Appendix A

Figure A1: An Example of the Choice Experiment Scenario Shown to Participants

8. Suppose your jurisdiction is considering a **utility-scale solar project** that will have **50 MW** of nameplate capacity, run for 25 years, generate electricity to serve about 8,500 homes, and occupy 375 acres of farmland.

There are 2 potential plans, Plan A and Plan B, for the solar project that are the same except for the **life-cycle carbon emissions reduction**, **lease payment to landowners**, **savings on the electricity bill**, and **land quality of the occupied farmland**. Based on data from the Energy Information Administration, the average monthly electricity bill for residential customers in Iowa is $110. Land quality is based on the index, Corn Suitability Rating 2 (CSR2) that ranges from 5 to 100. The state average CSR2 values for high-, medium- and low-quality land are about 85, 70, and 55, respectively.

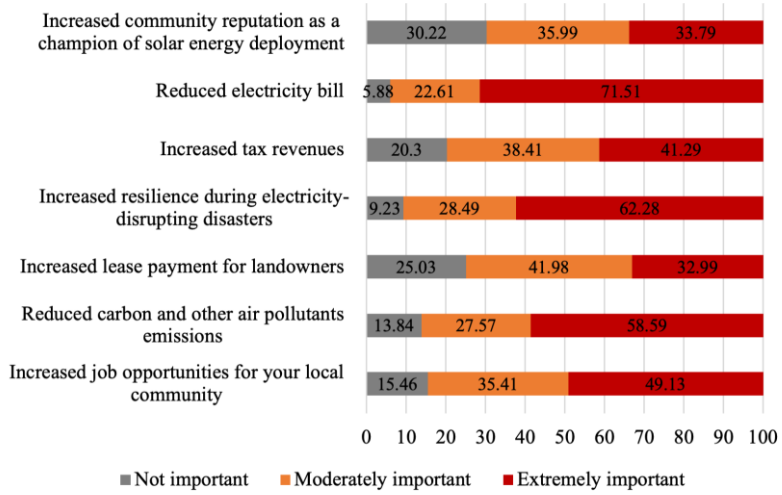
In the following, we ask you to choose whether you prefer Plan A or Plan B in 6 scenarios.

Scenario 1	**Plan A**	**Plan B**
Expected carbon emissions reduction relative to coal-fired power plants	85%	95%
Expected annual lease payment to landowners	6 times prevailing cash rent	4 times prevailing cash rent
Expected savings on the monthly electricity bill for your household	$25	$40
Land quality of the occupied farmland	Low (CSR2=55)	Medium (CSR2=70)
Which plan are you more likely to support in your jurisdiction?	☐	☐

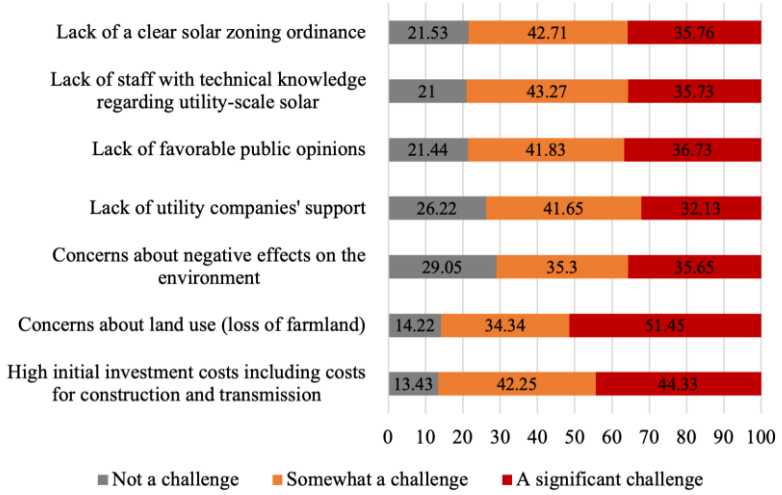
How certain are you of your choice, on a scale of 1 to 5? (1 = very uncertain; 5 = very certain)

