

Supplementary Materials

This document is a supplement to the article titled “Social Equity in Protected Areas Co-management: Perceived Fairness of Local Residents in Giant Panda National Park, China”

Supplementary Materials - Table S 1 - Survey questions related to the demographics and characteristics of local residents

Survey questions related to the demographics and characteristics of local residents		
<i>Topic</i>	<i>Survey Questions (Survey)</i>	<i>Potential Responses</i>
Gender	Interviewee's gender?	Male/female
Age	What is your age group?	20-30/30-40/40-50/50-60/60+years old
Professional	What is your occupation?	Farmers, workers, merchants, other
Education	What is your highest level of education completed?	No school/primary school/junior school/high school, technical secondary school, vocational high school /bachelor's degree, junior college or above
administrative village	Which village do you live in?	Luoyigou village, Yinping village, Weiba village, Dongqiao village, Suyang Village、 other
The live time	How many years have you lived in this village?	0-10、 10-20、 >20years
Household size	How many people live in your household?	List
Household migrant workers	How many people in your family work outside?	List
Annual household income	What is your family's total annual income?	<1/1-3/3-6/6-10/>10(10000RMB)
Household source of income	What is your family's main source of income?	Animal Husbandry and Plantation / Tourism /Forester/ Local workers/ Foreign workers/ other

Supplementary Materials - Table S 2 - Survey questions related to participated types of co-management local residents

Survey questions related to participated types of co-management local residents		
<i>Topic</i>	<i>Survey Questions (Survey)</i>	<i>Potential Responses</i>
Instruction	I participated in the energy transformation and other facilities renovation projects of the Giant Panda National Park .	Yes(1)/No(0)
	I participated in the skills training and industry support organized by the Giant Panda National Park .	Yes(1)/No(0)
	I participated in environmental educational activities of the Giant Panda National Park .	Yes(1)/No(0)
Consultation	I attended community-based Co-management meeting	Yes(1)/No(0)
	I participated in the consultation on the planning and policy making of the Giant Panda National Park	Yes(1)/No(0)
	I was able to easily obtain about co-management information of the Giant Panda National Park	Yes(1)/No(0)
Agreement	I was participated in signing fire prevention and human-wildlife conflict compensation agreements	Yes(1)/No(0)
	I was signed to participate in community-based co-management management	Yes(1)/No(0)
	I participated in the bee farming and other cooperative benefit sharing.	Yes(1)/No(0)
Cooperation	I participated in the fire prevention and forest patrolling work of the Giant Panda National Park	Yes(1)/No(0)
	I was participated in enacting conservation rules	Yes(1)/No(0)
	I have accountability for some conservation affairs	Yes(1)/No(0)

Supplementary Materials - Table S 3 - Survey questions and responses related to recognitional, procedural and distributional equity

