Supplementary Information

Bridging Behavioural Experiments and Participatory Scenario Planning to Address Social Dilemmas in Conservation-Development Trade-offs

This file includes:
Materials and Methods for Study 1
Figures S1 to S7 for Study 1
Tables S1 to S8 for Study 1
Materials and Methods for Study 2
Results for Study 2

Materials and Methods (Study 1)

1. Experimental study

1.1 Participants

Inclusion criteria: Participants were included if they (1) completed the survey and answered all questions, (2) agreed to take part in the research, (3) were over 18 years old, (4) committed to answering honestly, and (5) passed an attention check. Data collection was conducted via Prolific, an online platform for recruiting research participants. The survey was designed to take approximately 10 minutes to complete. Participants were compensated with £1.40 for their time, which is in line with the Prolific platform's guidelines for fair compensation. Out of 416 individuals who attempted the survey, 360 met these criteria and received payment. Data for these participants was collected on two separate dates: (1) On 18th December 2023, 181 participants answered "Should" questions; (2) On 4th January 2024, 179 participants answered "Would" questions.

1.2 Experimental design

Each participant was randomly allocated into one of two conditions: first-person perspective (all stories used "You" and "Your community") and third-person perspective (all stories used a name e.g., Hank and Hank's community). The name was randomly allocated from 16 names, split into 8 male and 8 female names from different cultures. In each condition, participants read 10 stories about a green space. Participants read a short story and answer the question based on the scenario provided. Using the first-person scenario as an example, the story and the 10 statements are as follows:
The first two paragraphs are always the same:
"Imagine a green space in your community. This green space is a peaceful haven of nature amidst the urban setting. It is home to local plant and animal life, providing a breath of fresh air and a touch of natural beauty. Preserving this green space is beneficial for the environment and ecosystem in the short and long term. One day, it becomes known to you that the local government is considering a substantial change in land-use of the green space."
The third paragraph will provide a different information each time. Here are the 10 statements:

- Control: "It is not known to you for what purpose(s) the council intends on using the land."
- Aligned - Individual: "This green space has plants that purify the air, significantly improving air quality for you. Assume that you have asthma and are in need of clean air."
- Aligned - Community: "Local schools use this green space for environmental education. Preserving it will continue to allow hands-on learning experiences for the community's students."

- Aligned - Both: “The green space not only harbours plants that improve air quality for you (assuming you have asthma and are in need of clean air), but also serves as an outdoor classroom for the community’s schools, enriching education on environmental sustainability.”
- Temptation - Individual: “In addition to being a member of the community, you are also a local land developer, and you are offered a substantial profit to build residential complexes on the green space.”
- Temptation - Community: “The local council plans to convert the green space into a commercial use.
- The council is offering to fund community projects to compensate for the loss of the green space.”
- Temptation - Both: “A proposal has been made to convert the green space into a mixed-use area with residential buildings and a shopping mall, promising job opportunities for you and increased revenue for community projects.”
- Sacrifice - Individual: “The main reason for this change is that the council does not have enough resources to maintain this green space anymore. You are financially capable of contributing money to preserve this green space, but it would result in a short-term financial burden.”
- Sacrifice - Community: “The main reason for this change is that the council does not have enough resources to maintain this green space anymore. Local businesses in your community are capable of contributing money to preserve this green space, but it would result in a short-term financial burden on the community as a whole.”
- Sacrifice - Both: “The main reason for this change is that the council does not have enough resources to maintain this green space anymore. The community as a whole, including you and local businesses, are capable of contributing money to preserve this green space, but it would result in a short-term financial burden on you and the community as a whole.”

Participants were reminded to note that the stories are very similar. They should treat each story as independent from all the previous ones.
Participants then answer the question: What Should/Would You/third person name do? The choices are:

- Preserve: “Support the preservation of the green space as it is”
- Change: “Support the change in the use of the green space”
- Equal: “Show equal support for both decisions”

1.3 Demographics

Table S1 summarises the demographic information of participants.

Table S1. Demographics of Study 1. A total of 360 participants were paid and included in the main analysis. Number of participants and proportions (%) reported for the following variables: age, gender, employment, income, and education.

Characteristic	N = 360
Age	
18-24 years old	22 (6.1%)
25-34 years old	120 (33%)
35-44 years old	102 (28%)
45-54 years old	52 (14%)
55-64 years old	36 (10%)
65+ years old	28 (7.8%)
Gender	
Female	157 (44%)
Male	193 (54%)
Non-binary / third gender	8 (2.2%)
Prefer not to say	2 (0.6%)
Children	
0	217 (60%)
1	76 (21%)
2	51 (14%)
3	11 (3.1%)
4	5 (1.4%)
Employment	
Working full-time	216 (60%)
Working part-time	57 (16%)
Unemployed and looking for work	30 (8.3%)
A homemaker or stay-at-home parent	17 (4.7%)
Student	12 (3.3%)
Retired	16 (4.4%)
Other	12 (3.3%)
Income	
Less than $25,000	43 (12%)
$25,000-$49,999	75 (21%)
$50,000-$74,999	80 (22%)
$75,000-$99,999	48 (13%)
$100,000-$149,999	70 (19%)
$150,000-$199,999	0 (0%)
$150,000 or more	35 (9.7%)
Prefer not to say	9 (2.5%)
Education	
Some Primary	1 (0.3%)
Completed Primary School	1 (0.3%)
Some Secondary	7 (1.9%)
Completed Secondary School	35 (9.7%)
Vocational or Similar	23 (6.4%)
Some University but no degree	64 (18%)
University Bachelors Degree	148 (41%)
Graduate or professional degree (MA, MS, MBA, PhD, JD, MD, DDS)	79 (22%)
Prefer not to say	2 (0.6%)

1.4 Comprehension and attention questions

Comprehension questions. Before answering the comprehension questions, participants read a description of the following terms which they will encounter in the study:

- **Green Space**: An area of grass, trees, or other vegetation set apart for recreational or aesthetic purposes in an otherwise urban environment. Green spaces are essential for environmental health and provide a natural respite for urban residents.
- **Change in Land-Use**: In this context, "change in land-use" refers to modifying the purpose or function of a green space within an urban area. It often involves converting these areas, typically used for recreation or as natural habitats, into spaces for residential, commercial, or industrial development. This change can significantly affect local ecosystems and community access to natural environments.
- **Community**: A group of people living in the same place or having a particular characteristic in common. In the context of this study, 'community' refers to the collective of individuals and families who interact with and are affected by the green space.
- **Ecosystem**: A biological community of interacting organisms and their physical environment. In an urban context, an ecosystem includes not only human and animal life but also plants, microorganisms, and non-living elements like air and water, all interdependent and influencing each other's survival.