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

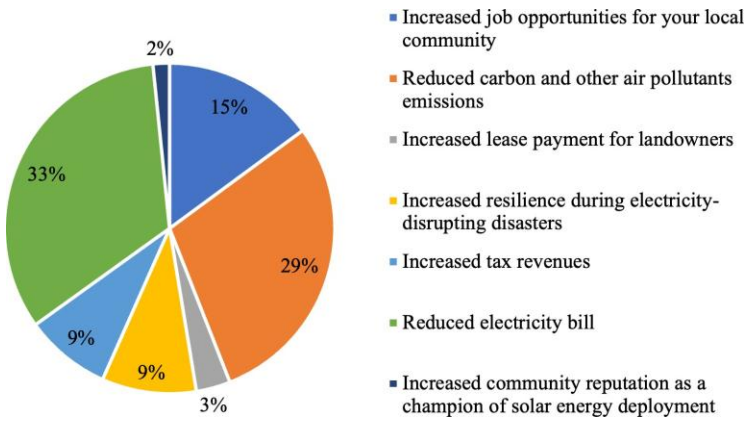
Figure A2: Perceived Benefits and Challenges of Utility-Scale Solar Projects for Local Communities



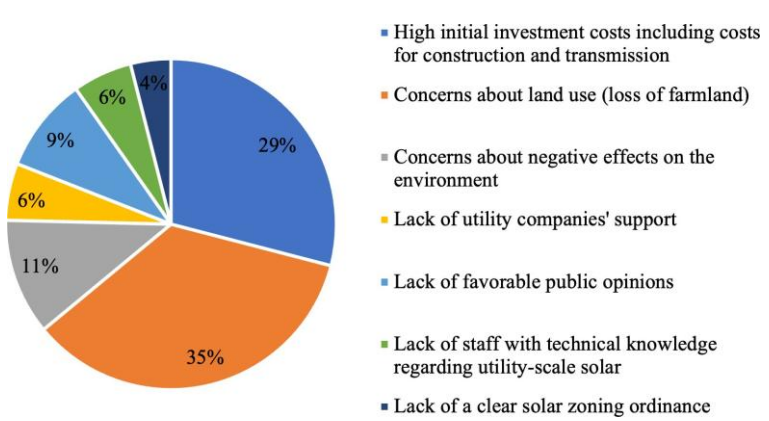
(a) Rating of Perceived Benefits



(b) Rating of Perceived Challenges



(c) Rating of the Most Important Benefit



(d) Rating of the Most Important Challenge

Table A1: Experimental Design of Information Treatments

	Control group	Treatment groups		
		Treatment 1	Treatment 2	Treatment 3
Treatment	No information	Peers' information	Positive information	Negative information
Description	No	Approximately 25% of the townships/counties in Midwestern states have zoning ordinances regarding utility-scale solar systems, and increasingly more jurisdictions have adopted utility-scale solar zoning ordinances. According to the Solar Model Ordinances published by the Great Plain Institutes, the most commonly used setback distance from the property line of a nonparticipating parcel in Midwestern states is 150 feet. The requirement for a decommissioning bond (financial assurance to restore the land to its original status) is project specific. Based on our studies, the decommissioning bond to cover the full restoration cost is approximately $3,500 per acre on average across the Midwest.	While some people oppose building utility-scale solar systems, studies have shown that such systems provide great benefits in reducing greenhouse gas (GHG) emissions (90% CO2 emissions reduction relative to coal-fired electricity generation), mitigating other air pollutants such as NOx (2.4 lbs/MWh from coal-fired electricity generation), creating job opportunities and tax revenues, reducing energy costs, and dependency on fossil fuels.	While some people support building utility-scale solar systems, studies have shown that such systems result in adverse impacts to local communities, such as interference with existing land uses (e.g., occupying prime farmland, 5-10 acres per MW), alteration of topsoil conditions and drainage channels during construction (e.g., increased runoff and erosion), loss of wildlife habitats, and aesthetic issues to neighbors.
Questions	Attention-checking questions			
	Perception and preference questions			

Note: Participants were randomly assigned to one of four groups (1 control, 3 treatment groups), with each participant seeing only one information description. Following the information description, respondents were tested about the information provided to ensure that they had read the information provided. Specifically, each individual was presented with two questions concerning the information provided, the survey instrument explicitly stated that the answers to these questions appeared in the paragraph of description. Three attempts were allowed, those who failed the test after all 3 attempts were not allowed to continue the survey and so were excluded from our study. Respondents who passed the test were presented with questions about their perceptions, and preferences regarding utility-scale solar energy and six discrete choice scenarios.