Recognitional Equity		
<i>Attribute</i>	<i>Survey Questions</i>	<i>Potential Responses</i>
Culture	GPNP can respect our local culture and traditional customs	Strongly disagree(1)/disagree(2)/not sure(3)/agree(4)/strongly agree(5)
Livelihood	GPNP imposes no negative impact on my original livelihood	Strongly disagree(1)/disagree(2)/not sure(3)/agree(4)/strongly agree(5)
Legal and traditional rights	GPNP can sincerely respect my legal and traditional rights	Strongly disagree(1)/disagree(2)/not sure(3)/agree(4)/strongly agree(5)
Land ownership	I have no land ownership conflicts with GPNP	Strongly disagree(1)/disagree(2)/not sure(3)/agree(4)/strongly agree(5)
Traditional knowledge	Community-based traditional knowledge can be effectively involved in the management of GPNP	Strongly disagree(1)/disagree(2)/not sure(3)/agree(4)/strongly agree(5)
Procedural Equity		
<i>Attribute</i>	<i>Survey Questions (Survey)</i>	<i>Potential Responses</i>
Decision making	I can fully express my opinion and effectively involved in the decision-making process of GPNP	Strongly disagree(1)/disagree(2)/not sure(3)/agree(4)/strongly agree(5)
Participation	GPNP has convenient channels and fair procedures to encourage local participation	Strongly disagree(1)/disagree(2)/not sure(3)/agree(4)/strongly agree(5)
transparency	The information about conservation decisions and reasons for decisions are readily available	Strongly disagree(1)/disagree(2)/not sure(3)/agree(4)/strongly agree(5)
Accountability	I understand the responsibility of ATA, and knowing to whom to raise concerns to solve issues related to management actions	Strongly disagree(1)/disagree(2)/not sure(3)/agree(4)/strongly agree(5)
Free, prior and informed consent (FPIC)	When ATA issues plans and policies regarding to me, I will be informed in advance	Strongly disagree(1)/disagree(2)/not sure(3)/agree(4)/strongly agree(5)
Distributional Equity		
<i>Attribute</i>	<i>Survey Questions (Survey)</i>	<i>Potential Responses</i>
Conservation burdens	I fairly bear the responsibility of conservation in GPNP, compared to other local residents	Strongly disagree(1)/disagree(2)/not sure(3)/agree(4)/strongly agree(5)
Ecological compensation	I am satisfied with the ecological compensation made by GPNP	Strongly disagree(1)/disagree(2)/not sure(3)/agree(4)/strongly agree(5)
Wildlife conflicts compensation	I can easily get appropriate compensation from human-wildlife conflicts.	Strongly disagree(1)/disagree(2)/not sure(3)/agree(4)/strongly agree(5)
Benefits distribution	I can fairly get economic benefits from co-management, compared to other local residents	Strongly disagree(1)/disagree(2)/not sure(3)/agree(4)/strongly agree(5)
Employment distribution	I can fairly get employment opportunities from ATA, compared to others	Strongly disagree(1)/disagree(2)/not sure(3)/agree(4)/strongly agree(5)
Combined Equity Scores		

Combined Recognitional Equity Score	Combined responses to above questions related to culture, livelihood, legal and traditional rights, land ownership, traditional knowledge	All individual items are first standardized on a scale of 1-5. Then add up all the items and average them
Combined procedural equity score	Combined responses for all questions in procedural category including decision making, participation transparency, accountability,, free, prior and informed consent (FPIC)	All individual items are first standardized on a scale of 1-5. Then add up all the items and average them
Combined distributional equity scale	Combination of conservation burdens, ecological compensation, wildlife conflicts compensation, benefits distribution, employment distribution	All individual items are first standardized on a scale of 1-5. Then add up all the items and average them
Combined Equity Score	Combination of recognitional, procedural, and distributional equity scores.	The scores for the three entitlement classes are calculated by summing and averaging. This score is then normalized to a scale of 1-5.

Supplementary Materials - Table S 4 - Co-management activities in TGPNP (N=424)

Category	Co-management Activities
Instruction	<p>1: Subsidize the construction of biogas digesters, wood-saving stoves and other energy conservation projects, and repair iron rope bridges and other infrastructure construction assistance.</p> <p>2: Promote the standardized operation of rural farmhouses and carry out training on standardized operation skills for rural tourism.</p> <p>3: Funding villages to carry out industrial support projects such as planting walnuts, konjac, livestock and poultry breeding.</p> <p>4: Carry out regular nature protection publicity and education activities.</p>
Consultation	<p>5: Establish community-based co-management committee and conduct regular working meetings.</p> <p>6: Hold regular consultation meetings on the planning and policy development of TGPNP.</p> <p>7: Post announcements and brochures through community columns to publicize information on community-based co-management work.</p>
Agreement	<p>8: Regularly hold on-site meetings to sign forest fire safety agreements.</p> <p>9: Develop compensation agreements for human-wildlife conflict.</p> <p>10: Formulation of community-based co-management agreements.</p> <p>11: Establishing a Chinese bee breeding cooperative.</p> <p>12: Establishment of persimmon cooperative.</p>
Cooperation	<p>13: Establishment of forest protection joint defense team.</p> <p>14: Conduct regular conservation rule-making meetings.</p> <p>15: Regular recruitment of forest rangers.</p>

Supplementary Materials - Table S 5 - Descriptive summary of survey sample including the number and percentage of local residents participated in co-management types and activities (N=424)