We had two comprehension checks in the survey. The first one was to check if the participant understood the definition of an ecosystem. The second one was to check if the participant understood the structure of the stories. We did not use these questions to filter out participants but rather to check if the participants understood the survey. We also provided them with the correct answer after they answered. Table S3 summaries number of participants answered the questions correctly and incorrectly.

Table S3. Comprehension check.

Characteristic	N = 360
Q1. Given the description in the previous page, which of the following falls under the term 'Ecosystem' [Choose all that apply]	
Correct	205
Incorrect	155
Q2. How should you approach the 10 stories you will read about the green space?	
Correct	325
Incorrect	35

Attention Question. In alignment with the rules of Prolific, surveys that last more than 5 minutes should include at least two attention questions and participants can only be excluded if they fail both questions. Prolific rules also mandate that the answer to the attention question should be presented on the same page. We asked the following two questions (the first appeared immediately before the first task, and the second appeared immediately after the second task):

Attention Question:

"In studies like ours, there are sometimes a few people who do not carefully read the questions they are asked and just quickly click through the survey. These random answers are problematic because they compromise the results of the studies. It is very important that you pay attention and read each question. Please answer YouTube in the question below, to show that you read our questions carefully (and regardless of your own opinion).

When an important event is happening or is about to happen, many people try to get informed about the development of the situation. In such situations, where do you get your information from?"

- TV
- X (formerly Twitter)
- Facebook
- YouTube
- Reddit
- Radio
- Newspaper
- Tiktok
- Other

1.5 Analysis

Preprocess data.
We created binary variables to simplify and standardise the interpretation of demographic predictors:

- College Education (college_educated): Participants were coded as college-educated (1) if they reported at least some university education, a university degree, a graduate/professional degree, or vocational training. All others (e.g., those with only primary or secondary schooling) were coded as 0. Participants who selected "Prefer not to say" were coded as missing.
- Employment Status (employed): Participants working full-time or part-time were coded as employed (1).Those who were unemployed, homemakers, students, or retired were coded as 0.
- Income Level (high_income): Participants reporting a personal income of $75,000 or more annually were coded as high income (1); those reporting less were coded as 0. "Prefer not to say" responses we retreated as missing.
- Parental Status (have_children): Participants who reported having one or more children were coded as1; those with none were coded as 0.

Statistical models.
We estimated three linear probability models (LPM) predicting participants' support for preservation(Preserve), using the felm() function with cluster-robust standard errors (clustered by ResponseId) toaccount for repeated responses from each participant.
In the first and third models, the key experimental predictors were four factors manipulated across trials:

- Type (within-subject):
  Participants were randomly assigned to one of three moral framing conditions:
  - Aligned (reference category)
  - Sacrifice
  - Temptation
- Level (within-subject):
  Each trial described a preservation action framed at one of three levels:
  - Both Individual & Community (reference category)
  - Community
  - Individual
- Perspective (between-subject; randomly allocated):
  Trials were presented from either a:
  - First-person (reference category)
  - Third-person perspective
- Grammar (between-subject; two different dates):
  The action framing used either:
  - Should (reference category)
  - Would

These manipulations were fully crossed in a factorial design and repeated across trials per participant. The reference categories (baseline) for each factor are reflected in the intercept of the models.
In Model 1, only the experimental manipulations were included. Model 2 tested the predictive power of demographics alone. Model 3 combined both experimental and demographic predictors.

Table S4 and S5 present results of the three regression models predicting support for preservation.

Table S4. Regression models predicting support for preservation. Linear probability models (LPM) were used (N = 360 participants; 3,240 responses). Column (1) only included the experimental manipulations. Column (2) tested the predictive power of demographics alone. Column (3) combined both experimental and demographic predictors. Coefficients represent changes in the probability of supporting preservation decisions; clustered standard errors (by participant Response ID) are shown in parentheses. Asterisks indicate statistical significance (*p<0.05, **p<0.01, ***p<0.001).

	Dependent variable:		
	Support for Preservation		
	Experimental	Demographics	Full
	(1)	(2)	(3)
Sacrifice	-0.157***		-0.166***
	-0.023		-0.024
Temptation	-0.188***		-0.199***
	-0.026		-0.026
Community	0.036*		0.039**
	-0.014		-0.015
Individual	-0.001		0
	-0.016		-0.016
Third perspective	0.024		0.023
	-0.025		-0.025
Would	-0.025		-0.006
	-0.025		-0.027
Age25-34 years old		0.029	0.028
		-0.053	-0.054
Age35-44 years old		0.059	0.059
		-0.054	-0.054
Age45-54 years old		0.115	0.114
		-0.061	-0.061
Age55-64 years old		0.085	0.087
		-0.064	-0.065
Age65+ years old		0.082	0.079
		-0.07	-0.07
Male		-0.059*	-0.058*
		-0.026	-0.027
Non-binary / third gender		0.072	0.07
		-0.055	-0.058
Have children		-0.061*	-0.062*
		-0.028	-0.028
Employed		-0.047	-0.048
		-0.03	-0.031
High income		-0.015	-0.016
		-0.026	-0.026
College educated		0.059	0.061
		-0.041	-0.042
Constant	0.768***	0.650***	0.749***
	-0.027	-0.065	-0.069
Observations	3,240	3,051	3,051
R2	0.033	0.017	0.053

Note: p<0.05; p<0.01; p<0.001

Clustered standard errors (by ResponseId) in parentheses.

Table S5. Aggregated results for participant responses to conservation–development scenarios across dilemma types and groups. The table shows the overall means, standard errors, and 95% confidence intervals (ci_upper, ci_lower) for the preservation, change, and equal-choice decisions, for each type and level (pooled over perspective and grammar). Higher values indicate stronger support for the stated option.

