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Public Perceptions concerning Responsibility for Climate Change Adaptation

Erik Persson [1,*], Åsa Knaggård [2,3] and Kerstin Eriksson [4]

1 Department of Philosophy, Lund University, SE-221 00 Lund, Sweden
2 Department of Political Science, Lund University, SE-221 00 Lund, Sweden; asa.knaggard@svet.lu.se
3 Centre for Environmental and Climate Science, Lund University, SE-221 00 Lund, Sweden
4 Division Safety and Transport, RISE Research Institutes of Sweden, SE-223 70 Lund, Sweden; kerstin.eriksson@ri.se
* Correspondence: erik.persson@fil.lu.se; Tel.: +46-765549523

Abstract: For successful climate change adaptation, the distribution of responsibility within society is an important question. While the literature highlights the need for involving both public and private actors, little is still known of how citizens perceive their own and others' responsibility, let alone the moral groundings for such perceptions. In this paper, we report the results of a survey regarding people's attitudes towards different ways of distributing responsibility for climate change adaptation. The survey was distributed to citizens in six Swedish municipalities and completed by 510 respondents. A large number of respondents wanted to assign responsibility for making decisions about and implementing adaptation measures to local governments, but also to property owners, whereas the national government was raised as responsible for setting decision boundaries and for financial support. The most preferred principles for a fair distribution of responsibility among the respondents were desert, ability, efficiency and need, while the principle of equal shares found less support. All principles received some support, indicating that it is necessary to consider several principles when distributing responsibility for climate change adaptation. Compared to earlier studies, this study shows more nuanced perceptions on who should be responsible and on what moral grounds.

Keywords: climate change adaptation; distribution principles; public perception; responsibility

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1. Introduction

Negative effects of climate change are increasing, including flooding due to heavy rainfall and sea-level rise [1]. The need to adapt and prepare for these effects is becoming increasingly urgent. One pertinent issue for successful climate change adaptation is how responsibility is to be divided within society and who is going to do what. These issues have been raised in the adaptation literature, highlighting the need for governance solutions including multi-level [2–5] and multi-actor responsibility [3,5–8]. A particular focus in the literature concerns the need to involve both public and private actors for adaptation measures to function well [6,7,9–12]. At the same time, previous citizen surveys indicate that the agreement on the distribution of responsibilities between different actors is not distinct and that there is a gap between the distribution prescribed by literature and the distribution supported by the public. In many cases, the public believes local governments should take on the greatest responsibility for climate adaptation [7,12,13]. Furthermore, why private actors, and in particular homeowners, should take on a more prominent role in climate adaptation than before, as often suggested in the literature, is not addressed or discussed beyond stating that it is needed for successful and efficient adaptation [6,14]. Little focus has been given to how responsibility for climate adaptation can be distributed fairly within a society [15,16]. Although there are many studies on how this might be

achieved in an international context [17–21], these are not necessarily applicable to the national or subnational context [22].

In addition to the question of what is the most efficient distribution in a technical sense, and the question of what is a fair distribution, there is also a need to understand how those affected think regarding fairness in relation to responsibility and climate change adaptation. The reason for the latter is purely instrumental and related to the question of efficiency, not to any question of actual fairness. No matter how efficient a distribution looks on paper, it will not work if those affected by it will not consider it fair. Important to note is that we do, of course, not believe that any ultimate truth about what is a fair distribution can be reached through a questionnaire study (whether such a truth exists or not). What we aim for with this study is to understand how people who have been or will be affected by climate change and/or climate change adaptation measures perceive questions of fairness in relation to responsibility and climate change adaptation. Knowledge of what people think regarding fairness will be of great help for increasing the social acceptability of climate change adaptation.

Although some general conclusions regarding how different populations think about fairness in relation to responsibility for climate adaptation can be drawn from existing studies, no one-size-fits-all exists when it comes to what people see as fair. The social acceptability of a particular distribution of responsibility [15], thus, is something that needs to be studied within particular contexts. Current distributions of responsibility within societies, or in other words who does what, might need to be reconsidered in the light of new climate risks and additional costs for negative effects [23]. To understand what might be seen as a fair distribution, given these circumstances, we need to study public perceptions of responsibility vis-à-vis climate adaptation in a particular context. Many studies exist on public perceptions related to climate adaptation, but most of these consider public awareness of the risks and their willingness to act [24,25]. Very few studies try to disentangle what the public see as a fair distribution [15,23].

We study public perceptions of a fair distribution of forward-looking responsibility [26] for climate adaptation, meaning responsibility for preventing negative effects of climate change, in a Swedish context. Using a questionnaire, distributed to individuals, we aim to

1. Investigate which actors are perceived as suitable for taking on responsibility for climate adaptation;
2. What principles of fair distribution are preferred for distributing that responsibility.

We argue that a more nuanced understanding of what a fair distribution could be, contributes both to the literature on responsibility for climate adaptation, and to the possibility to build social acceptability for decisions about responsibility for climate adaptation.

2. Materials and Methods

In this paper, we report the results of a survey regarding people's attitudes towards different ways of distributing responsibility for climate change adaptation. The survey takes the form of a set of statements to which the respondents are asked to react by stating to which degree they agree with the statements on a scale range from 1 (totally disagrees) to 7 (totally agrees). The questions in this survey were part of a larger questionnaire study, distributed in Swedish to members of the general public aged 18 and up, in six municipalities in southern and western Sweden (see map, Figure 1). These municipalities were chosen as they differ in terms of region, size, and flooding history, but all face increased flooding risks due to climate change.

The respondents were invited via regular mail that included information about the questionnaire and the project behind the study, a link to an online questionnaire, and information about privacy and legal issues. Two additional letters were sent out to remind respondents about the survey. As no personal log-in code was provided, the two reminders were sent out to all 6000 sampled respondents. The online questionnaire was open from 1 December 2020 to 31 March 2021. This process resulted in 510 completed questionnaires,

equaling a response rate of 8.5 percent. For each statement there were answers missing, ranging from 4 to 43 respondents not giving an answer. For most questions the missing answers were rather few (ranging from 4 to 12), but towards the end of the questionnaire the number of missing answers increased. The last ten statements all had 20 or more answers missing. This could indicate that the respondents had tired and lost focus. It could also indicate that respondents saw the later statements as more difficult to answer.

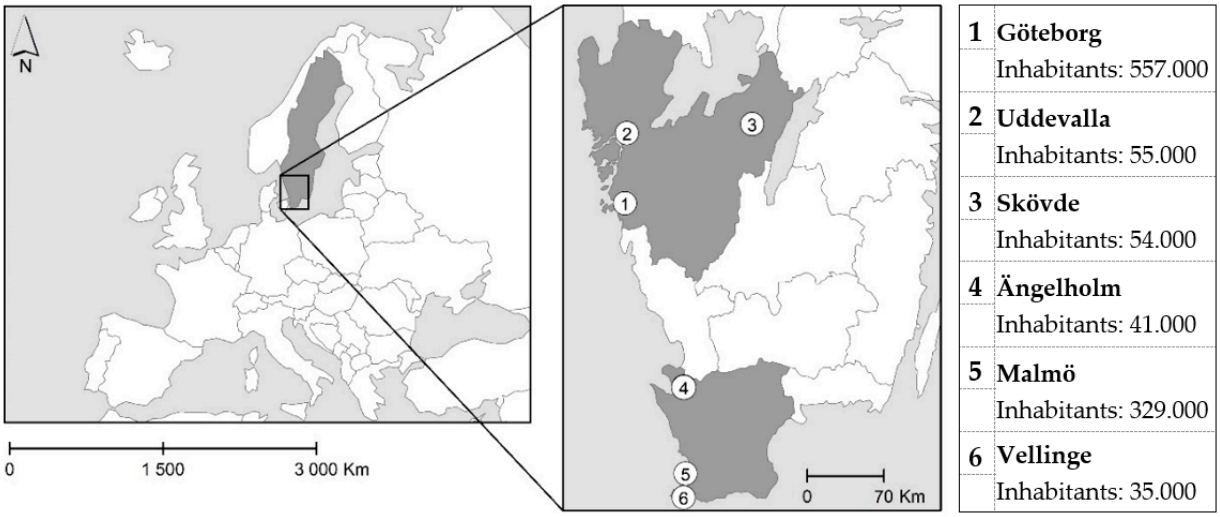

Figure 1. Map of studied municipalities (numbers) in two regions (gray areas) in Sweden. Municipalities are listed to the right with information on the number of inhabitants. Source: map made with Natural Earth; Statistics Sweden; prepared by Karin Larsson, Centre for Geographical Information Systems, Lund University.

The questionnaire contained three parts. The first covered the socio-economic characteristics of the respondents (age, gender, education, living conditions, education, political preferences, etc.). We used the answers to the questions in this part only to understand if our sample was biased. The second part covered questions concerning climate change, climate adaptation, and experience of flooding. In this study, we only use one question from part 2, concerning individuals' perceived barriers to adaptation. The focus in this study is on part 3 of the questionnaire, containing a number of statements regarding who should be responsible for what aspects of adaptation and based on what principles of fair distribution. For the full questionnaire, see Supplement 1.