Category	Co-management Activities	Number (participated)	Percentage (%)
Instruction	A1 Energy transformation and other infrastructure building projects	316	74.5
	A2 Skill training and industrial support activities	153	36.1
	A3 Environmental educational activities	239	56.4
Consultation	A4 Community-based co-management meetings	98	23.1
	A5 Consultative meetings for planning and policy making	84	19.8
	A6 Easy access to co-management Information	113	26.7
Agreement	A7 Agreements of fire prevention and human-wildlife conflict compensation	80	18.9
	A8 Agreements of community-based co-management	39	9.2
	A9 Benefits sharing of bee farming and other cooperatives	102	24.1
Cooperation	A10 Fire prevention and forest patrolling work	115	27.1
	A11 Participation in enacting conservation rules	47	11.1
	A12 Accountability for some conservation affairs	23	5.4

Supplementary Materials - Table S 6 - Descriptive summary of survey sample including quantity of co-management participation of local residents (N=424)

Quantity of co-management participation	0	1	2	3	4	5	6	7	8	9	10	11	12
Number of people	19	104	89	61	38	31	26	20	11	11	4	6	4
Frequency (%)	4.5	24.5	21.0	14.4	9.0	7.3	6.1	4.7	2.6	2.6	0.9	1.4	0.9

Supplementary Materials - Table S 7 - Descriptive summary of responses to all individual perceptions indicators. For each item the upper row indicates absolute number of responses, the lower number indicates the relative percentage on the total number of responses.

EQUITY CATEGORY	ITEM	STRONGLY DISAGREE	DISAGREE	NOT SURE	AGREE	STRONGLY AGREE	
<i>Recognitional Equity</i>	Culture	8	41	91	218	66	N
		1.89	9.67	21.46	51.42	15.57	%
	Livelihood	21	59	47	227	70	N
		4.95	13.92	11.08	53.54	16.51	%
	Legal and traditional rights	31	50	102	208	33	N
		7.31	11.79	24.06	49.06	7.78	%
	Land ownership	16	38	36	221	113	N
		3.77	8.96	8.49	52.12	26.65	%
	Traditional knowledge	9	36	193	162	24	N
		2.12	8.49	45.52	38.21	5.66	%
<i>Procedural Equity</i>	Decision making	79	121	91	110	23	N
		18.63	28.54	21.46	25.94	5.42	%
	Participation	98	183	75	55	13	N
		23.11	43.16	17.69	12.97	3.07	%
	Transparency	75	106	89	139	15	N
		17.69	25.00	20.99	32.78	3.54	%
	Accountability	64	143	85	119	13	N
		15.09	33.73	20.05	28.07	3.07	%
	Free, prior and informed consent (FPIC)	93	151	66	103	11	N
		21.93	35.61	15.57	24.29	2.59	%
<i>Distributional Equity</i>	Conservation burdens	14	57	65	178	110	N
		3.30	13.44	15.33	41.98	25.94	%
	Ecological compensation	75	189	75	64	21	N
		17.69	44.58	17.69	15.09	4.95	%
	Wildlife conflicts compensation	121	160	60	65	18	N
		28.54	37.74	14.15	15.33	4.25	%
	Benefits distribution	53	102	177	79	13	N
		12.50	24.06	41.75	18.63	3.07	%
	Employment distribution	50	121	142	90	21	N
		11.79	28.54	33.49	21.23	4.95	%

Supplementary Materials - Table S 8 - Correlation analysis between demographic characteristics and perceived fairness