Table A2: Landownership by Information Treatment and Sample

Landownership	No information	Peer information	Positive information	Negative information
Public officials				
- Landowner	20	14	16	19
- Non-landowner	25	31	27	28
General population				
- Landowner	24	21	14	14
- Non-landowner	150	164	156	143

Note: We conducted Pearson chi-square tests to test for balance across treatment groups. The results suggest that there are no statistically significant differences in landownership representation across information treatments for both public official sample ($\chi^2 = 1.81$, p-value = 0.61), and the general population sample ($\chi^2 = 3.44$, p-value = 0.33).

Table A3: Heterogeneity Analysis: Latent Class Model Results in Preference Space

	Class 1 Cost-Conscious Accepter	**Class 2** Strong Land Stewards	**Class 3** Solar Advocates
Class share	46.5%	32.9%	20.6%
Carbon emission reduction 95%	0.2909**	-0.3960***	0.8661***
	(0.1238)	(0.1247)	(0.1284)
Lease payment to landowners	0.026	-0.0874***	0.1564***
	(0.0371)	(0.0327)	(0.0591)
Energy saving on electricity bill	0.0875***	-0.003	-0.0059
	(0.0062)	(0.0057)	(0.0101)
Medium quality farmland	-0.2271*	-0.6662***	0.4401**
	(0.1161)	(0.1304)	(0.1927)
High quality farmland	-0.8896***	-2.2668***	1.0672***
	(0.2247)	(0.2688)	(0.3676)
Cluster membership:			
Landownership	0.1099	0.8922**	
	(0.3904)	(0.3528)	
Knowledge_utility_solar	-0.8366***	-0.3834	
	(0.2549)	(0.2485)	
County_utility_solar	-0.2178	-0.2221	
	(0.3079)	(0.3210)	
Rooftop_adopt_plan	-0.2357	-0.6259**	
	(0.2676)	(0.2893)	
Community_part_int	-0.1845	-0.5433**	
	(0.2096)	(0.2180)	
Constant	2.3323***	2.0750***	
	(0.5717)	(0.5689)	
Log likelihood	-2,596		
AIC	5245.410		
BIC	5437.441		
Certainty level ≥ 3	Yes		
Number of respondents	816		
Observations	9066		

Note: Based on the Bayesian Information Criterion (BIC) statistics, we selected a model with 3 classes. The class assignment was determined by several factors: landownership, knowledge levels directly related to utility-scale solar energy, the presence of utility-scale solar projects in the respondent's county of residence, and participation in or interest in rooftop and community solar projects. Robust standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A4: Heterogeneity Analysis: Latent Class Model Results in Preference Space (Covariate-Free Specification)

	Class 1 Cost-Conscious Accepter	**Class 2** Strong Land Stewards	**Class 3** Solar Advocates
Class share	43.8%	34.3%	22%
Carbon emission reduction 95%	0.1757	-0.3576***	0.9694***
	(0.1493)	(0.1151)	(0.1646)
Lease payment to landowners	-0.0142	-0.0954***	0.2268***
	(0.0606)	(0.0310)	(0.0753)
Energy saving on electricity bill	0.0877***	-0.0036	0.0055
	(0.0060)	(0.0054)	(0.0139)
Medium quality farmland	-0.2375**	-0.5584***	0.2625
	(0.1198)	(0.1356)	(0.2391)
High quality farmland	-0.8319***	-2.1526***	0.8534**
	(0.2314)	(0.2526)	(0.4196)
Cluster membership:			
Constant	0.6902***	0.4447**	
	(0.2223)	(0.1779)	
Log likelihood	-2,618		
AIC	5270.703		
BIC	5391.612		
Certainty level ≥ 3	Yes		
Number of respondents	816		
Observations	9066		

Note: Robust standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A5: Generalized Multinomial Logit Models in Willingness-to-Pay Space: Accounting for Scale Heterogeneity

Variable	(1)
Mean parameters	
Carbon emission reduction 95%	3.1627***
	(1.2042)
Lease payment to landowners	0.3753
	(0.4212)
Medium quality farmland	-5.0097***
	(1.5584)
High quality farmland	-20.3812***
	(2.1961)
Standard deviation parameters	
Carbon emission reduction 95%	2.5958
	(1.6487)
Lease payment to landowners	0.5745*
	(0.3049)
Medium quality farmland	4.5199*
	(2.4876)
High quality farmland	16.5922*
	(9.3193)
τ	1.1237**
	(0.4469)
Log likelihood	-2,657
AIC	5335.986
BIC	5414.221
Certainty level ≥ 3	Yes
Number of respondents	816
Observations	9066