The statements in part 3 covered different types of actors, including several public and private actors, and public actors on different political levels. Further, the statements concerned different aspects of adaptation, including agenda-setting, decision-making, implementation, and financing (see further [27]), for which a forward-looking responsibility can be distributed. Finally, the statements also covered a number of principles concerning how responsibility should be distributed in a fair way among different actors. The principles included in the statements were: equal shares, desert, need, ability, and efficiency [22,27] (see Table 1 for definitions). These are commonly advocated principles for distribution in general [28,29], and also discussed in academic literature on climate change mitigation and adaptation [17–21,30].

All principles and their different versions were covered in the questionnaire. Some principles have several statements connected to it, whereas others have fewer. However, the statements are not always directly connected to one particular principle. In some cases, a statement covers different principles depending on if respondents support the statement or not. In other cases, the support for a particular principle can only be deduced in relation to other statements. This has consequences for the analysis, making it focus on the degree of support rather than on the number of statements showing support for a particular principle.

Table 1. Ethical principles for the distribution of responsibility.

Principle	Definition
Equal shares	*Version 1*: All actors need to take on responsibility for a particular issue to an equal degree [19,21,31]. *Version 2*: Responsibility should be distributed so as to promote equal distribution of something else, or equality in general [19,21,32].
Desert	*Version 1*: Those who have caused a problem or made it worse should be responsible for dealing with it (guilt) [17,33,34]. *Version 2*: Those who have solved or mitigated a problem should take less responsibility in the future or should be compensated for their effort (merit) [32].
Need	*Version 1*: Those in need of a problem being dealt with should be responsible for dealing with it [21,35]. *Version 2*: Those worst hit by a problem should take less responsibility for dealing with it [18,30,36]. *Version 3*: The worst off in general terms should take less responsibility for dealing with a problem [18,31,36].
Ability	Those more able to deal with a problem should be more responsible for dealing with it [17,20,34].
Efficiency	It does not matter as such who takes on responsibility, as long as the problem is solved efficiently [28,29].

The questionnaire was presented to the respondents online using the Sunet Survey questionnaire tool. Data were downloaded from the questionnaire tool as an Excel file and in aggregated form as a pdf file with frequencies and relative frequencies of answers for all questions. *p*-values were calculated through chi^2 tests using R 4.1.1 for Windows.

Of the 510 participants, 53% were males. The age of the participants was on average 52 years, with a median of 53 years. Almost 61% were living in a household with two adults. In 70% of the households, there were no children. More than 67% of the participants had a self-owned home (self-owned property or condominium), whereas 31% rented. More than 75% of the respondents lived in a major city and 65% had education at university level.

To assess the bias of the sample, we use statistics from the governmental agency Statistics Sweden [37]. The sample is biased in some important ways, of which several are expected. One of the most pronounced biases is the high average age (52 years) compared to in the country at large (41.4 years). Several of the other biases are related to the age of the respondents. For example, the proportion of people living in self-owned homes is higher (67%) in the sample than in the population in the six studied municipalities (55%). However, it also follows earlier research, reporting a higher interest concerning climate adaptation among homeowners [7]. Further, the proportion of households without children is much higher in the sample than in the population of the municipalities, 70% compared to 49%. The timing of the questionnaire (around Christmas), combined with the effects of the COVID19 pandemic (having to stay home with children, also with only mild symptoms, and some children having online school) could also play a role in the low response rate among people living with children. Less directly related to the age of the respondents was the educational level. Although the statistics are not fully comparable, the educational level was markedly higher in the sample than in the population of the six municipalities, with a larger proportion of individuals with education at university level in the sample. In terms of political sympathies, few participants responded that they would vote for the right-wing party, Sweden Democrats, which differs markedly from the results of a national poll performed earlier this year [38] (6% compared to 19% in the poll). The percentage of respondents answering that they would vote for the Green Party was also markedly higher than the results from the national poll (8% compared to 4% in the poll). This bias was anticipated. It is not surprising that those who sympathize with the Green Party show a higher-than-average interest in questions regarding climate change. Correspondingly, it is not surprising that the proportion of sympathizers with the Sweden Democrats who answered the questionnaire was low, as many of the party's voters are skeptical towards global climate change [39]. Taken together, our sample is older than the country average, with higher education and with weaker sympathy for the right-wing populists. Therefore, the result might also be biased. Contributing to this problem is that our sample is relatively small and that the response rate is below 10 percent. This makes it difficult to draw general conclusions about the attitudes of the population in the six municipalities. Rather, we will focus our conclusions on the attitudes within the sample as such.

3. Results

Here, we report how the respondents reacted to the question about barriers to adaptation and to 36 statements about responsibility covering different aspects of climate adaptation and ethical distribution principles. Throughout the results and discussion sections, we refer to the number of the question (Q) or statement (S) as indicated in the full questionnaire (Supplement 1).

The only question from Section 2 of the questionnaire used in this study reads as follows: *What do you perceive to be the largest barriers for you to adapt your accommodation to climate change? Give a maximum of three alternatives* (Q21). n = 505 respondents answered this question and gave a total of 805 alternatives (1–3 alternatives each). The most commonly mentioned alternative was "I lack knowledge on what to do" (263 mentions, which equals 52% of respondents and 33% of the total number of mentions). The least commonly mentioned alternative was "I lack the stamina" (25 mentions, which equals 5% of the respondents and 3% of the total number of mentions). Forty-eight respondents answered "I do not know" (10% of the respondents, 6% of the total number of mentions). See Figure 2.

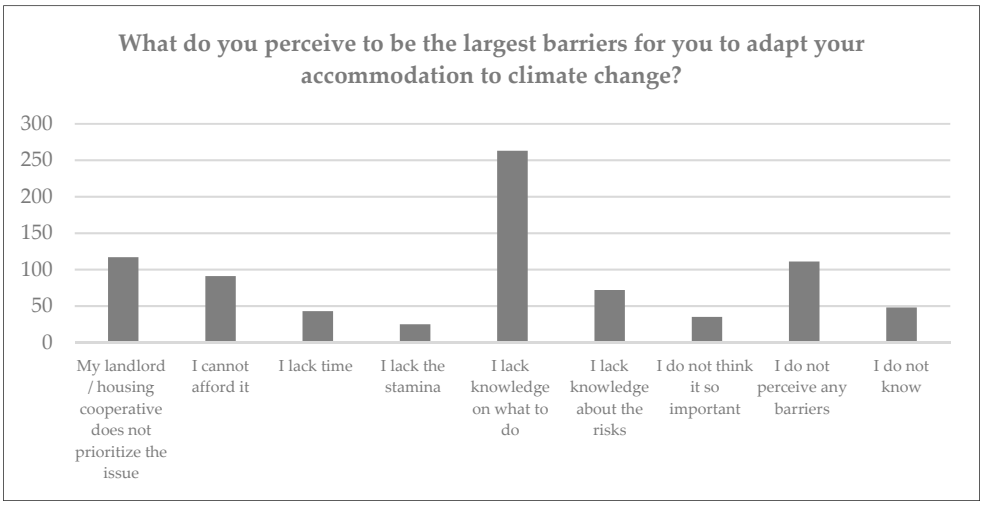

Figure 2. Result for (Q21) What do you perceive to be the largest barriers for you to adapt your accommodation to climate change? Give a maximum of three alternatives. Numbers of responses for nine set alternatives.

The first two statements concern the responsibilities of individual inhabitants. The first of these (S1) reads: *Municipal inhabitants have a responsibility to influence the local government to implement adaptation measures to decrease flood risks*. n = 506 respondents reported their reactions to this statement. The distribution of answers is fairly right-skewed. The most common answer was 5 (20% of the respondents) and the least common answer was 1—totally disagree (6%). 37% reported total or nearly total agreement (levels 6 or 7), while only 13% reported that they totally or nearly totally disagreed. Almost half of the respondents (49%) ended up in one of the middle levels (3–5) or answered "don't know". Even within the mid-range, the distribution is fairly right-skewed. m = 4.7, sd = 1.8, $p < 0.001$ (Figure 3).

The second statement about the responsibility of individual inhabitants (S2) reads: *Municipal inhabitants have a responsibility to influence their landlord, housing collective, or neighbors to implement adaptation measures to decrease flood risks*. This statement was answered by n = 502 respondents. Additionally, this statement was fairly right-skewed. The most common answer was 6 (18%) and the least common answer was 1—totally disagree (7%). 35% reported total or near-total agreement, while 16% reported total or near-total disagreement. 50% gave answers in the mid-range or answered "don't know". m = 4.6, sd = 1.8, $p < 0.001$ (Figure 3).