Category	Analysis method	recognitional equity		procedural equity		distributional equity		Combined social equity	
		F/correlation coefficient	P/ Sig. (2-tailed)	F/correlation coefficient	P/ Sig. (2-tailed)	F/correlation coefficient	P/ Sig. (2-tailed)	F/correlation coefficient	P/ Sig. (2-tailed)
Gender	one-way ANOVA	0.794	0.373	0.057	0.811	0.267	0.606	0.000	0.994
Age	Spearman correlation analysis	-.107*	0.028	-.129**	0.008	-.134**	0.006	-.167**	0.001
Professional	one-way ANOVA	0.890	0.446	0.529	0.663	1.061	0.365	0.741	0.528
Education	Spearman correlation analysis	.216**	0.000	.222**	0.000	.206**	0.000	.278**	0.000
Villages	one-way ANOVA	5.560	0.000	2.128	0.077	2.095	0.081	2.111	0.079
Residency years	Spearman correlation analysis	-0.016	0.737	-0.042	0.385	0.057	0.242	-0.012	0.810
Household size	Spearman correlation analysis	0.126**	0.010	-0.024	0.624	0.030	0.534	0.058	0.237
Household migrant workers	Spearman correlation analysis	-0.011	0.825	-0.057	0.242	-0.052	0.287	-0.033	0.493
Annual household income	Spearman correlation analysis	0.151**	0.002	.110*	0.024	.184**	0.000	.190**	0.000
Farming	one-way ANOVA	0.613	0.434	0.109	0.741	1.302	0.254	0.346	0.557
Tourism	one-way ANOVA	2.655	0.104	1.489	0.223	14.105	0.000	7.630	0.006
Forestry	one-way ANOVA	0.384	0.536	23.937	0.000	20.835	0.000	16.910	0.000
Local employment	one-way ANOVA	3.023	0.083	0.000	0.990	3.560	0.060	1.977	0.160
Nonlocal employment	one-way ANOVA	0.230	0.632	0.735	0.392	1.448	0.229	0.571	0.450

Supplementary Materials - Table S 9 - Correlation analysis of co-management participation type and fairness perception

Category	Analysis method	recognitional equity		procedural equity		distributional equity		Combined social equity	
		correlation coefficient	Sig. (2-tailed)	correlation coefficient	Sig. (2-tailed)	correlation coefficient	Sig. (2-tailed)	correlation coefficient	Sig. (2-tailed)
Instruction	Spearman correlation analysis	.190**	0.000	.278**	0.000	.321**	0.000	.333**	0.000
Consultation	Spearman correlation analysis	.177**	0.000	.389**	0.000	.325**	0.000	.399**	0.000
Agreement	Spearman correlation analysis	.102*	0.035	.216**	0.000	.279**	0.000	.250**	0.000
Cooperation	Spearman correlation analysis	.169**	0.000	.374**	0.000	.392**	0.000	.411**	0.000
Quantities of co-management participation	Spearman correlation analysis	.198**	0.000	.373**	0.000	.400**	0.000	.418**	0.000

Supplementary Materials -Model S1 - A regression model recognitional equity and relevant independent variables

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.355a	.126	.107	.60479	1.855
a. Dependent Variable: recognitional equity					
b. Predictors: (Constant), Age, Education, Villages, Household size, Annual household income, Instruction, Consultation, Agreement, Cooperation					

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.900	9	2.433	6.653	.000b
	Residual	151.429	414	.366		
	Total	173.329	423			
a. Dependent Variable: recognitional equity						
b. Predictors: (Constant), Age, Education, Villages, Household size, Annual household income, Instruction, Consultation, Agreement, Cooperation						

Coefficients								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.625	.197		13.300	.000		
	Age	.031	.029	.062	1.090	.276	.654	1.529
	education	.102	.035	.164	2.887	.004	.651	1.535
	villages	.058	.024	.118	2.457	.014	.914	1.094
	Household size	.121	.047	.121	2.588	.010	.961	1.041
	Annual household income	.047	.028	.086	1.684	.093	.804	1.243
	Instruction	.061	.038	.086	1.623	.105	.743	1.345
	Consultation	.082	.037	.130	2.236	.026	.625	1.600
	Agreement	-.073	.041	-.097	-1.804	.072	.727	1.376
	Cooperation	.089	.051	.101	1.763	.079	.637	1.570
a. Dependent Variable: recognitional equity								
b. Predictors: (Constant), Age, Education, Villages, Household size, Annual household income, Instruction, Consultation, Agreement, Cooperation								

Supplementary Materials -Model S2 - A regression model procedural equity and relevant independent variables

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
2	.535a	.286	.272	.75835	1.919
a. Dependent Variable: procedural equity					
b. Predictors: (Constant), Age, Education, Annual household income, Forestry, Instruction, Consultation, Agreement, Cooperation					

