactly equal to 0,
because there is a certain degree of 'randomness'. In other words: the misfit
describes to what extent the answering patterns of the laypeople and the experts
are similar to each other.

4. Discussion and conclusion

In total, we collected 119 questionnaires from native English-speaking laypeople
and 34 questionnaires from (not necessarily native English-speaking) experts.
15 of the experts were native English/American speakers (2 others came from
South Africa, where English is also a major language, 2 others didn't fill this

15

316   question out and the rest of the experts came from the Netherlands, Belgium,
317   Germany, Turkey, Switzerland, Luxembourg, Brazil, France and Italy. All experts
318   were of PhD level or above and were thus considered to have enough knowledge
319   of the English scientific language. Nevertheless, two participants wrote in the
320   comments that they found some of the terms difficult to understand due to the
321   fact that they were non-native English-speakers.
322   This could be a limitation to our study, because possibly the non-native English-
323   speaking experts would have answered differently if they had been native
324   English-speaking experts. However, since the majority of the experts (n=32)
325   didn't have trouble understanding the questions (or at least did not write a
326   comment about this), we don't consider this a major limitation.
327   Our definition from jargon is adopted from a study by Castro et al. (2007), in
328   which it is described as both (1) technical terms with only one meaning listed in
329   a technical dictionary, and (2) terms with a different meaning in lay contexts.
330   Therefore, this definition is not influenced by a distinction between native and
331   non-native English-speakers. However, it can be expected that hydrogeological
332   terms sometimes have a less strict meaning for non-native English speakers in
333   general, and especially for non-native English speaking lay people, due to the
334   difference in understanding between laypeople and experts (Hut et al., 2016).
335   This is why we excluded non-native English-speaking laypeople.
336   A disadvantage of the survey was that some of the text questions were still quite
337   ambiguous. The interpretation of some terms changes depending on the context
338   and the specific background. Due to the limitations of a multiple choice format, in
339   some cases none of the definitions might seem to have a perfect fit, whereas with
340   the pictures it is the other way around and sometimes more than one picture
341   could fit a generic term. Giving only 4 predefined options could seem a bit
342   leading and restricted Moreover, non-native speaking experts could be confused
343   by some of the English definitions.
344   Concerning the surveys of the laypeople, a disadvantage of the hand-outs was the
345   fact that the pictures could not be enlarged. In addition, the prints were two-
346   sided, and in some cases participants overlooked some of the questions. Even
347   though the survey was of the forced type, not all people did answer all the
348   questions.
349   The answering pattern within a group (laypeople or experts) could be inherent
350   to the specific answers. In some cases, the answers were quite similar to each
351   other, in other cases, the difference was quite big. However, this could not
352   explain the misfit between laypeople and experts, since they both filled out the
353   same survey.
354   Of course, this research is only a first step in investigating the possibilities of a
355   common vocabulary. By introducing our method to the scientific community
356   (and making it accessible via open access) we hope to encourage other scientists
357   to carry out this survey with other terminology as well.
358   Since relatively little is known about the interpretation of jargon by laypeople

359 and experts (especially in the natural sciences), additional research in this field
360 is recommended.

361 Concluding, this study shows that there exists a strong difference in the
362 interpretation of common hydrological terms between laypeople and experts.
363 This difference is only present when the terms are presented in a textual way.
364 When they are presented in a visual way, we have shown that the answer
365 patterns by laypeople and experts are the same.

366 Therefore, the most important finding of this study is that pictures are more
367 clear than words when it comes to science communication. We strongly
368 recommend to use relevant pictures whenever possible when communicating
369 about scientific topics to laypeople.

370 Our findings differ from medical jargon studies which take into account both
371 textual terms and illustrations. For example, Boyle (1970) finds that there is a
372 significant difference between doctors and patients when it comes to the
373 interpretation of both terms and illustrations. However, these illustrations
374 differed in various ways from the pictures in our study: they were hand drawn,
375 and only meant to indicate the exact position of a specific bodily organ.

376 What makes a 'good' picture for science communication purposes would be an
377 interesting topic for further research. Also, more research could be done on the
378 textual terms: how could the existing interpretation gap between experts and
379 laypeople be diminished? What impact would the combination of pictures and
380 textual terms have - would the text enhance the pictures and vice versa? All in all,
381 a broader research which incorporates more terminology and pictures (from
382 various scientific disciplines) would be a very valuable starting point. Also, in
383 line with Hut et al. (2016), it would be interesting to analyse the understanding
384 of motion pictures (e.g. documentaries) in geoscience communication, while TV
385 is a powerful medium.

386

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388 Our special thanks goes to dr. Sam Illingworth, senior lecturer in Science
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390 project in various ways: from thinking along about the questionnaire to helping
391 out with the logistics while carrying out the survey in Manchester.

392 Also, we would like to express our thanks to all the participants in the survey and
393 to the members of the AGU focus group.

394

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454   **Appendix A: questionnaire**

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Questionnaire hydrological terms

Thank you for participating in this survey! We will ask you some questions about water and terminology. We are not looking for a 'right' answer, but for the answer that is, in your opinion, the best definition.
It will take approx. 5 minutes to participate. Have fun!