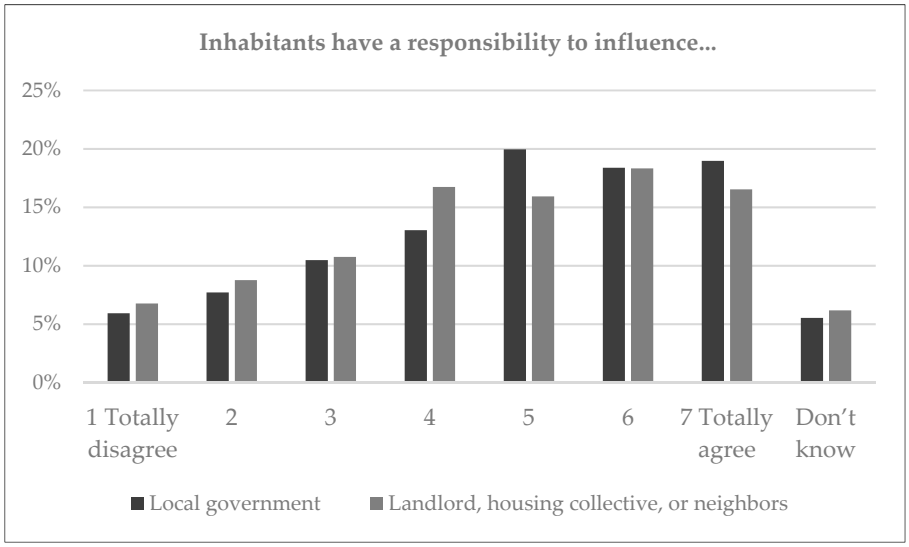

Figure 3. Result for (S1) municipal inhabitants have a responsibility to influence the local government to implement adaptation measures to decrease flood risks, and (S2) municipal inhabitants have a responsibility to influence their landlord, housing collective, or neighbors to implement adaptation measures to decrease flood risks. Percentage of the responses on a seven-graded scale of agreement (1, totally disagree, to 7, totally agree).

We then had two statements about the responsibilities of property owners. Just as with the answers to the questions about individual inhabitants, the distributions of answers to these statements were fairly right-skewed. The first of these statements (S3) reads: *Property owners should take responsibility themselves to decrease the flood risks for their property.* This statement was answered by n = 505 respondents. The most common answer was 7—totally agree (30%) and the least common answer was 1—totally disagree (3%). 7% of the respondents reported that they totally or nearly totally disagreed, while 50% reported total or near-total agreement. 44% of the respondents' answers were in the mid-range or "don't know". Within the mid-range, the distribution was also clearly right-skewed. m = 5.3, sd = 1.6, $p < 0.001$ (Figure 4).

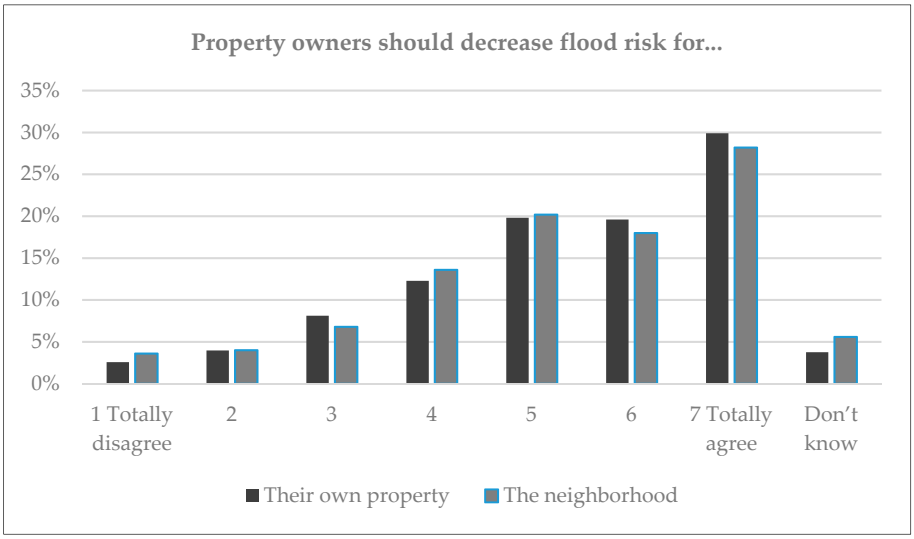

Figure 4. Result for (S3) Property owners should take responsibility themselves to decrease the flood risks for their property, and (S4) Property owners should implement adaptation measures on their properties to decrease the flood risks for the neighborhood. Percentage of the responses on a seven-graded scale of agreement (1, totally disagree, to 7, totally agree).

The next statement (S4) reads: *Property owners should implement adaptation measures on their properties to decrease the flood risks for the neighborhood*. n = 500 respondents answered this question. The most common answer to this statement was 7—totally agree (28%) and the least common answer was 1—totally disagree (4%). 8% of the respondents answered that they totally or nearly totally disagreed, while 46% reported that they totally or nearly totally agreed. 46% ended up in the mid-range or answered "don't know". Here too, the mid-range was fairly right-skewed. m = 5.2, sd = 1.7, $p < 0.001$ (Figure 4).

Here follows five statements about the responsibility of local governments. The first one (S5) reads: *The local government should decide to what degree property owners are allowed to make changes to their properties that increase flood risks for the neighborhood*. This statement was answered by n = 503 respondents. The distribution of answers here was also fairly right-skewed. The most common answer was 7—totally agree (24%) and the least common answer was 1—totally disagree (6%). 13% reported that they totally or nearly totally disagreed, while 45% reported that they totally or nearly totally agreed. 42% of the respondents were in the middle range or answered "don't know". m = 5.0, sd = 1.8, $p < 0.001$ (Figure 5).

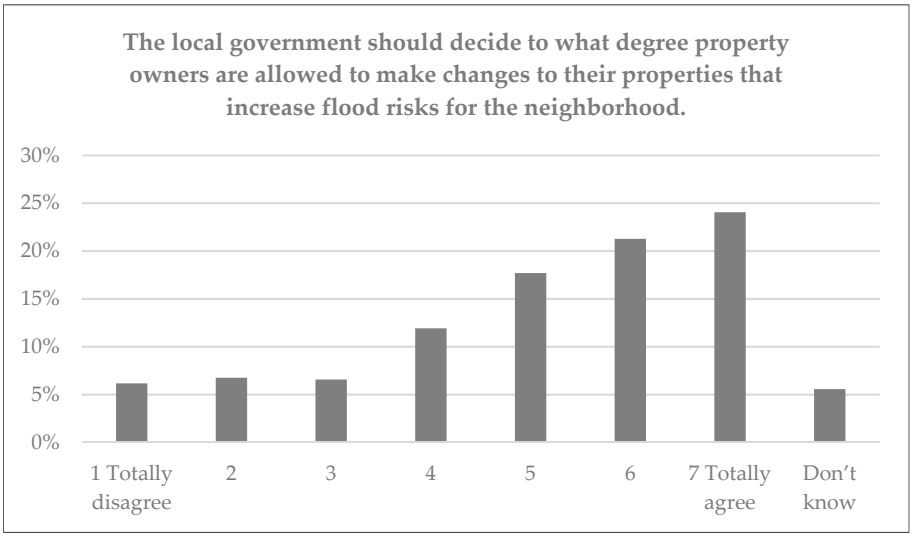

Figure 5. Result for (S5) The local government should decide to what degree property owners are allowed to make changes to their properties that increase flood risks for the neighborhood. Percentage of the responses on a seven-graded scale of agreement (1, totally disagree, to 7, totally agree).

The next statement (S6) reads: *The local government should give subsidies to property owners that cannot pay themselves for adaptation measures*. n = 502 respondents reacted to this statement. Here, the distribution was somewhat right-skewed. The majority (52%) ended up in the mid-range or answered "don't know". The least common answer was 1—totally disagree (4%), while the most common answer was 5 (23%), that is, at the positive end of the mid-range. 12% reported that they totally or nearly totally disagreed, while 36% reported that they totally or nearly totally agreed. m = 4.8, sd = 1.7, $p < 0.001$ (Figure 6).

The next statement about the responsibility of municipalities (S7) reads: *If the local government decides that new properties are to be built in a manner decreasing flood risks, the local government should pay for the extra expenses*. A total of n = 503 respondents answered this question. Here, the answers were more equally distributed than for the previous statements. The most common answer was 7—totally agree (19%), and the least common answer was 3 (10%). 22% reported that they totally or nearly totally disagreed, while 32% reported that they totally or near totally agreed. 46% answered in the mid-range or chose "don't know". m = 4.3, sd = 2.0, $p < 0.001$ (Figure 6)

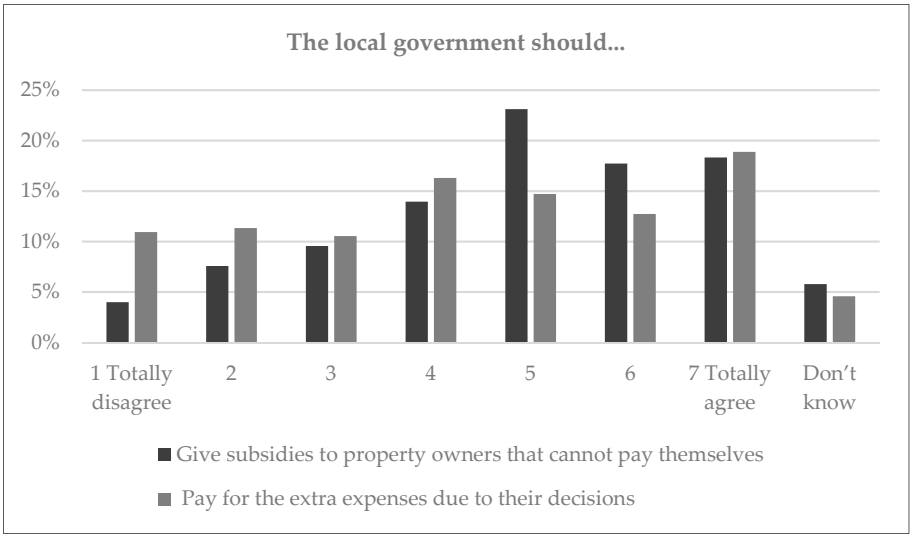

Figure 6. Result for (S6) The local government should give subsidies to property owners that cannot pay themselves for adaptation measures, and (S7) If the local government decides that new properties are to be built in a manner decreasing flood risks, the local government should pay for the extra expenses. Percentage of the responses on a seven-graded scale of agreement (1, totally disagree, to 7, totally agree).