type	level	Estimate	se	ci_upper	ci_lower	Question
Aligned	Both	0.7916667	0.021434	0.8336773	0.749656	Preserve
Aligned	Community	0.7305556	0.0234161	0.7764511	0.6846601	Preserve
Aligned	Individual	0.8166667	0.0204219	0.8566936	0.7766398	Preserve
Sacrifice	Both	0.6194444	0.0256249	0.6696693	0.5692195	Preserve
Sacrifice	Community	0.6083333	0.0257621	0.6588271	0.5578395	Preserve
Sacrifice	Individual	0.6388889	0.0253505	0.6885758	0.589202	Preserve
Temptation	Both	0.5472222	0.026271	0.5987135	0.495731	Preserve
Temptation	Community	0.7277778	0.0234917	0.7738215	0.6817341	Preserve
Temptation	Individual	0.5	0.026389	0.5517224	0.4482776	Preserve
Aligned	Both	0.1222222	0.017287	0.1561048	0.0883397	Change
Aligned	Community	0.1833333	0.0204219	0.2233602	0.1433064	Change
Aligned	Individual	0.125	0.0174547	0.1592112	0.0907888	Change
Sacrifice	Both	0.2166667	0.0217431	0.2592832	0.1740501	Change
Sacrifice	Community	0.1972222	0.0210004	0.2383831	0.1560614	Change
Sacrifice	Individual	0.1888889	0.0206584	0.2293793	0.1483985	Change
Temptation	Both	0.2055556	0.021328	0.2473583	0.1637528	Change
Temptation	Community	0.1222222	0.017287	0.1561048	0.0883397	Change
Temptation	Individual	0.2861111	0.0238526	0.3328622	0.23936	Change
Aligned	Both	0.0861111	0.0148057	0.1151303	0.0570919	Equal
Aligned	Community	0.0861111	0.0148057	0.1151303	0.0570919	Equal
Aligned	Individual	0.0583333	0.0123697	0.082578	0.0340887	Equal
Sacrifice	Both	0.1638889	0.0195371	0.2021816	0.1255962	Equal
Sacrifice	Community	0.1944444	0.0208881	0.2353851	0.1535038	Equal
Sacrifice	Individual	0.1722222	0.0199276	0.2112803	0.1331642	Equal
Temptation	Both	0.2472222	0.0227683	0.291848	0.2025964	Equal
Temptation	Community	0.15	0.0188455	0.1869372	0.1130628	Equal
Temptation	Individual	0.2138889	0.0216416	0.2563064	0.1714714	Equal

1.6 Results

Figure S1 compares the proportion of supporting preservation in Should versus Would groups, categorized by dilemma type (Aligned, Sacrifice, Temptation), interest group affected (Individual, Community, Both), for the First-person and Third-person groups.

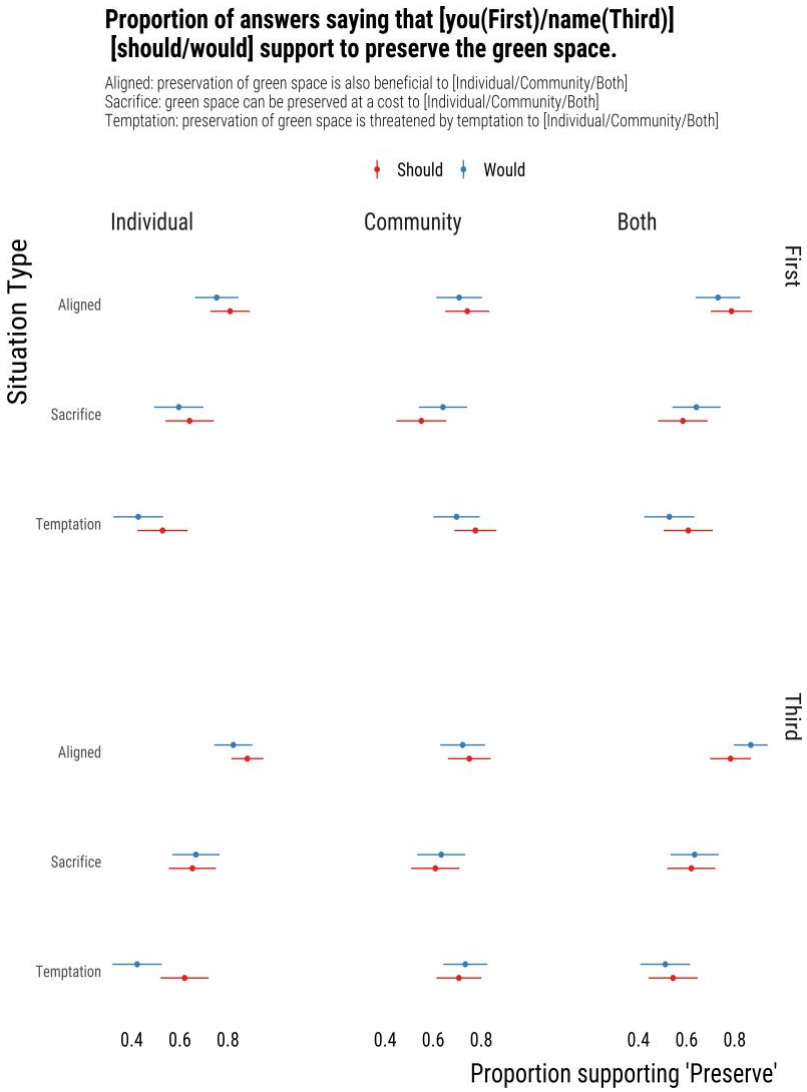


Figure S1. Comparison of preservation support in Should versus Would on across dilemma types, affected groups, and framing conditions (First-person vs. Third-person).

Figure S2 illustrates the difference between the proportion of supporting the re-purpose of a green space, categorised by dilemma type (Aligned, Sacrifice, Temptation), interest group affected (Individual, Community, Both), for the First-person and Third-person groups.

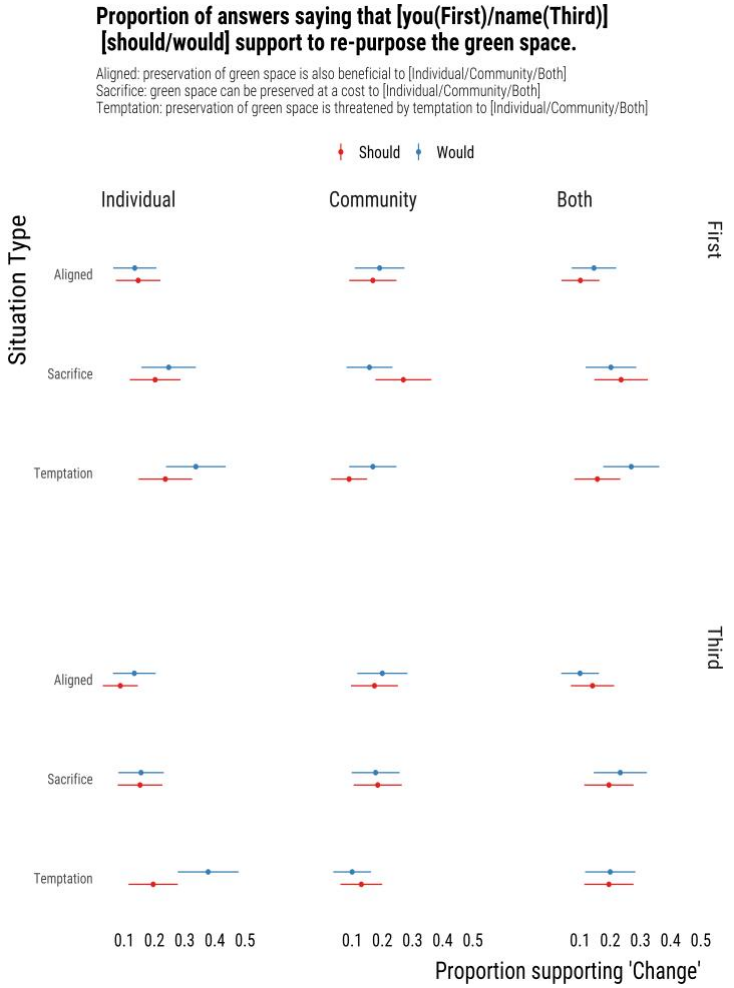


Figure S2. Comparison of re-purpose support in Should versus Would on across dilemma types, affected groups, and perspective-taking.