Note: Column (1) excludes responses with a high level of uncertainty. Robust standard errors clustered at the individual level in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A6: Random Parameter Logit Models in Willingness-to-Pay Space: Addressing Respondent Uncertainty in Choice Decisions

Variable	(1)	(2)
Mean parameters		
Carbon emission reduction 95%	2.3631*	-15.0500
	(1.3956)	(23.5579)
Lease payment to landowners	0.3552	2.5413
	(0.4483)	(4.5669)
Medium quality farmland	-4.7723***	-20.6091
	(1.4926)	(18.8935)
High quality farmland	-23.1676***	-95.7955
	(2.6863)	(58.8344)
Standard deviation parameters		
Carbon emission reduction 95%	1.4524***	19.8803
	(0.1203)	(22.9839)
Lease payment to landowners	0.4544***	5.1068
	(0.0378)	(4.0797)
Medium quality farmland	1.6033***	24.2515
	(0.1373)	(22.7995)
High quality farmland	3.5987***	82.4078
	(0.3439)	(93.0663)
Log likelihood	-3,082	-394
AIC	6184.272	807.329
BIC	6256.719	858.906
Number of respondents	865	221
Observations	10350	1284

Note: Column (1) uses the same specification as Column (2) in Table 3 but includes observations with high levels of uncertainty (certainty level = 1 or 2). Column (2) only includes observations from respondents who reported a higher level of uncertainty. Robust standard errors clustered at the individual level in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A7: Random Parameter Logit Models in Willingness-to-Pay Space: Accounting for Potentially Unreliable Responses

Variable	(1)	(2)
Mean parameters		
Carbon emission reduction 95%	2.8024**	3.0126**
	(1.3147)	(1.3830)
Lease payment to landowners	0.1593	0.2703
	(0.4323)	(0.4586)
Medium quality farmland	-4.4437***	-4.8799***
	(1.4079)	(1.4613)
High quality farmland	-21.1795***	-21.5898***
	(2.5524)	(2.6741)
Standard deviation parameters		
Carbon emission reduction 95%	1.3891***	1.4810***
	(0.1218)	(0.1394)
Lease payment to landowners	0.4349***	0.4642***
	(0.0382)	(0.0438)
Medium quality farmland	1.5151***	1.5937***
	(0.1373)	(0.1577)
High quality farmland	3.4501***	3.6780***
	(0.3463)	(0.4015)
Log likelihood	-2,577	-2,187
AIC	5173.758	4394.015
BIC	5244.640	4463.322
Certainty level ≥ 3	Yes	Yes
Number of respondents	798	684
Observations	8850	7560

Note: Column (1) uses the same specification as Column (2) in Table 3 but excludes respondents who always selected either Project A or Project B across all six choice scenarios. Compared to Column (1), Column (2) further excludes respondents who completed the survey in less than ten minutes. Note that both columns exclude responses with a higher level of uncertainty. Robust standard errors clustered at the individual level in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A8: Random Parameter Logit Models in Preference Space: Sub-sample Regressions based on the Rating of Perceived Benefits and Challenges

Variable	Carbon reduction (1)	Lease payment (2)	Energy saving (3)	Loss of farmland (4)
Mean parameters				
Carbon emission reduction 95%	0.5361***	0.4019***	0.2113**	0.049
	(0.1127)	(0.1327)	(0.0960)	(0.1308)
Lease payment to landowners	0.003	0.2141***	0.014	0.0318
	-0.0336	-0.0417	-0.0294	-0.0416
Energy saving on electricity bill	0.0603***	0.0556***	0.0653***	0.0587***
	(0.0063)	(0.0076)	(0.0061)	(0.0077)
Medium quality farmland	-0.0802	-0.1822	-0.0663	-0.4900***
	(0.1170)	(0.1511)	(0.1055)	(0.1391)
High quality farmland	-0.9238***	-0.8477***	-0.8018***	-1.6839***
	(0.2046)	(0.2532)	(0.1832)	(0.2861)
Standard deviation parameters				
Carbon emission reduction 95%	1.3469***	1.1592***	1.1477***	1.3814***
	(0.1577)	(0.1938)	(0.1367)	(0.1947)
Lease payment to landowners	-0.4085***	0.3093***	0.3612***	-0.4651***
	(0.0532)	(0.0668)	(0.0498)	(0.0690)
Energy saving on electricity bill	-0.0694***	-0.0619***	0.0759***	-0.0829***
	(0.0069)	(0.0090)	(0.0066)	(0.0100)
Medium quality farmland	-0.6742***	-0.6455**	0.5794***	0.9413***
	(0.2077)	(0.3037)	(0.2126)	(0.2778)
High quality farmland	1.7860***	1.8368***	1.7465***	2.8615***
	(0.2534)	(0.3229)	(0.2157)	(0.4257)
Log likelihood	-1,638	-939	-1,944	-1,386
AIC	3363.043	1957.675	3975.515	2856.511
BIC	-1,638	-939	-1,944	-1,386
Certainty level ≥ 3	Yes	Yes	Yes	Yes
Number of respondents	488	275	598	426
Observations	5524	3134	6698	4746