Statement (S8) states: *Local governments with large financial capacity should contribute to climate adaptation measures by local governments with weak financial capacity*. A number of n = 501 respondents responded to this statement. The answer to this statement was somewhat right-skewed but not to the same extent as some of the other statements. The most common answer was 7—totally agree (21%) and the least common answer was 2 (7%). 7% totally or nearly totally disagreed, 34% totally or nearly totally agreed, and 49% ended up in the middle range or answered "don't know". The percentage of respondents who answered "don't know" was relatively high for this statement (12%). m = 4.6, sd = 2.0, $p < 0.001$ (Figure 7).

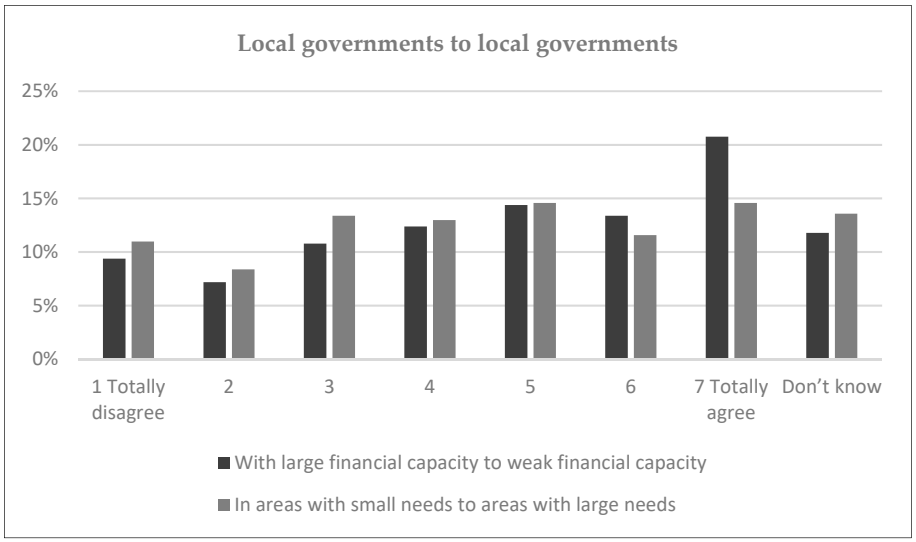

Figure 7. Result for (S8) The local government should give subsidies to property owners that cannot pay themselves for adaptation measures, and (S9) If the local government decides that new properties are to be built in a manner decreasing flood risks, the local government should pay for the extra expenses. Percentage of the responses on a seven-graded scale of agreement (1, totally disagree, to 7, totally agree).

The next statement (S9) states: *Local governments in areas with small needs of climate adaptation should contribute to adaptation measures by local governments in areas with large needs*. This statement was answered by n = 501 respondents. For this statement, the answers were relatively equally distributed. Five and seven were the most common answers (15%) and two was the least common answer (8%). 19% totally or nearly totally disagreed, while 26% totally or nearly totally agreed. 55% ended up in the mid-range or answered "don't know". The percentage of respondents who answered "don't know" was relatively high for this statement (14%). m = 4.2, sd = 2.0, p = 0.09 (note that $p > 0.05$) (Figure 7).

Next follows four statements about national government responsibility. The first of these (S10) states that: *The right to build in areas where there is a high flood risk should be limited by national regulation*. This statement was answered by n = 501 respondents. The distribution of answers was clearly right-skewed. The most common answer was 7—totally agree (43%) and the least common answer was 1—totally disagree (3%). 5% reported that they totally or nearly totally disagreed. 65% reported that they totally or nearly totally agreed, and 30% answered in the mid-range or that they did not know. m = 5.8, sd = 1.5, $p < 0.001$ (Figure 8).

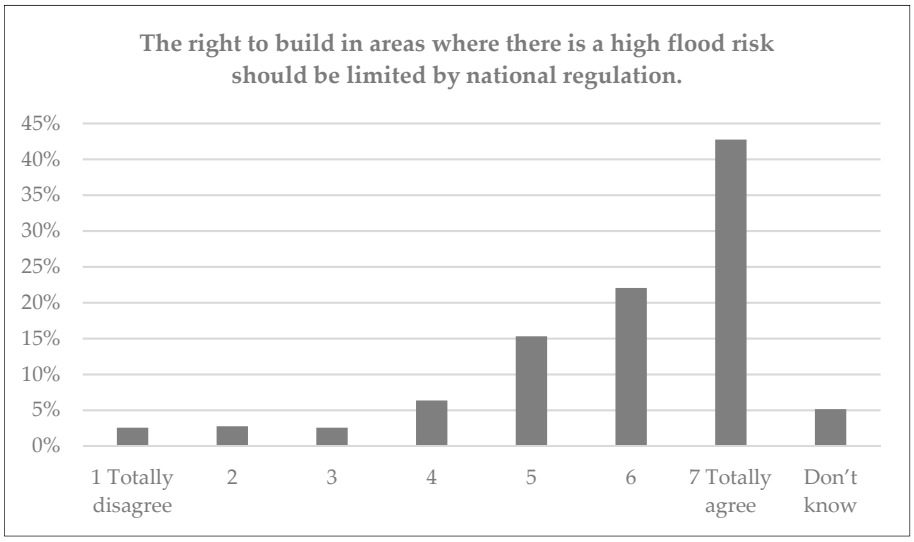

Figure 8. Result for (S10) The right to build in areas where there is a high flood risk should be limited by national regulation. Percentage of the responses on a seven-graded scale of agreement (1, totally disagree, to 7, totally agree).

The next statement (S11) states: *The national government should give subsidies to local governments wanting to implement ambitious adaptation measures*. This statement was answered by n = 503 respondents. The distribution of the answers was clearly right-skewed. The most common answer was 7—totally agree (37%) and the least common answer was 2 (2%). 62% answered that they totally or nearly totally agreed, while 5% answered that they totally disagreed, and 33% answered in the mid-range or that they did not know. m = 5.7, sd = 1.5, $p < 0.001$ (Figure 9).

Statement (S12) reads: *The national government should subsidize adaptation measures by local governments with weak financial capacity*. This statement was answered by n = 498 respondents. The distribution is strongly right-skewed. The most common answer was 7—totally agree (38%) and the least common answer was 2 (3%). 62% reported that they totally or nearly totally agreed, while 6% reported that they totally or nearly totally disagreed. 22% ended up in the mid-range or answered "don't know". m = 5.7, sd = 1.6, $p < 0.001$ (Figure 9).

The next statement (S13) reads: *The national government should give subsidies to local governments in areas with large needs of climate adaptation, regardless of the financial capacity of the local government*. A number of n = 498 respondents answered this statement. The

answers to this statement are right-skewed but closer to a normal distribution than for many of the previous statements. The most common answer was 5 (22%) and the least common answer was 1—totally disagree (6%). 13% of the respondents reported that they totally or near totally disagreed, while 31% stated that they totally or nearly totally agreed. 56% were in the mid-range or answered that they did not know. m = 4.6, sd = 1.7, $p < 0.001$ (Figure 9).

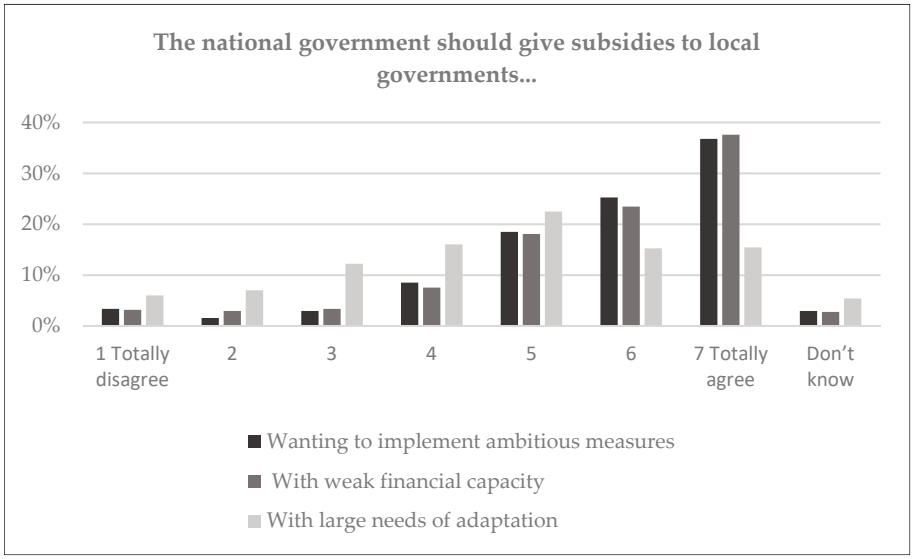

Figure 9. Result for (S11) The national government should give subsidies to local governments wanting to implement ambitious adaptation measures; (S12) The national government should subsidize adaptation measures by local governments with weak financial capacity, and (S13) The national government should give subsidies to local governments in areas with large needs of climate adaptation, regardless of the financial capacity of the local government. Percentage of the responses on a seven-graded scale of agreement (1, totally disagree, to 7, totally agree).