Figure S3 compares differences between Third-Should and First-Would conditions in support for preserving the green space, categorised by dilemma type (Aligned, Sacrifice, Temptation), interest group affected (Individual, Community, Both).

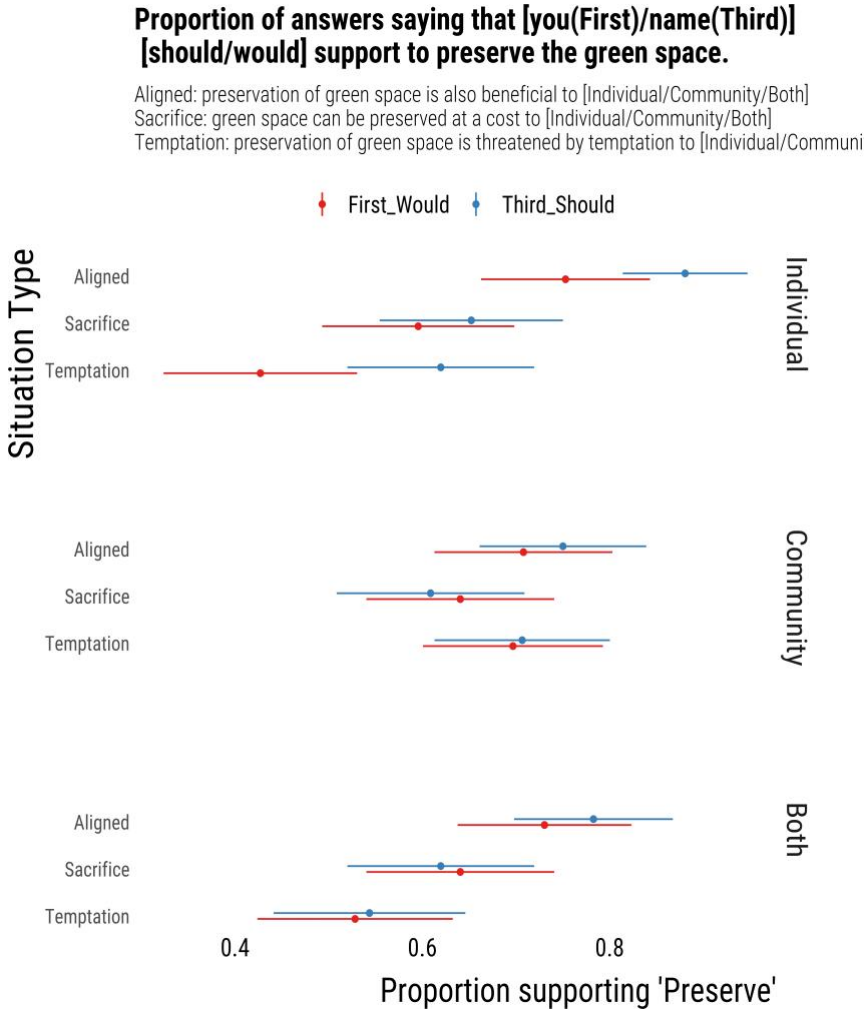


Figure S3. Differences between Third-Should and First-Would conditions in support for preservation.

Figure S4 compares differences between Third-Should and First-Would conditions in support for repurposing the green space, categorised by dilemma type (Aligned, Sacrifice, Temptation), interest group affected (Individual, Community, Both).

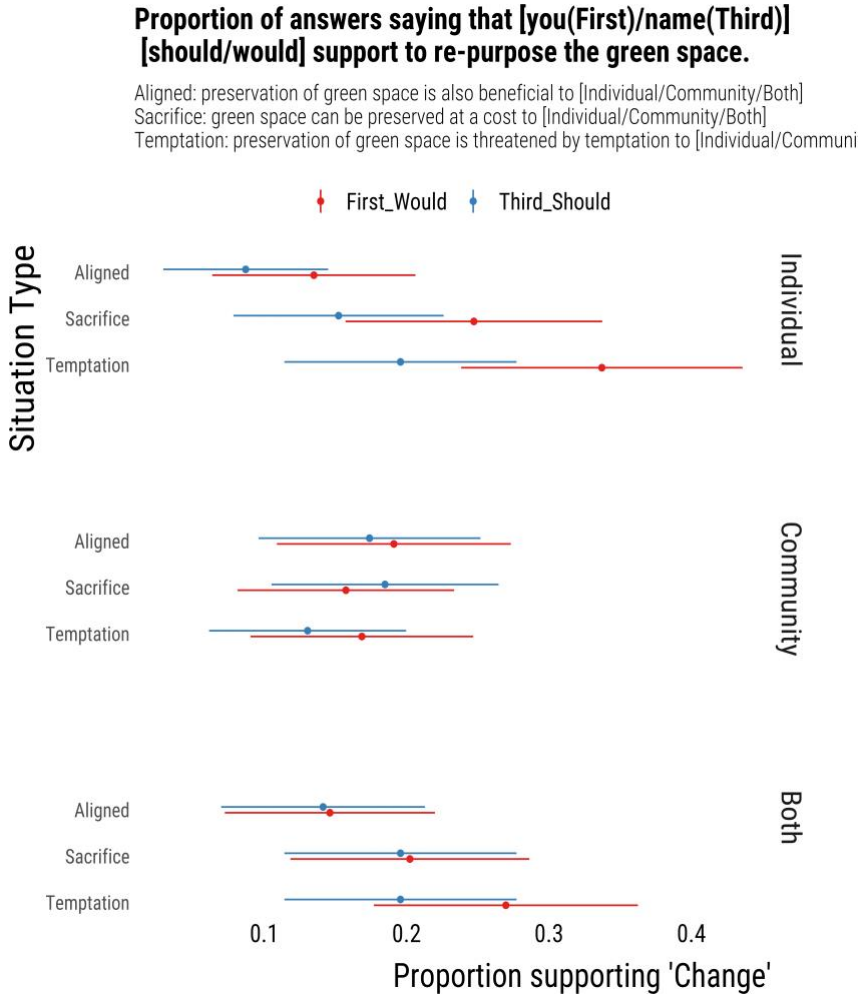


Figure S4. Differences between Third-Should and First-Would conditions in support for re-purposing.