1. What is, in your opinion, the best definition of a river?

○ A: Path of fresh water flowing into the ocean

○ B: Water flowing only on the surface of the land and never underground

○ C: Large stream which serves as the natural drainage for a basin

○ D: Flow of surface water within a straight channel

2. What is, in your opinion, the best definition of a river basin?

○ A: Area having a common outlet for its surface runoff

○ B: Dry river channel which may be flooded during high water events

○ C: Catchment which a river flows into

○ D: Body of water (lake, sea, ocean) a river flows into

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3. What is, in your opinion, the best definition of groundwater?

○ A: All water stored in the ground

○ B: All water which is in direct contact with the ground

○ C: Water flowing under ground

○ D: Subsurface water occupying the saturated zone

4. What is, in your opinion, the best definition of an aquifer?

○ A: Subsurface water body

○ B: Groundwater that reaches the surface through a permeable rock layer

○ C: Geological formation capable of storing, transmitting and yielding water

○ D: Man-made structure first built by the Romans to transport water

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5. What is, in your opinion, the best definition of a lake?

○ A: Man-made body of standing surface water of significant extent

○ B: Inland body of standing surface water of significant extent

○ C: Small body of water encompassed by high mountains

○ D: Area of variable size filled with water

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6. What is, in your opinion, the best definition of a dam?

○ A: Barrier constructed across a valley to store water or raise the water level

○ B: Barrier that prevents a river to flow into a lake

○ C: Man-made, giant concrete structure to regulate water flow

○ D: Man-made object to keep rivers or seas from overflowing land

7. What is, in your opinion, the best definition of a delta?

○ A: Feature resulting from an alluvial deposit at a rivermouth

○ B: River mouth that spreads out a little bit, like the shape of a Greek letter Delta

○ C: Triangular shaped island in a river

○ D: Landform that forms from deposition of sediment carried by a river

8. What is, in your opinion, the best definition of downstream?

○ A: Heavy intensity rain water falling down

○ B: Direction from which a fluid is moving

○ C: Stream that branches off from the main stream

○ D: Direction in which a fluid is moving

9. What is, in your opinion, the best definition of a flood?

○ A: Large wave of moving water

○ B: Overflow of water onto lands that are not normally covered by water

○ C: Rise in the water level to a peak from which it recedes at a slower rate

○ D: Unusually large run-off event that leads to economic damage

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10. What is, in your opinion, the best definition of a stream?

○ A: River that drains into another river and not into a lake, sea or ocean

○ B: Watercourse that flows into a larger watercourse or into a lake

○ C: Small river with water moving fast enough to be visible with the naked eye

○ D: General term for any body of flowing water

11. What is, in your opinion, the best definition of discharge?

○ A: Volume of water that passes through the whole river in one day

○ B: Volume of water flowing through a river cross-section per unit time

○ C: Water with enough sediment in it to limit visibillity to less than 1 feet

○ D: Flowing water in a reservoir used to generate electricity

12. What is, in your opinion, the best definition of a water table?

○ A: Top surface of the zone of saturation

○ B: Saturated part of an aquifer

○ C: Tide table kept at water authority

○ D: Height to which water raises in a well

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13. Which of the following photos is, in your opinion, the best depiction of a geyser?

○ A:

○ B:

○ C:

○ D:

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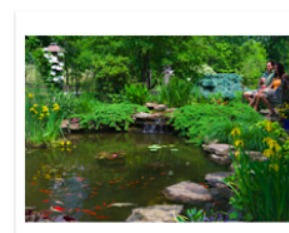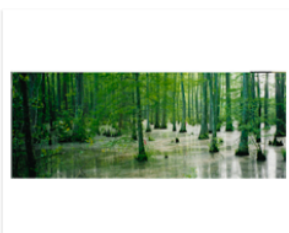14. Which of the following photos is, in your opinion, the best depiction of a sewer?
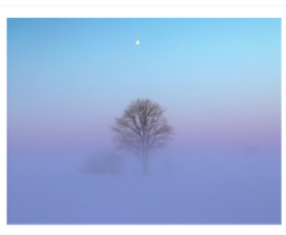

○ A:

○ B:

○ C:

○ D:

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19. Which of the following photos is, in your opinion, the best depiction of a reservoir?

A: B: C: D:

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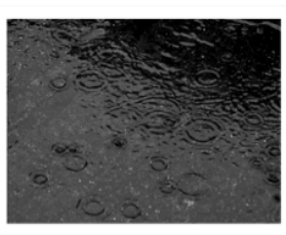20. Which of the following photos is, in your opinion, the best depiction of a dike?

A: B: C: D:

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474 **Appendix B**

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476 Table 2: Bayes Factors (BF) and their base-10 logarithms.

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Term	BF	Log 10 BF
Aquifer	7.801e+03	3.892
River basin	7.428e+14	14.871
Dam	8.783e-01	-0.056
Delta	1.273e+02	2.105
Dew	1.798e-02	-1.745
Dike	3.685e-01	-0.434
Discharge	1.531e+06	6.185
Downstream	1.841e+02	2.265

Flood (text)	4.165e-03	-2.380
Flood (picture)	6.403e-02	-1.194
Geyser	5.209e-03	-2.283
Groundwater	2.418e+03	3.383
Hydro power	4.070e+00	0.610
Lake	6.324e+00	0.801
Pond	5.069e-03	-2.295
Reservoir	1.274e+00	0.105
River (text)	2.784e-02	-1.555
River (picture)	7.094e+11	11.851
Sewer	4.790e-02	-1.3197
Stream	8.046e+00	0.906
Swamp	4.601e-02	-1.337
Water table	1.360e+01	1.134

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