The next two statements are about the responsibility of corporations. The first of these (S14) states: *Corporations active in Sweden and with large emissions of greenhouse gases should take on a larger responsibility for climate adaptation in society*. This statement was answered by $n = 503$ respondents. The distribution was strongly right-skewed. The most common answer was 7—totally agree (61%) and the least common answer was 2 (1%). Taken together, 3% reported that they totally or nearly totally disagreed, while 82% reported that they totally or nearly totally agreed. 15% found themselves in the mid-range or answered "don't know". The percentage of respondents who answered "don't know" was quite low (1%). m = 6.3, sd = 1.3, $p < 0.001$ (Figure 10).

The second statement about the responsibility of corporations (S15) states: *Corporations active in Sweden should take on a larger responsibility for climate adaptation in society, as adaptation then becomes more efficient*. A total of $n = 500$ respondents reacted to this statement. The distribution of answers to this statement was also right-skewed, though slightly less than for the previous statement. The most common answer was 7—totally agree (41%) and the least common answer was 2 (2%). Taken together, 5% answered that they totally or nearly totally disagreed, while 59% answered that they totally or nearly totally agreed. 35% of the answers were in the mid-range or "don't know". m = 5.7, sd = 1.6, $p < 0.001$ (Figure 10).

The next batch of statements focuses on different areas of responsibility in combination with different actors. For each area of responsibility, we suggest different actors as responsible.

The first of these (S16) states: *The responsibility for deciding whether one should build a property on land with a high flood risk should reside with the property buyer*. A total of $n = 482$ respondents reacted to this statement. The distribution of the answers was fairly left-skewed. The most common answer was 1—totally disagree (33%) and the least common answer was 6 (8%). 47% of the respondents answered that they totally or nearly totally

disagreed. 17% answered that they totally or nearly totally agreed. 36% of the answers were in the mid-range or stated that they did not know. m = 3.1, sd = 2.1, $p < 0.001$ (Figure 11).

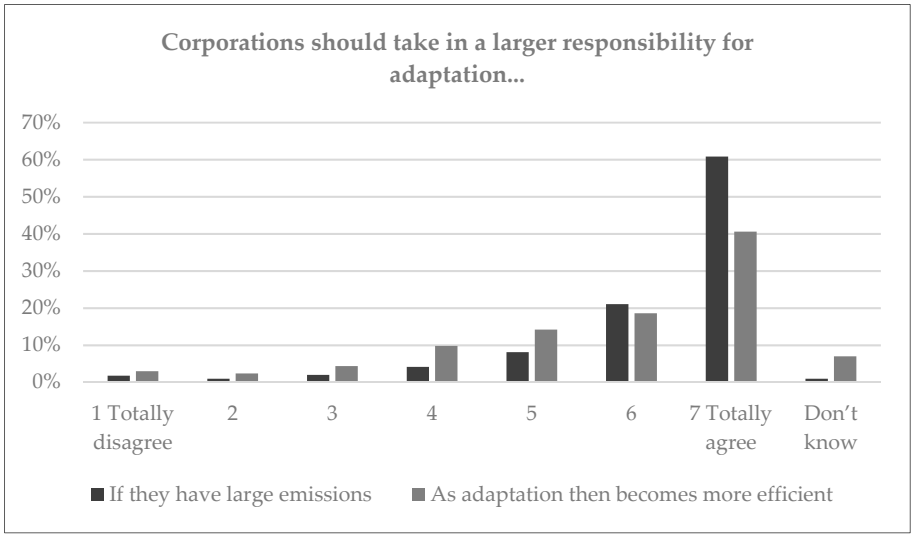

Figure 10. Result for (S14) Corporations active in Sweden and with large emissions of greenhouse gases should take on a larger responsibility for climate adaptation in society, and (S15) Corporations active in Sweden should take on a larger responsibility for climate adaptation in society, as adaptation then becomes more efficient. Percentage of the responses on a seven-graded scale of agreement (1, totally disagree, to 7, totally agree).

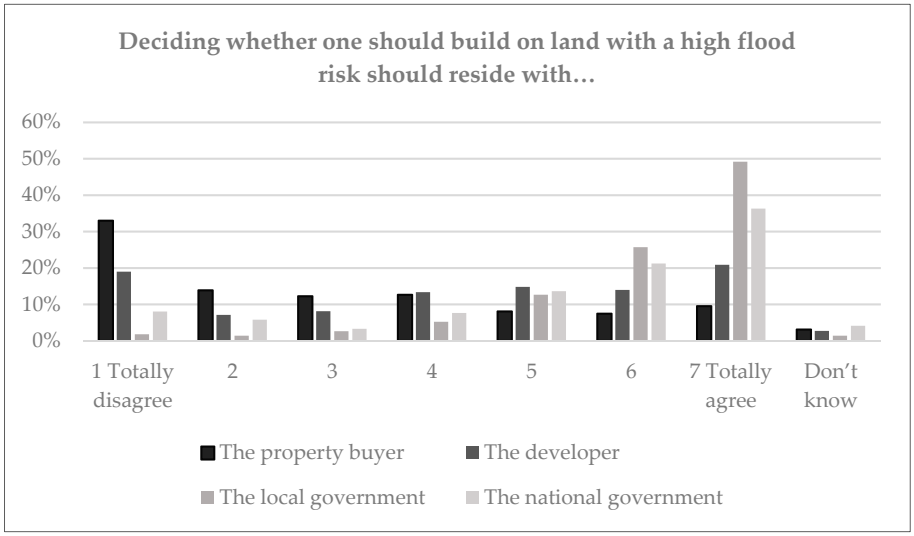

Figure 11. Result for (S16)–(S19) The responsibility for deciding whether one should build a property on land with a high flood risk should reside with (S16) the property buyer, (S17) the developer, (S18) the local government, and (S19) the national government. Percentage of the responses on a seven-graded scale of agreement (1, totally disagree, to 7, totally agree).

The next (S17) statement regards the developer: *The responsibility for deciding whether one should build a property on land with a high flood risk should reside with the developer*. This statement was answered by $n = 479$ respondents. The distribution of the answers to this statement was right-skewed and a bit u-shaped. The two most common answers were 7—totally agree (21%) and 1—totally disagree (19%). The least common answer was 2 (7%). 35% answered that they totally or nearly totally disagreed. 26% reported that they totally agreed or nearly totally agreed (though this merging is a bit difficult to interpret since the

two merged answers were the second most common and the least common answers). 39% answered in the mid-range or that they did not know. m = 4.3, sd = 2.2, $p < 0.001$ (Figure 11).

The next statement (S18) brings up the responsibility of the local government: *The responsibility for deciding whether one should build a property on land with a high flood risk should reside with the local government*. This statement was answered by $n = 498$ respondents. The distribution of answers to this question was very strongly right-skewed. The most common answer was 7—totally agree (49%) and the least common answer was 2 (1%). 3% answered that they totally or nearly totally disagreed, while 69% answered that they totally or nearly totally agreed. 22% of the respondents answered in the mid-range or that they did not know. The percentage of respondents who answered "don't know" was quite low (1%). M = 6.0, sd = 1.3, $p < 0.001$ (Figure 11).

The next statement (S19) deals with the responsibility of the state. It reads: *The responsibility for deciding whether one should build a property on land with a high flood risk should reside with the national government*. A number of $n = 485$ respondents answered this statement. The distribution was clearly right-skewed and slightly u-shaped. The most common answer was 7—totally agree (36%). The least common answer was 3 (3%). 57% stated that they totally or nearly totally agreed, while 14% stated that they totally or nearly totally disagreed. 29% answered in the middle range or that they did not know. m = 5.3, sd = 1.9, $p < 0.001$ (Figure 11).

The next batch of statements regards the responsibility of different actors to inform. The first of these statements (S20) reads: *The responsibility for informing the public about flood risks and possible adaptation measures should reside with the local governments*. This statement was answered by $n = 500$ respondents. The distribution of answers to this statement was strongly right-skewed. The most common answer was 7—totally agree (49%), and the least common answer was 1—totally disagree (<1%). 1% of the respondents reported that they totally or nearly totally disagreed, while 79% reported that they totally or nearly totally agreed. 19% answered in the mid-range or that they did not know. The percentage of respondents who answered "don't know" was quite low. (2%). m = 6.2, sd = 1.1, $p < 0.001$ (Figure 12).