1.7 Heterogeneity

Figure S5 shows effect of name on preservation, classifying the used names into male and female names. It seems like people required male characters to preserve green space more than their female peers. This is not necessarily statistically significant.

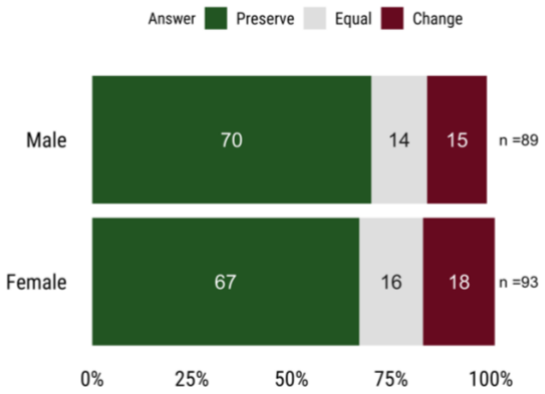


Figure S5. Effects of name on decision-making.

Table S6 summarises participants' answers for the realism and relevance of the scenarios presented, their perceptions of conflicts between individual, community, and ecosystem interests, and their personal preferences regarding the use of green spaces. The majority (76%) indicated their responses closely reflected real-life decisions, and most (81%) felt scenarios were somewhat to highly realistic. Respondents widely acknowledged conflicts between individual and community (92%) and community and ecosystem interests (90%). Preferences regarding personal use of green spaces varied, with balanced use (49%) slightly exceeding strict preservation (47%). Community influence on personal property decisions was mixed, with a notable minority (42%) supporting individual autonomy. Responses also varied regarding community objections to personal property use, with 56% of participants open to reconsideration.

Table S6. Proportion of answers for each of the 9 questions which we included at the end for exploration purposes and for potential heterogenous effects.

Characteristic	**N = 360**
To what extent do the responses you provided in this survey reflect actions you would actually take in	
Completely or mostly reflect	274 (76%)
Somewhat reflect	81 (23%)
Minimally reflect or do not reflect at all	5 (1%)
To what extent do the scenarios presented in this survey resemble situations you might encounter or	
Completely or mostly resemble	137 (38%)
Somewhat resemble	156 (43%)
Minimally resemble or do not resemble at all	67 (19%)
Do you believe that the interests of individuals can be in conflict with the interests of their larger	

Yes	332 (92%)
No	4 (1%)
Unsure	24 (7%)
Do you believe that the interests of communities can be in conflict with the well- being of the larger	
Yes	323 (90%)
No	12 (3%)
Unsure	25 (7%)
What type of area do you live in?	
Large urban city	80 (22%)
Medium-sized city	32 (8.90%)
Small town	50 (14%)
Suburban area (residential area near a city)	160 (44%)
Rural or countryside	38 (11%)
Other (please specify)	0 (0%)
How would you describe the amount of green spaces (like parks, gardens, or natural areas) in your area?	
Abundant – lots of green spaces easily accessible	123 (34%)
Moderate – some green spaces, but not extensive	184 (51%)
Limited – very few green spaces	51 (14%)
None – no green spaces at all	1 (0.3%)
Not sure/I don't know	1 (0.3%)
Imagine you own a green space (such as a backyard) in your area. How would you prefer to use this	
Preserve it mainly for its natural state and greenery	170 (47%)
Re-purpose it for personal use (e.g., building, recreational activities)	8 (2%)
Balance between preservation and personal use	176 (49%)
Not sure / Prefer not to say	6 (2%)
If you choose to re-purpose your green space for a use other than preservation (e.g., construction,	
No say – It's my property and my decision	150 (42%)
Some say – Community opinions should be considered but not decisive	106 (29%)
Significant say – Community approval should be required for major	68 (19%)
Full say – Community should have the final decision	15 (4%)
Not sure / Prefer not to say	21 (6%)
Considering the potential environmental impact, how likely would you be to change your decision	
Very unlikely – I would stick to my original decision	65 (18%)
Somewhat unlikely – I might reconsider but not necessarily change my	79 (22%)
Neutral – It could go either way	97 (27%)
Somewhat likely – I would likely reconsider my decision	75 (21%)
Very likely – I would definitely change my decision based on	30 (8%)
Not sure / Prefer not to say	14 (4%)

Materials and Methods (Study 2)

2.1 Workshop procedure and template worksheets

Figure S6 illustrates the four-step participatory workshop process used to co-create experimental scenarios addressing social dilemmas in conservation-development trade-offs. This structured approach involved identifying focal conservation and community issues, imagining variations including positive and negative outcomes (give-some, take-some, win-win, lose-lose situations), exploring diverse stakeholder perspectives on these dilemmas, and finally, designing experiments by creating a matrix of scenarios through cross-factor analysis.

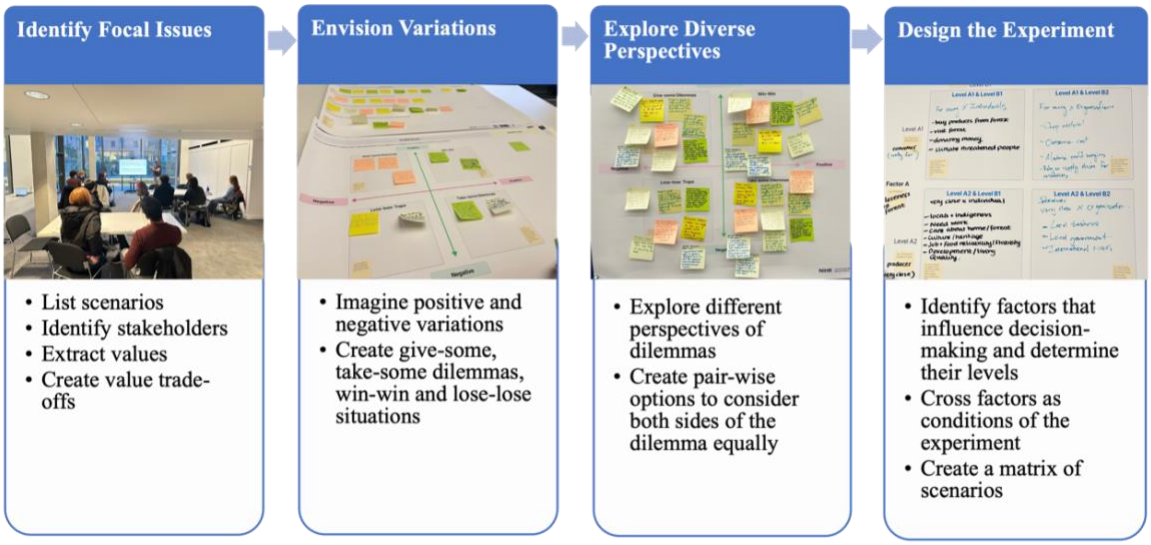


Figure S6. The four steps of the first workshop.