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
2	Regression	95.493	8	11.937	20.756	.000b
	Residual	238.666	415	.575		
	Total	334.160	423			
a. Dependent Variable: procedural equity						
b. Predictors: (Constant), Age, Education, Annual household income, Forestry, Instruction, Consultation, Agreement, Cooperation						

Coefficients								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
2	(Constant)	1.893	.210		9.034	.000		
	Age	.031	.036	.044	.860	.390	.657	1.521
	education	.142	.045	.165	3.182	.002	.640	1.562
	Annual household income	-.046	.034	-.062	-1.360	.175	.840	1.190
	Forestry	.215	.206	.049	1.043	.298	.787	1.271
	Instruction	.052	.047	.052	1.090	.276	.748	1.336
	Consultation	.248	.046	.283	5.371	.000	.621	1.611
	Agreement	-.040	.052	-.038	-.766	.444	.709	1.410
	Cooperation	.314	.064	.257	4.876	.000	.620	1.614
a. Dependent Variable: procedural equity								
b. Predictors: (Constant), Age, Education, Annual household income, Forestry, Instruction, Consultation, Agreement, Cooperation								

Supplementary Materials -Model S3 - A regression model distributional equity and relevant independent variables

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
3	.535a	.286	.270	.61367	1.914

a. Dependent Variable: distributional equity

b. Predictors: (Constant), Age, Education, Annual household income, Tourism ,Forestry, Instruction, Consultation, Agreement, Cooperation

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
3	Regression	62.442	9	6.938	18.423	.000b
	Residual	155.906	414	.377		
	Total	218.349	423			
a. Dependent Variable: distributional equity						
b. Predictors: (Constant), Age, Education, Annual household income, Tourism, Ranger, Instruction, Consultation, Agreement, Cooperation						

Coefficients								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
3	(Constant)	2.249	.172		13.054	.000		
	Age	.009	.029	.015	.293	.770	.654	1.530
	education	.045	.036	.066	1.259	.209	.636	1.572
	Annual household income	.018	.029	.030	.620	.536	.743	1.345
	Tourism	.092	.089	.048	1.031	.303	.806	1.240
	Forestry	-.014	.167	-.004	-.082	.934	.786	1.272
	Instruction	.079	.039	.100	2.055	.041	.734	1.362
	Consultation	.090	.037	.127	2.413	.016	.621	1.611
	Agreement	.088	.042	.104	2.095	.037	.702	1.425
	Cooperation	.296	.052	.300	5.689	.000	.619	1.615
a. Dependent Variable: distributional equity								
b. Predictors: (Constant), Age, Education, Annual household income, Tourism, Ranger, Instruction, Consultation, Agreement, Cooperation								

Supplementary Materials -Model S4 - A regression model combined social equity and relevant independent variables

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
4	.580a	.336	.321	.47910	1.802
a. Dependent Variable: combined social equity					
b. Predictors: (Constant), Age, Education, Annual household income, Tourism, Forestry, Instruction, Consultation, Agreement, Cooperation					

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
4	Regression	48.051	9	5.339	23.260	.000b
	Residual	95.029	414	.230		
	Total	143.080	423			
a. Dependent Variable: combined social equity						
b. Predictors: (Constant), Age, Education, Annual household income, Tourism , Forestry, Instruction, Consultation, Agreement, Cooperation						

Coefficients								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
4	(Constant)	2.377	.134		17.677	.000		
	Age	.020	.023	.044	.882	.378	.654	1.530
	education	.094	.028	.167	3.334	.001	.636	1.572
	Annual household income	.015	.023	.030	.657	.512	.743	1.345
	Tourism	-.022	.069	-.014	-.315	.753	.806	1.240
	Forestry	-.064	.130	-.022	-.491	.624	.786	1.272
	Instruction	.070	.030	.108	2.314	.021	.734	1.362
	Consultation	.139	.029	.243	4.787	.000	.621	1.611
	Agreement	-.002	.033	-.004	-.073	.942	.702	1.425
	Cooperation	.236	.041	.295	5.794	.000	.619	1.615
a. Dependent Variable: combined social equity								
b. Predictors: (Constant), Age, Education, Annual household income, Tourism, Forestry, Instruction, Consultation, Agreement, Cooperation								