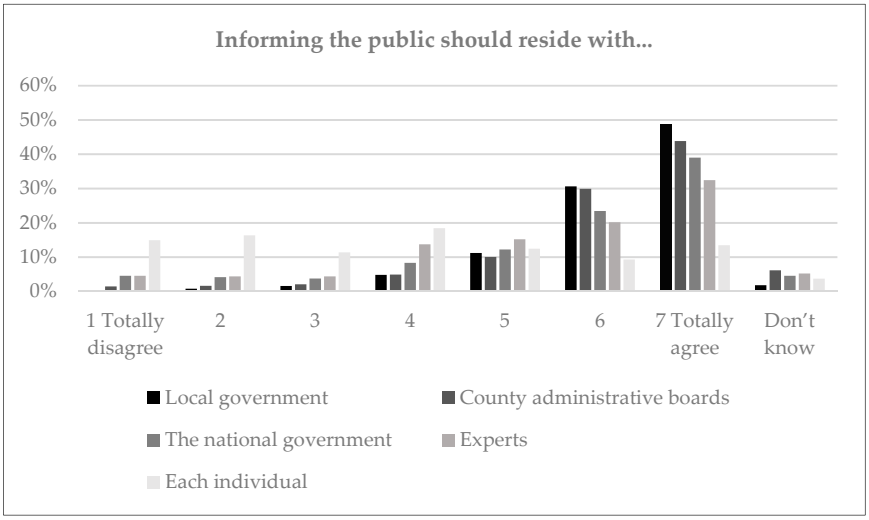

Figure 12. Result for (S20)–(S26) The responsibility for informing the public about flood risks and possible adaptation measures should reside with . . . (S20) the local governments; (S21) the county administrative boards; (S22) the national government; (S23) experts, and (S26) each individual, informing him- or herself. Percentage of the responses on a seven-graded scale of agreement (1, totally disagree, to 7, totally agree).

The next statement (S21) reads: *The responsibility for informing the public about flood risks and possible adaptation measures should reside with the county administrative boards*. This statement was answered by $n = 488$ respondents. The distribution of the answers is right-

skewed with 7—totally agree as the most common answer (44%), and 1—totally disagree as the least common answer (1%). A total of 3% answered that they totally or nearly totally disagreed, while 74% answered that they totally or nearly totally agreed. 23% answered in the mid-range or that they did not know. m = 6.0, sd = 1.3, $p < 0.001$ (Figure 12).

Statement (S22) states: *The responsibility for informing the public about flood risks and possible adaptation measures should reside with the national government*. This statement was answered by $n = 482$ respondents. The distribution of the answers is right-skewed and slightly u-shaped. The most common answer was 7—totally agree (39%). The least common answer was 3 (4%). 9% reported that they totally or nearly totally disagreed, while 62% reported that they totally or nearly totally agreed. 29% of the respondents answered in the mid-range or "don't know". m = 5.6, sd = 1.7, $p < 0.001$ (Figure 12).

The next statement (S23) says: *The responsibility for informing the public about flood risks and possible adaptation measures should reside with experts*. This statement was answered by $n = 481$ respondents. The distribution of answers is again a bit right-skewed. The most common answer was 7—totally agree (32%). The least common answers were 2 and 3 (4% each). 9% of the respondents totally or nearly totally disagreed, while 53% totally or nearly totally agreed. 38% answered in the mid-range or "don't know". m = 5.3, sd = 1.7, $p < 0.001$ (Figure 12).

The final statement (S26) in this batch states that: *The responsibility for informing the public about flood risks and possible adaptation measures should reside with each individual, informing themselves*. This statement was answered by $n = 483$ respondents. The distribution of answers here is a bit irregular. The most common answer was the middle choice, 4 (18%). The least common answer was 6 (9%), while the extreme positions (1 and 7) ended up in the middle of the percentage range with 16 and 15%, respectively. 31% stated that they totally or nearly totally disagreed, while 23% stated that they totally or nearly totally agreed. 46% answered in the mid-range or that they did not know. m = 3.8, sd = 2.0, $p < 0.001$ (Figure 12).

The last batch of statements deals with the responsibility for making decisions about climate change adaptation in general. The first of these (S33) states: *It is better if decisions about climate adaptation measures are taken by experts*. This statement was answered by $n = 489$ respondents. The distribution of answers is clearly right-skewed, though the least common answer was 2 (2%). The most common answer was 7—totally agree (43%). 7% totally or nearly totally disagreed. 65% totally or nearly totally agreed. 27% answered in the mid-range or "don't know". m = 5.7, sd = 1.7, $p < 0.001$ (Figure 13).

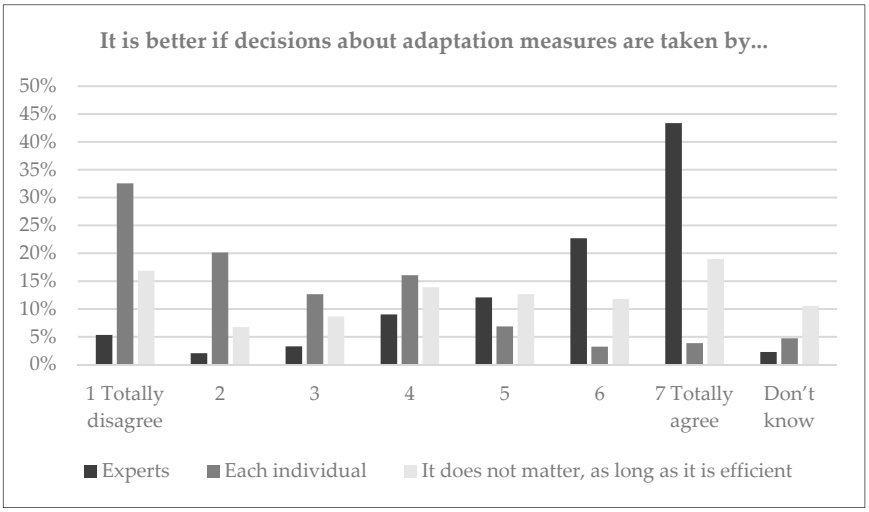

Figure 13. Result for (S33)–(S36) It is better if decisions about climate adaptation measures are taken by: (S33) experts; (S35) each individual, and (S36) It does not matter [who decides about climate adaptation measures], as long as the measures are efficient. Percentage of the responses on a seven-graded scale of agreement (1, totally disagree, to 7, totally agree).

Statement (S35) reads: *It is better if decisions about climate adaptation measures are taken by each individual*. This statement was answered by n = 467 respondents. The distribution here is strongly left-skewed. The most common answer was 1—totally disagree (32%). The least common answer was 6 (3%). 53% totally or nearly totally disagreed, while 7% totally or nearly totally agreed. 40% answered in the mid-range or "don't know". m = 2.7, sd = 1.7, $p < 0.001$ (Figure 13).

The last statement (S36) says: *It does not matter [who decides about climate adaptation measures], as long as the measures are efficient*. This statement was answered by n = 475 respondents. The distribution is quite irregular. The most common answer was 7—totally agree (19%) followed by 1—totally disagree (17%). The least common answer was 2 (7%). 24% of the respondents totally or nearly totally disagreed, while 31% totally or nearly totally agreed. 46% answered in the mid-range or "don't know". A relatively large percentage (11%) answered "don't know". m = 4.2, sd = 2.2, $p < 0.001$ (Figure 13).

4. Discussion

Here, we discuss the results, first concerning who should be responsible for what, and then what principles for fair distribution the respondents prefer to guide the distribution of responsibility.

4.1. Who Should Be Responsible for What?

We now turn to the respondents' perceptions about the distribution of responsibility regarding different aspects of adaptation, including agenda-setting, decision-making, implementation, and paying for adaptation measures [27]. Earlier studies of people's perceptions of the responsibility distribution for climate adaptation, often discussed as tasks or roles, have shown that people generally think that local governments should be in charge [7,12,13]. Most of these have not considered different aspects of that responsibility, however, which means there is room for a more nuanced picture. Our survey enables respondents to choose more than one responsible actor in combination with distinguishing between different aspects of responsibility. The result of our survey points to the fact that the answers to those questions are less straight-forward than shown by earlier research. Our respondents point out local governments as crucial in terms of adaptation responsibility, but not for all aspects of adaptation and not as the sole responsible actors.

For decision-making and implementation, a large number of respondents see local governments as responsible. Especially when it comes to deciding whether to allow the building of property on land with a high flood risk, the respondents agree that local governments should be given the responsibility (S18). Here, 50% of respondents agreed totally with the statement and an additional 25% agreed nearly totally. When it comes to making decisions limiting what can be achieved on existing properties, respondents did not agree as strongly with a local government responsibility (S5), but still 45% concurred totally or nearly totally with the statement. However, the result shows that they believe property owners (S4) and companies (S14, S15) also need to take on responsibility for societal adaptation. This indicates that the result corresponds with the academic studies calling for a shared public–private responsibility [5,7,9]. These results reflect current Swedish legislation, placing responsibility on local governments and property owners, and also reflect the result of the public investigation from 2017, coming to the conclusion that property owners have an unreasonably large responsibility [40].

Tennekes et al. [41], argue that what one prefers is often what one knows, indicating that an existing responsibility distribution will be preferred over other distributions. Following this line of argument, it seems reasonable to assume that many respondents prefer local government responsibility because they believe that they already have such responsibility. What speaks against this is the fact that a large portion of the respondents to a high degree agreed with the statement (S10) that the national government should regulate the right to build in areas of high flood risk, which they essentially do not do in Sweden today. Almost two thirds of the respondents concurred totally or nearly totally. This indicates

that respondents do not think local governments should have the sole responsibility for all decisions. Instead, national authorities should provide the boundaries within which local governments should act. The answers to statements (S18) and (S19), asking about local and national government responsibility for making the decisions to allow building in high flood risk areas, confirms this interpretation. Compared to the result of (S10), respondents indicate a national responsibility to a somewhat lower level (57% totally or nearly totally agree that the national government should take responsibility), whereas they concur to a very high degree with local governments taking on responsibility (75% totally or nearly totally agree). Here, the statements concern decision-making in particular cases and not for setting the boundaries for such decisions. As Swedish local governments have a far-reaching self-determination [42], the answers show support for this model, although they also indicate that the national government has to be more active in supporting or limiting local government decisions on climate adaptation than it has previously been.