The following four worksheets showcases the template used during the workshops:

Part 1: Identify Focal Issues

Co-create story-based scenarios

Scribbling area

List Scenarios: What are some ecologically-relevant scenarios you can think of which may include dilemma situations? List 3-6 scenarios

e.g. The local government is considering a substantial change in land use of a green space which provides home for animals and plants

Pick your scenarios

Identify Stakeholders: Choose 1-2 scenarios from the above. For each scenario, list everyone who can be affected in that scenario

These can be individuals, communities, organisations, ecosystems, directly or indirectly affected, split into subgroups if needed (e.g., children vs. adults)

e.g. for green space:

Community;
Local government;
Environment

Identify your stakeholders

Extract Values: Choose 1-2 scenarios from the last part. For each scenario and each stakeholder, list all relevant values

These can be efficiency, effectiveness, safety, privacy, security, fairness, autonomy, flexibility, sustainability, transparency, well-being, purity, aesthetics

e.g. for green space:
Community:
well-being, purity, aesthetics, efficiency
Local government:
efficiency
Environment:
sustainability

Extract your values

Create Value tradeoffs: Choose 1-2 scenarios from the last part. For each scenario, list relevant values tradeoffs associated with each option

e.g. for green space
preservation:
Positives: sustainability for environment; well-being for community
Negatives: less Effectiveness for government and community

re-purposing
Positives: Effectiveness for government
Negatives: less sustainability for environment; harm (less safety) for non-human lives

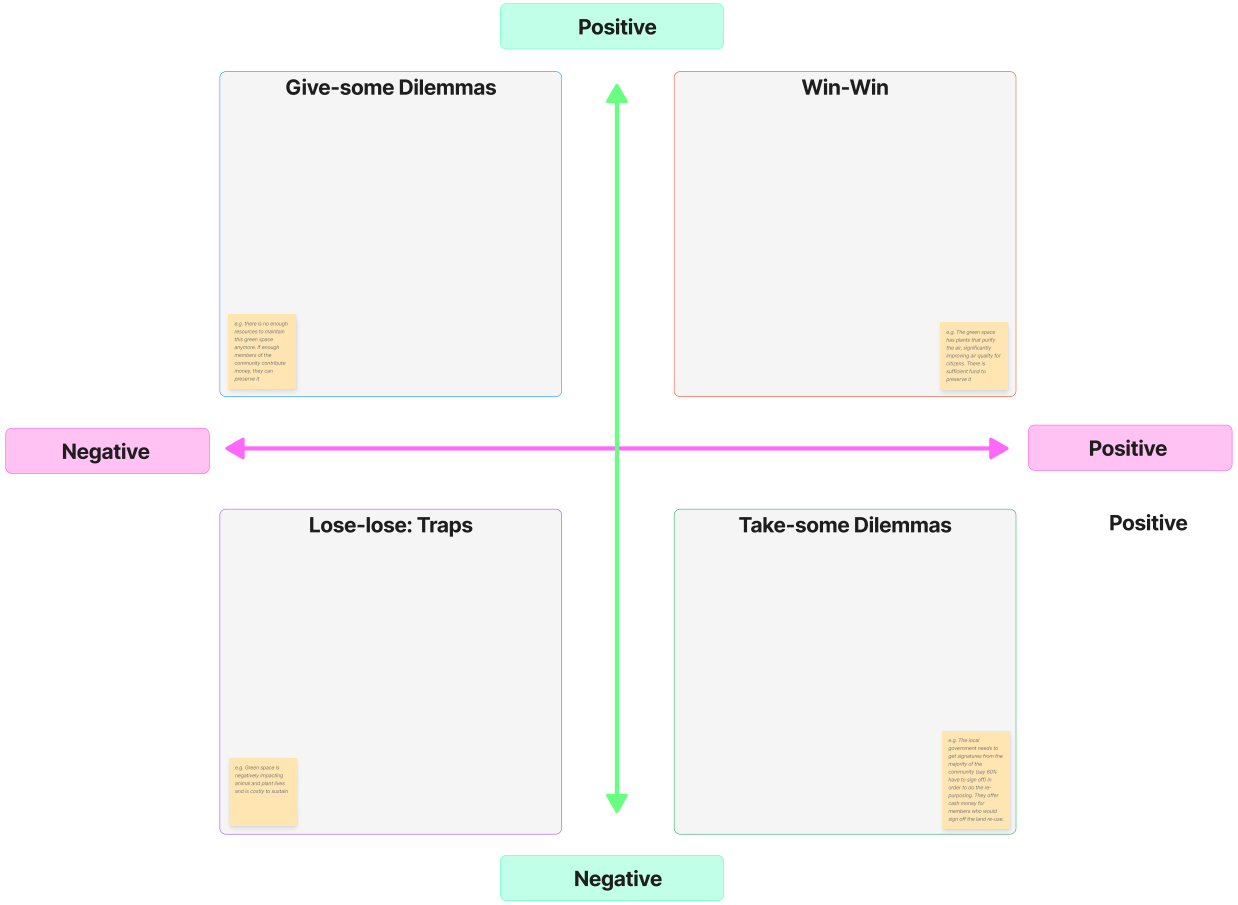
Create your value tradeoffs

Part 2: Envision Variations

Imagine different possibilities for your scenarios

Scribbling area

Choose one of the scenarios you worked on in Part 1. Imagine different variations in terms of dilemmas, best-case situations (Win-Win), and worst-case situations (Lose-Lose) and locate them in the relevant box below:



Part 3: Explore Diverse Perspectives

Explore factors influencing decision-making

Play a game to explore how different factors influence decision-making in dilemma situations.

Step 1: Select a Scenario
Start by choosing one scenario you developed in Part 1.

Step 2: Develop Scenario Variations
Create 10 unique variations of this scenario. Aim for a diverse range that equally influences the attractiveness of the two options in the dilemma.