Note: Sub-sample construction was based on respondents' ratings of perceived benefits and challenges associated with utility-scale solar energy systems in their local communities. The four subsamples comprised respondents who rated each of the following as "very important" or "extremely important": carbon emission reductions (column (1)), lease payments to landowners (column (2)), household energy savings on electricity bills (column (3)), or loss of farmland quality (column (4)). Robust standard errors clustered at the individual level in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A9: Random Parameter Logit Models in Willingness-to-Pay Space: Excluding Paper Copy Responses

Variable	(1)	(2)	(3)
Mean parameters			
Carbon emission reduction 95%	3.8920***	4.5133***	3.8073***
	(1.3352)	(1.4170)	(1.4372)
Lease payment to landowners	0.1358	0.1238	0.1850
	(0.4379)	(0.4738)	(0.4683)
Medium quality farmland	-3.5326**	-2.2451	-2.7236*
	(1.4654)	(1.5845)	(1.5695)
High quality farmland	-17.9984***	-14.9182***	-15.5841***
	(2.4984)	(2.5861)	(2.5207)
Carbon emission reduction 95% × Public official		-4.0493	
		(3.7398)	
Lease payment to landowners × Public official		0.1367	
		(1.1995)	
Medium quality farmland × Public official		-9.7437**	
		(4.2895)	
High quality farmland × Public official		-23.0514**	
		(8.9690)	
Carbon emission reduction 95% × Landowner			0.0200
			(4.7492)
Lease payment to landowners × Landowner			-0.0125
			(1.6195)
Medium quality farmland × Landowner			-9.9995
			(6.2735)
High quality farmland × Landowner			-27.2427**
			(13.7121)
Standard deviation parameters			
Carbon emission reduction 95%	1.4510***	1.5787***	1.5575***
	(0.1316)	(0.1503)	(0.1412)
Lease payment to landowners	0.4399***	0.4760***	0.4719***
	(0.0395)	(0.0449)	(0.0427)
Medium quality farmland	1.5472***	1.6354***	1.6396***
	(0.1408)	(0.1539)	(0.1479)
High quality farmland	3.2422***	3.2107***	3.1691***
	(0.3258)	(0.3275)	(0.3105)
Log likelihood	-2,499	-2,488	-2,495
AIC	5017.819	5006.684	5019.913
BIC	5088.311	5112.422	5125.651
Certainty level ≥ 3	Yes	Yes	Yes
Number of respondents	765	765	765
Observations	8512	8512	8512

Note: Mixed distribution modes (online Qualtrics survey and mail-based survey) were employed to enhance the response rate from public officials, resulting in 57 physical copy responses from public officials with the rest coming from the online mode. Among these 57 physical copy responses, 28 are also landowners. Models 1, 2, and 3 use the same specifications as Column (2) in Table 3, Column (1) in Table 4, and Column (2) in Table 4, respectively, but exclude 57 responses from public officials via physical copies. Robust standard errors clustered at the individual level in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A10: Random Parameter Logit Models in Willingness-to-Pay Space: Excluding Non-supporters

Variable	(1)
Mean parameters	
Carbon emission reduction 95%	3.8042***
	(1.3098)
Lease payment to landowners	0.3076
	(0.4275)
Medium quality farmland	-3.8201***
	(1.4304)
High quality farmland	-18.3496***
	(2.4029)
Standard deviation parameters	
Carbon emission reduction 95%	1.4245***
	(0.1253)
Lease payment to landowners	0.4325***
	(0.0378)
Medium quality farmland	1.5234***
	(0.1353)
High quality farmland	3.2154***
	(0.3097)
Log likelihood	-2,476
AIC	4971.764
BIC	5042.188
Certainty level ≥ 3	Yes
Number of respondents	816
Observations	8454

Note: Robust standard errors clustered at the individual level in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.