Although there is a large degree of support among the respondents for private actors, both property owners (S3, S4) and companies (S14, S15), taking on responsibility for climate adaptation, they did not support the statement that each individual has a responsibility for such decisions (S35). A total of 43 respondents did not give an answer to this statement, indicating that it was a difficult one to decide on. More than half of the respondents who did give a response totally or nearly totally disagreed with the statement, whereas only 7% agreed with it totally or nearly totally. There are several possible interpretations of this result. One is that the respondents do not think that all individuals should be responsible for adaptation decisions, as they do not have the mandate to make such decisions. If you do not own property, it might be hard to see what adaptation decisions you could make. Although respondents did not think each individual should make adaptation decisions, they concurred to a higher degree that all should take on responsibility for influencing the local government (S1) and others in their neighborhood (S2) to act. 37% of the respondents agreed totally or nearly totally that inhabitants have a responsibility to influence their local government, whereas 35% thought the same about influencing other actors in the neighborhood. This gives support to respondents not generally being negative to assigning responsibility to each individual, just for certain aspects of adaptation.

The second possible interpretation of the result concerning individuals taking on responsibility for adaptation decisions is that respondents do not think each individual has enough knowledge to make sound adaptation decisions. This interpretation is supported by the fact that, to the question (Q21) about possible barriers for taking adaptation measures themselves, more than half of the respondents answered "lack of knowledge". This is higher than the result reported in earlier studies from Sweden [13] and other countries [43]. One further result, supporting that "lack of knowledge" is indeed an important reason for our respondents' hesitancy to support individual responsibility, is that the majority wanted public actors to inform them about climate adaptation, a result also supported by other studies [6,14]. A large majority of respondents agreed totally or nearly totally that local governments (79%) and county administrative boards (74%) should be responsible for providing information about climate adaptation measures, whereas the national government being responsible received somewhat less support (62% totally or nearly totally agreed). The responses to the statement that each individual is responsible for keeping themselves informed about climate risks and adaptation measures (S26), are rather evenly spread over the alternatives, though the most common answer was the middle choice, followed by the answers that they totally or nearly totally disagreed and that they totally agreed. This indicates that a portion of the respondents believe each individual, in fact, should have a responsibility to inform themselves, in line with the response about responsibility for influencing others to act. Others disagree with this, rather following the responses concerning making decisions. It is therefore difficult to draw any clear conclusions about the respondents' attitudes to each individual's responsibility for getting information. To what extent the responses indicate that "lack of knowledge" can explain the respondents' low support for individual responsibility for adaptation decisions is unclear. Further

studies need to investigate to what extent respondents would answer differently, were they provided with more knowledge on adaptation measures.

When it comes to the question of paying for adaptation measures, a smaller portion of the respondents think the responsibility should fall on local governments. In fact, just over one third of the respondents totally or nearly totally agreed that local governments should give subsidies to property owners that cannot pay for adaptation measures themselves (S6), with support to a medium extent being the most common answer. Just under a third of the respondents totally or nearly totally agreed that local governments should pay for any extra adaptation expenses they assign on developers (S7). In comparison, a much higher portion of respondents believed the national government should contribute towards financing local climate adaptation, a result in line with earlier research [23]. For each of the statements that the national government should subsidize adaptation measures by local governments with weak financial capacity (S12) and ambitious local governments (S11), 62% of the respondents agreed totally or nearly totally. These results can provide nuance to earlier studies of attitudes to adaptation responsibility in Sweden [13,24] and elsewhere [7,12,44], indicating an approval of placing almost all public responsibility on local governments. Instead, our study indicates support for a shared responsibility between the local and national levels. Further, the answers to statements (S3) and (S4), concerning property owners' responsibility, and (S14) and (S15), concerning corporations' responsibility, indicate that respondents also find paying for adaptation measures to be a shared responsibility between public and private actors.

All in all, the preferences of the respondents, when divided over different aspects or tasks of adaptation, show a quite intricate understanding of governance systems and the roles of different actors within them. This result might be dependent on the bias towards higher education in our sample, and further investigation is needed for more certain conclusions to be made. Compared to earlier studies, this study shows more nuanced perceptions on who should be responsible for what. Even if earlier studies on Swedish perceptions show that respondents believe both public and private actors should be responsible [13], our study gives a more nuanced answer to the question of who should be responsible for what (see Table 2).

Table 2. Summary of who should be responsible for what.

Responsibility for What?	Who Should Be Responsible?
Agenda-setting	Individuals
Decision-making (and implementation)	Local governments, Property owners, Corporations
Providing information	Local governments, County administrative boards
Paying for adaptation (measures)	National government, Property owners, Corporations

4.2. Principles for Responsibility Distribution

In addition to testing people's preferences for which actors are suitable to carry responsibility for different aspects of climate adaptation, we also wanted to test if the respondents were guided by certain distribution principles.

4.2.1. The Equal Shares Principle

One principle for distribution of responsibility, influential in many circumstances, states that responsibility should be divided equally among all actors. This principle is influential in philosophical, as well as political discussions about responsibility for climate change mitigation and adaptation on the global level [21,31].

The responses to statement (S1) and statement (S2) regarding the responsibility of each individual to influence the local government or the neighborhood are both quite positive, which indicates a positive attitude towards an equal distribution of responsibility.

The principle of equal shares can, however, be interpreted in two different ways [22]. The deontological version, tested above, claims that the distribution of responsibility as such should be the/a basis for distribution. There is, however, also a consequentialist version, according to which responsibility should be distributed to promote an equal distribution of something else, for instance money or general welfare, or specifically the benefits of climate adaptation. The attitude to this version was tested by two statements, (S8 and S12). The aim in these two statements was the same: namely, to redistribute resources from those with more to those with less. The difference between them was that the source of the resources differed (other local governments and the national government, respectively). The two statements thus both aim at a more equal distribution of adaptive ability among local governments but represent two different ways of distributing the responsibility to pay.

The responses to both statements were positive but to different degrees. The responses to statement (S8) were fairly positive, but not to the same extent as with many other statements. A relatively high number of respondents also answered "don't know" or answered in the mid-range of the scale. The responses thus indicate that the respondents as a group are positive but a bit hesitant towards this statement. On the other hand, the response to statement (S12) that had the same structure but where the source was different (the national instead of the local government), was strongly positive. There may be different reasons why more respondents wanted to see the national government than other local governments as the source. It could be that people are positive towards the consequentialist version, but that they hesitate if they think the money will come from their own local government. Another possible interpretation is that they are committed to both the deontological and the consequentialist versions and thus see the government as a more suitable source of subsidies, since that means the responsibility to pay will in practice be distributed among all taxpayers. These two interpretations do not exclude one another. It is also possible that the respondents see the national government as a better source because it has more resources, but we will return to that when we discuss ability as a basis for distribution.

This question aside, however, what is important here is that the reactions to both statements are positive, which indicates that an equal outcome is seen as important, and that one of the statements was much more positive than the other, which indicates that how to distribute responsibility to achieve this outcome matters from the perspective of the respondents.

4.2.2. The Desert Principle

Desert can be positive or negative. It can be a matter of being punished for what you did wrong, or of being rewarded for what you did right. The former is often also called guilt-based distribution, while the latter is often called merit-based distribution.

Guilt as a basis for distributing responsibility is frequently discussed, both in general and in connection with climate change [17,33,34]. It also seems to be important for our respondents. The responses to statement (S14) grounding the responsibility of corporations in previous emissions was overwhelmingly positive and much stronger than the support for (S15) that allocates responsibility to corporations for a different reason. Taken together, the reactions to these two statements indicate that guilt is seen as an important basis for the distribution of responsibility.

Merit is more difficult to operationalize as a basis for climate adaptation. What counts as merit in a situation when almost all adaptation work is still in the future, and how should it be used for distributing responsibility, which is usually seen as a burden rather than as a benefit?

One way of dealing with both these questions is to define merit in terms of taking on responsibility (that is, being ambitious at climate adaptation) and handle it as a matter of compensation. That is, to compensate those who freely take on a larger responsibility. We asked the respondents about this idea in the form of statement (S11), suggesting that the national government should financially support ambitious local governments. The reaction

to this statement among the respondents was strongly positive, which might be seen as an indication that high ambitions regarding climate adaptation is something that should be rewarded, and thus that desert in terms of merit is relevant as a basis for distribution for the respondents, though in a slightly different sense than for guilt.

4.2.3. The Need Principle

Distribution according to need is a principle that makes very good sense when talking about the distribution of resources. This means when need is used as a basis for distribution in connection with climate change, it is usually in connection with the distribution of emission rights or with compensation for adaptation costs [18,30,36].

The term 'need' can of course also be used in different ways. Most relevant for our question is to distinguish between general need (being generally poor or vulnerable) on the one hand, and adaptation needs on the other.