- **Variation Goal**: Craft 5 variations designed to sway a person towards choosing Option A, and another 5 variations aimed at making Option B more appealing.
- **Restriction**:

a. All variations should resemble relevant and/or interesting cases rather than verging on extreme unrealistic cases.

b. Variations should preserve the essence of the dilemma (without making structural changes).

Step 3: Evaluate Your Scenarios
A participant, who is unaware of the game's mechanics, will respond to all 10 variations.

Step 4: Scoring Method
Your score will be determined by the numberof the less frequently chosen option. For example:

- If the participant chooses Option A 7 times and Option B 3 times, your score is 3 (the lesser of the two).
- If Option A is chosen in all 10 variations, you score 0, as 0 is the minimum choice between the two options (0 for Option B, 10 for Option A).

Goal of the game: The aim is to create scenarios that are balanced and compelling, challenging the participant to consider both sides of the dilemma equally.

Example: Green Space Dilemma
Scenario 1: Promoting Preservation

- *Option A (Preserve): By choosing to preserve the green space, you will protect the habitat of an endangered and beloved species, the cute panda.*
- *Option B (Re-purpose): Choosing to re-purpose the green space means the government and a company will collaborate on a new project, potentially generating significant revenue for both.*

Scenario 2: Promoting Re-purposing

- *Option A (Preserve): Opting to preserve the area saves a critical habitat for an endangered snake.*
- *Option B (Re-purpose): If you decide to re-purpose the green space, it will be developed into a mental health hospital. This facility addresses a pressing community need.*

Scribbling area

Part 4: Design the experiment

Use the scenarios and factors in experimental design

Designing a Multi-Factorial Experiment

Step 1: Scenario Selection
Start by selecting one scenario you developed in Part 1 of this project.

Step 2: Identify Factors
Reflect on your previous work in Parts 2-3. Identify two distinct factors from your scenario that influence decisions. You're welcome to choose more than two factors if you wish.

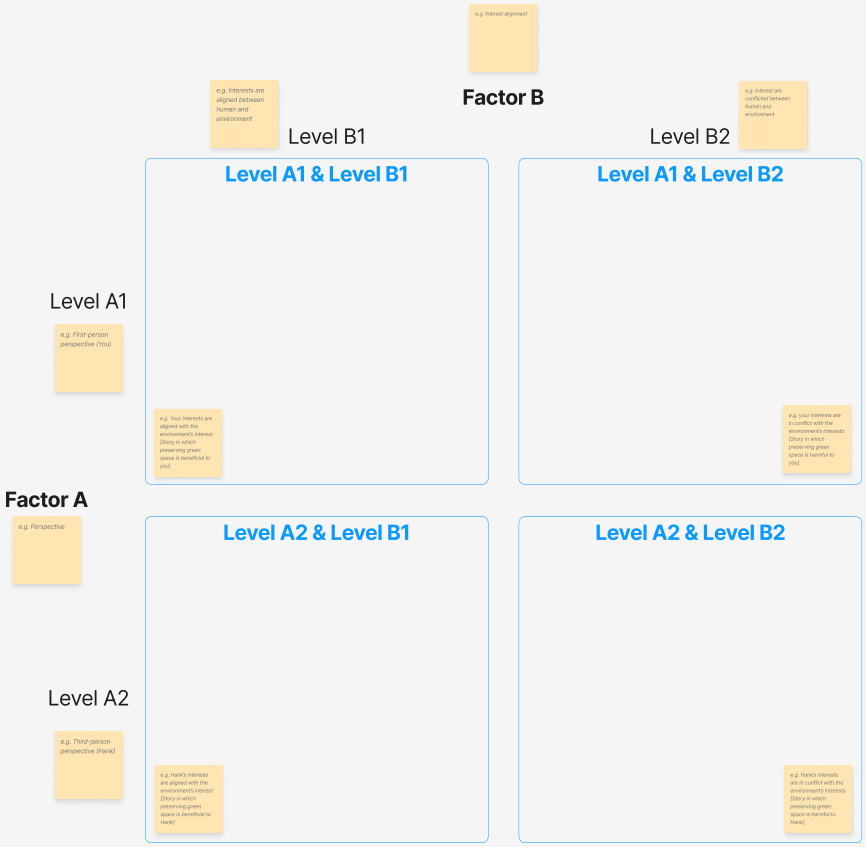
Step 3: Define Levels
For each factor chosen, determine at least two possible levels. These levels represent different states or variations of each factor.

Step 4: Cross the Factors
Utilize a cross (Cartesian product) of the levels of your chosen factors to outline your experimental conditions. This means you'll combine every level of one factor with every level of the other, creating a comprehensive set of scenarios.

Example: If you have two factors (Factor A and Factor B), and each has two levels (A1, A2 for Factor A and B1, B2 for Factor B), you will generate four experimental conditions as follows:
Condition 1: A1B1 | Condition 2: A1B2 | Condition 3: A2B1 | Condition 4: A2B2

Objective: Your goal is to design an experiment that systematically explores how different combinations of factors and their levels influence decision-making within your chosen scenario. This approach allows for a nuanced understanding of the factors at play.

Scribbling area



2.2 Results

2.2.1 Scenarios generated from the first workshop

Table S7 summarises 29 distinct scenarios identified and discussed by participants during participatory workshops.

Table S7. List of scenarios generated during the first participatory scenario planning workshop.

	List of scenarios
1	Animal testing
2	Sponsoring an endangered species or habitat
3	Allotments - whether to build or not?
4	Wind turbines in local area
5	Meat consumption
6	Should government subsidise large fishing boats?
7	Overtourism (in national parks / Hawaii etc.)
8	Clothes / consumer values (eco friendly vs. cheap, e.g. SHEIN vs. Patagonia)
9	Development along a shoreline
10	Putting in a new hydro-power dam
11	Choosing whether to support a new local housing development
12	The local council wants to repurpose the green belt to build a housing estate
13	The government wants to carry out a scheme for deforestation in order to repurpose the land
14	A wealthy farmer wants to build a stinky pig farm on pristine natural land that is near the village centre
15	The council doesn't have enough money to afford both a new SEND school and also to make a proper sewage plant. Without a sewage plant the raw sewage will be dumped into the rivers and devastate the ecosystems
16	A hotel company wants to build a new resort down the beach from one of the only hatching places of a rare turtle. It is possible the resort-goers would disturb turtles
17	The council plans to move sand from an ecological reserve to tourist beaches to increase revenue. This would destroy the natural habitat of the local marine wildlife.
18	The government wants to dam a river and turn it into a reservoir
19	A hotel company wants to build a new resort on a coastal ecological reserve. This will disrupt local wildlife, and the acquisition of resources from the surrounding areas will create an even bigger impact.
20	Convert a park into a habitat for an endangered butterfly species. This results in a loss of public space.
21	Replace a green space with housing. This is cheap/used by students/luxury
22	Put limits on fishing; fishermen will lose jobs but the fish population may recover.
23	Replace a park with housing.
24	Repurpose derelict homes for indoor gardens.
25	Heat control for energy reduction. This will impact the mental health/comfort of the residents.
26	Reducing deforestation
27	Reducing beef consumption. (Cultural significance)
28	Protect the rainforest or deforestation and repurposing the land for sheep farms or palm plantations.
29	More roads to reduce traffic or using/funding more public transportation