We thus distinguish between, on the one hand, statements (S8) and (S12), both dealing with general need (here represented by economic need), and on the other hand, statements (S9) and (S13), both dealing with adaptation needs. We found that more respondents agreed than disagreed with all these statements, but the support was stronger for (S8) and (S12) than for (S9) and (S13). This indicates that the respondents consider need a relevant basis for distribution of adaptation resources, but that they also consider general need more important than climate adaptation needs in this context.

The reactions to statement (S6), concerning local governments financially supporting property owners not able to pay for adaptation measures, complicates this conclusion. This statement deals with adaptation needs, but here, the reactions were more clearly positive. One thing that makes (S6) different from the other four statements discussed here is that the recipients in this statement are property owners, which make up more than two-thirds of the respondents.

The question of how to distribute compensation for climate adaptation expenses does not in itself answer the question of how to distribute the responsibility, however. Even so, we might be able to draw some tentative conclusions regarding what we need from a distribution of responsibility in order to increase the probability that those with more need (in either of the senses) will receive more adaptation resources. One possible conclusion is that if we want to distribute resources for climate adaptation to those who need it most, then it is probably important to aim for a distribution of responsibility that is efficient both in creating such resources and at distributing them to the right recipients. This in turn means that efficiency will have to be an important basis for the distribution of responsibility, but also that an equal distribution of responsibility for decision-making will be important. The reason for the latter is that a more equal distribution of the responsibility for decisions means a more equal influence over the decisions, which in turn will probably lead to more influence over the decisions, and thus the resources, by those in more need than would otherwise be the case. We might therefore be able to conclude that a need-based distribution of resources for climate adaptation calls for a distribution of responsibility that at least includes efficiency and equality as bases for the distribution.

In addition to the question of how to distribute responsibility so as to achieve a distribution of adaptation resources that will benefit those with more need, a need-based distribution of responsibility can also be construed as being about the distribution of responsibility as such. Need-based distribution can then mean either that everyone is responsible for satisfying their own needs [35], or that those in more need (usually in the general sense) should have less responsibility [35,45]. Here, the reactions from the respondents are mixed. The negative reaction among a large portion of the respondents to statement (S16) regarding the responsibility of property buyers, and to some extent the weakly negative reaction to (S26) regarding each individual's responsibility to inform themselves, seem to point away from the former interpretation and in favor of the latter. The reactions to statement (S3) regarding the responsibility of property owners to take responsibility for adapting their own property on the other hand, seems to point in the

opposite direction. Here, half of the respondents were strongly in favor and very few were strongly against.

4.2.4. The Ability Principle

This is a very influential principle in many contexts, including climate change mitigation and adaptation [17,19–21,36]. The most obvious is in connection with recruitment, where the ability to live up to the responsibilities of a position is seen as the most obvious property to look for in a new employee. Ability is also closely associated with efficiency. It can even be seen as a necessary basis for responsibility in the sense that whatever other distribution one favors, ability is a limiting factor in line with the almost universally embraced principle that ought implies can [46]. That is, whatever other property or properties one wants to use as a basis for responsibility, one cannot get around the fact that one cannot be responsible for doing what one lacks the ability to do. There are also other aspects, however. One is that it might not be considered fair to "punish" those most able by making them more responsible than others. Another, more instrumental, is that it might not be prudent to do so since that might discourage people from increasing their abilities.

Statement (S4) claims that property owners have a responsibility to implement measures that decrease the risk of flooding, not just on their own properties but in the area in general. This can be seen as advocating more responsibility for those with more ability. The reactions by the respondents to this statement were very positive. There may be several reasons for this positive response. It makes sense, though, to assume that a positive attitude to ability as a basis for responsibility is one of them.

The generally high approval rates for statements assigning responsibility to local and national governments also indicate that ability is considered relevant, since it can be assumed that these actors possess more economical and technical resources, as well as knowledge about climate change adaptation than most other actors. The high approval rates of the statements allocating responsibility to corporations also point in this direction, together with the generally low approval rate for statements allocating responsibility to individual inhabitants. Of special interest here are the responses to statements (S23) and (S33) that explicitly allocate responsibility to experts. The responses here were very positive, especially in contrast to the responses to statements (S26) and (S35) that allocate the same responsibilities to the individual. Additionally, statements (S20)–(S22) that allocate the responsibility to inform on local governments, the county administrative boards, and the national government, respectively, received very high ratings from a majority of the respondents. This can also be interpreted, at least partly, as a positive attitude towards ability as a basis for the responsibility to inform.

4.2.5. The Efficiency Principle

We noted earlier that from the consequentialist versions of the equal shares principle and the needs principle, the distribution of responsibilities as such does not matter as long as the resulting benefits are equally distributed or distributed in such a way that equality is promoted. If we are utilitarian, neither the distribution of responsibilities as such, nor the distribution of the resulting benefits as such matter. For both versions of consequentialism (egalitarian and utilitarian), however, the distribution of responsibilities may matter instrumentally if a certain distribution is more likely than others to alleviate need or increase equality or total happiness (or preference satisfaction, etc.). We frame this in terms of efficiency.

Statement (S15), which explicitly advocates efficiency (through corporations taking on responsibility), was received very positively by the respondents. This can be interpreted in different ways but can at least serve as an indication that distributing responsibility with the aim of achieving efficiency has a large degree of support among the respondents. The responses to statement (S36) concerning general decision-making on adaptation, on the other hand, were rather mixed with the two extremes (totally agree and totally disagree) as almost equal with just a slight overweight for the former. The difference might be

explained by the fact that in statement (S15) efficiency was mentioned as a property that should play a role in the distribution of responsibility. In (S36), on the other hand, it was explicitly stated that only efficiency mattered. In light of this, the results can be interpreted as indicating that many respondents are positive to including efficiency as a basis for responsibility, but many respondents also strongly disagree that it should be the only basis for responsibility. This interpretation is strengthened by the responses to statements (S5), that local governments should restrict what property owners are allowed to do with their property, and (S10), that the national government should restrict the right to build in areas with high flood risk, that can also be interpreted as including an aspect of efficiency and were also positively received by the respondents.

5. Conclusions

This study has contributed to a more nuanced view about public perceptions of responsibility for climate adaptation. It was found that, within the sample of 510 Swedish respondents, people's perceptions in terms of who should be responsible for what aspects of climate adaptation are rather complex. Following other studies, the respondents in this study also saw local governments as important responsibility takers. However, when asking about responsibility for different aspects of climate adaptation, the respondents clearly preferred local governments to make decisions and provide the public with information about adaptation measures, but wanted the national government to set up the boundaries for local governments' decisions and provide financial support to local governments. Further, the respondents also favored shared responsibility between public and private actors, which many earlier citizen surveys have not found. Thus, in the sample in this study, the gap between the prescribed public–private cooperation on climate adaptation by the adaptation literature and the findings of citizen surveys is not pronounced. The respondents preferred property owners to take on responsibility both for adapting their own property and for contributing to the adaptation of society at large. This was also found to be the case for corporations. However, the respondents did not support each individual to take on responsibility for adaptation decisions and for informing themselves, although they were more positive to each individual being responsible for influencing actors with the ability to make decisions (local government and property owners). All in all, the study shows that the public perception towards who should be responsible for what adaptation aspects points towards an elaborate distribution of responsibility.

The preferred distribution of responsibility is grounded in several distribution principles, forming a complex weave of moral groundings. The study shows that, among the five ethical principles for distributing responsibility studied, all have some support by the respondents. The most preferred principles among the respondents were responsibility based on desert, ability, efficiency, and need, while the principle of equal shares found less support. Even if based on very different moral groundings, when applied to a particular issue, the principles of ability, efficiency, and need to some extent overlap. The study found that the respondents support a distribution that places responsibility on actors with the ability, in terms of mandate, to make decisions, and in terms of financial, technical, and knowledge capacity, to make and implement adaptation measures that are sound and efficient. In terms of the need principle, including several versions, the respondents clearly supported that the generally worst off should be assigned less responsibility and should be provided with assistance from others taking on a greater responsibility. The respondents to a lower extent also supported that those worst off in terms of the need for climate adaptation should have less responsibility and be assisted. The efficiency principle also found support, but not as the only principle on which to base responsibility. The study also shows that respondents to some extent relate different principles to different actors and thus to different aspects of adaptation. For example, the ability principle was seen as important for assigning responsibility to public actors, for decision-making, and implementation, whereas the equal shares principle was seen as important in relation to

those without clear possibilities to implement adaptation decisions, and then in connection with the responsibility to influence others to act.

The study contributes to the literature on responsibility for climate adaptation by providing a more nuanced picture of public perceptions, covering both different aspects of adaptation and the moral foundation for assigning it. The preferred responsibility distribution is a complex weave of different public and private actors, tasks, and principles. Further studies of public perceptions in Sweden and elsewhere need to consider such complexity, for example by using methods such as focus group interviews, to entangle on what grounds, for what, and to whom responsibility should be assigned. The results reported here also need to be corroborated on larger samples to enable conclusions about generalizability in the Swedish population. The method used, with focus on ethical principles of distribution and aspects of responsibility, would also be useful in studying other issues where public and private responsibilities are mixed.

Supplementary Materials: The following is available online at https://www.mdpi.com/article/10.3390/su132212552/su132212552/s1. Supplement 1: The complete questionnaire with all questions (Q) and statements (S), including identification numbers and response alternatives.

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