The detailed descriptions of scenarios from the first workshop are summarised as follows:

In the first scenario, ‘build or not build a dam’, stakeholders such as the local community, government, water companies, and the ecosystem each have distinct values they prioritised. In a take-some dilemma, the temptations to build the dam include downstream development, increased jobs, decreased water prices, and government subsidies. Conversely, a give-some dilemma requires sacrifices from locals or the entire community, such as investing money, relocating houses, and reducing energy use. Lose-lose situations arise from excessively high costs that cause the river to dry up or the reservoir to flood, along with the simultaneous destruction of local businesses and the ecosystem. Win-win outcomes occur when construction prevents flooding and provides water and energy, or when the ecosystem feeds and entertains the community while becoming a habitat for other species. The dilemmas listed include economic benefits, such as profits from hydroelectric power, against environmental and social costs like habitat destruction and community displacement. Factors for experimental design include whether there is an alternative site for building the dam (A1) or if this is the only option (A2), and whether hydroelectricity could benefit a large population (B1) or just a small population (B2).

The second scenario focuses on deforestation for farming versus forest conservation. Stakeholders include farmers, logging workers, local food producers concerned with job and food security, animals that rely on the forest for food, and indigenous populations with cultural ties to the forest. In a give-some dilemma, limiting farming could lead to short-term financial hardship, whereas in a take-some dilemma, logging or hunting is allowed only sustainably. Lose-lose situations arise when restricting farming reduces funding for forest conservation or when excessive farming leads to toxic waste, deforestation, and species relocation. Conversely, win-win outcomes balanced sustainability and prosperity, such as plantations where forest insects pollinate crops, enhancing productivity and biodiversity, or farming profits funding forest preservation. The trade-offs include the potential for sustainable farming techniques to reduce ecological impacts and alleviate poverty versus threats to safety and loss of cultural heritage. Factors considered include the stakeholders significantly affected (individuals vs. organizations) and the proximity of stakeholder locations (distant vs. local).

The third scenario involves tourism development along a shoreline, balancing the interests of tourists, local communities, and environmental sustainability. The give-some dilemma requires people to sign a petition to stop development, while the take-some dilemma considers how tourism income could benefit the community. Lose-lose situations involve development plans being forced to abandon or becoming unprofitable, and the environment being damaged in the process. A win-win outcome occurs when the community agreed to develop sustainably, with profits offsetting environmental destruction. The trade-offs include increased tourism revenue and job creation, weighed against potential light pollution, disruption of local aesthetics, and the risk of losing cultural heritage. Factors identified included age (youth vs. elderly) and interest (environment vs. economic).

2.2.2 Scenarios generated from the second workshop

Table S8 showcases scenarios created during the second participatory scenario planning workshop. A detailed description of the three selected scenarios are presented here:

In the ‘Use of plastic bags’ scenario, stakeholders prioritize different values. Consumers value efficiency and environmental sustainability, shops focus on profit and operational efficiency, and the government aims to achieve a circular economy. A give-some dilemma requires many to stop using plastic bags, though some may not comply. The take-some dilemma involves shops charging for plastic bags to boost profits. Lose-lose situations arise when higher costs lead to increased plastic disposal, harming both the economy and the environment. Win-win outcomes occur through the development of reusable bags and the promotion of eco-friendly purchasing, benefiting both businesses and the environment.

The ‘Buy fast fashion clothes’ scenario highlights conflicting values among stakeholders. Consumers seek lower costs and a strong social image, companies aim for profit, influencers focus on engagement, factory workers depend on fair wages, and the environment values sustainability and aesthetics. A give-some dilemma involves consumers buying fewer clothes and investing more time and money in sustainable options, which can be costly. The take-some dilemma permits sustainable practices when government subsidies manufacturers. Lose-lose situations occur when consumers become victim of greenwashing, while negatively impacting factory workers and the environment despite reduced purchases. Win-win outcomes include spending less on clothes, opting for stylish second-hand items, and reducing unethical labour practices, benefiting both consumers and workers.

In the ‘Littering in conservation areas’ scenario, stakeholders holdholde varied values. Wildlife may just need survival and health, pickers a clean environment, droppers seek convenience and freedom, while the local council aims for tourism revenue and political re-election. A give-some dilemma involves some individuals picking up litter, requiring extra effort, while others may not participate. The take-some dilemma sees individuals littering and free-riding on others' efforts. Lose-lose situations arise when everyone litters, making the environment messy and inconvenient. Conversely, win-win outcomes occur when no one litters, keeping the area clean with minimal effort from everyone.

Table S8. Scenarios created during the second participatory scenario planning workshop.

Scenario 1: Use of plastic bags	Stakeholder values: Me: efficiency, care about environmental sustainability and recyclability Shops: profit, efficiency Government: accomplishment of circular economy	Give-some dilemma - Enough people need to stop using plastic bags but others may not do the same	Win-win - Development of reusable bags and packages, and behaviour change towards eco-friendly purchasing
		Lose-lose - People pay more for them, and more plastics are disposed of	Take-some dilemma - Shops charge for plastic bags to increase profit
Scenario 2: Buy fast fashion clothes	Stakeholder values: Consumer: lower cost, social image Company: profit Influencers and fashion industry: engagement and impact Factory workers: living expense payments Environment: aesthetics and sustainability	Give-some dilemma - Consumers buy less clothes, and spend more time and money for sustainable options	Win-win - Less spending on clothes, more stylish second-hand clothes, and less unethical labour
		Lose-lose - Consumers become victim of greenwashing and still negatively affect factory workers and the environment	Take-some dilemma - Government subsidies manufacturers to adopt sustainable practices
Scenario 3: Littering in conservation areas	Stakeholder values: Wildlife: survival, health Pickers: altruism, a clean environment Droppers: convenience, freedom Local council: tourism revenue, political re-election Locals: social pressure, responsibility, blame	Give-some dilemma - Some people pick up the litter: some need to make extra effort and time	Win-win - No-one litters: little work required, environment is clean
		Lose-lose - Everyone Litters: environment becomes messy and inconvenient to live in	Take-some dilemma - Some people litter: some people take advantage and free ride