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Abstract

"Intergenerational sustainability dilemma (ISD)" is a serious problem in that the current generation tends to choose actions to her benefit without considering future generations. However, little is known about how people deliberate and what kind of "concepts" people bring to decide on ISD in societies. We institute field experiments of an ISD game (ISDG) and conduct qualitative deliberative analysis in rural and urban societies of Nepal. A sequence of six generations, each of which consists of three people, is organized and each generation is asked to choose whether to maintain intergenerational sustainability (sustainable option) or maximize her payoff by irreversibly imposing costs on future generations (unsustainable option) in ISDG. Each generation makes a 10-minutes discussion for the decision, enabling deliberative analysis in ISD. The qualitative deliberative analysis shows that the attitudes and concepts, such as ideas, motivations and reasoning, that people discuss during deliberation vary between urban and rural people. A considerable portion of urban people are identified to be "stable" as an "influencer" that consistently argues her support for unsustainable option, while another considerable portion of urban people are "dependent" as a "conditional follower." Together with this fact, urban subjects bring concepts not to consider future generations more frequently and widely during their deliberation than do rural people, leading urban generations to choose unsustainable option. Overall, our deliberative analysis finds that urban subjects may be losing concerns for future generations.

Key Words: Intergenerational sustainability; future generations; deliberative approach; economic experiments

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Contents

1 Introduction

Capitalism and democracy are two dominant social regimes over several decades that are considered to provide goods and services "efficiently" through competition and freedom (Piketty, 2014). This efficient property serves as a main engine of economic growth, due to which the current generation has been utilizing resources more than ever with technological advancement and product innovation (Garri, 2010, Rogelj et al., 2017). However, the market competition and efficient property do not appear to function in reality as economic theory predicts (Kolstad, 2010). For instance, intra- and inter-generational allocations of environmental goods and natural resources are claimed to be inefficient as illustrated by climate change and natural resource depletion (Frederick et al., 2002, Rockstrom et al., 2009, Thompson, 2010, Jacobs and Matthews, 2012). More concretely, the current generation tends to take advantage of resources without fully considering future generations and leave more burdens on them, which we call "intergenerational sustainability dilemma (ISD)." In various contexts, many important decisions for ISD problems are made by groups, such as committees, juries, teams and associations that are typically followed by intra-group deliberation. Therefore, this paper addresses how people in a group deliberate in ISD.

Past literature has examined intergenerational sustainability in various settings. Fischer et al. (2004) have shown that people do not exploit resources in the existence of "intergenerational link" in a common pool experiment. Chaudhuri et al. (2009) have found that communication device such as leaving an advice to subsequent generations enhances intergenerational coordination. Hauser et al. (2014) have demonstrated that a voting mechanism can play an important role in promoting intergenerational sustainability. Kamijo et al. (2017) have designed and implemented a laboratory experiment of ISD game (ISDG) by introducing a treatment of negotiators for future generations and claimed that such a negotiator could improve intergenerational sustainability. Sherstyuk et al. (2016) have analyzed the level of difficulties in maintaining dynamic externalities by implementing laboratory experiments and suggested that, due to the strategic uncertainty, it is difficult to improve dynamic efficiency in an intergenerational setting. Shahrier et al. (2017) have conducted field experiments of ISDG in the capital city of Bangladesh and rural areas, and confirmed that urban

people fail in maintaining intergenerational sustainability due to a high proportion of proself people in urban areas.

Many experimental studies have focused on communication to understand how individuals and groups make decisions. Several works have identified that even non-informative cheap talk or chat can be an effective tool to facilitate coordination (Cooper et al., 1992, Charness, 2000, Duffy and Feltovich, 2002, Charness and Grosskopf, 2004, Blume and Ortmann, 2007, Ambrus et al., 2015). On the other hand, there are some specific situations where communication does not enhance coordination such as in competitive coordination games, showing that group members engage in a costly communication to achieve intra-group coordination, yielding a coordination failure with other groups (Bornstein et al., 2002, Cason et al., 2012, 2017). Some literature has used content analysis of a group chat to understand the roles of communication, suggesting that inter-group relationship is characterized by fear and greed (Cooper and Kagel, 2005, Keck et al., 2014, Bradfield and Kagel, 2015, Kagel and McGee, 2016). Overall, these experimental results show that communication does not always bring a successful coordination or outcome in intra- or inter-group relationships, and the content analysis of chats reveals various reasons behind the results.

In the fields of philosophy and political science, there are several studies that have tried to understand roles and functions of deliberation among people in collective decision-making situations (Cohen, 1986, Rawls, 1993, Chambers, 2003, Niemeyer and Dryzek, 2007). Some class of literature suggests that deliberation can be considered tools for understanding deeper aspects of sociodemographic background, culture and ways of communication in societies (See, e.g., Steenbergen et al., 2003, Dryzek and List, 2003, Gronlund et al., 2009, Mercier and Landemore, 2012, List et al., 2013, Klinger and Russmann, 2015, Pedrini, 2015), and is easily understood by ordinary people and believed to promote fairness and unbiased decisions (Simon and Sulkin, 2002, Fishkin and Luskin, 2005). Goeree and Yariv (2011) have suggested that deliberative voting rules provide deeper insights in an agenda setting and collective decisions. Ban et al. (2012) have used field data from a village parliament in South India and identified that deliberation can bring more consensus for prioritizing public goods and safeguard policies from corruption.

Intergenerational sustainability has been discussed in relation to justice, ethics and equity (Rawls, 1971, Barry, 1997, Wolf, 2007, 2008). Past literature has provided a wide variety of theories and evidence on the effects of deliberation. However, none of the literature has analyzed deliberation to understand how people think facing ISD. Given this state of affairs, we seek to identify attitudes and concepts, i.e., ideas, motivations and reasoning people bring during deliberation by instituting ISDG in rural and urban societies of Nepal. A sequence of six generations, each of which consists of three subjects, is organized and each generation is asked to choose whether to maintain intergenerational sustainability (sustainable option) or maximize her own generations' payoff by irreversibly imposing a cost on future generations (unsustainable option) in ISDG. Each generation makes 10-minutes deliberation for the decision, enabling deliberative analysis in ISD. A novelty in this research is to employ qualitative deliberative analysis to reveal the "attitudes" and "concepts" that rural and urban people have in ISD, especially concerning whether or not to consider sustainability of future generations.

2 Methods and materials

2.1 Study areas

This experiment has been conducted in two types of Nepalese fields: (i) urban areas, such as Kathmandu, Lalitpur, Bhaktapur and Pokhara city, and (ii) rural areas of several traditional villages from Parbat and Chitwan districts. These areas are almost homogeneous in terms of culture, language and religion. The urban residents are usually high in human development index on the basis of UNDP (2014), and the population density is high. For instance, Kathmandu has a population density of people 4416 people per km^2 (Central Bureau of Statistics, 2011) and is the most crowded city, with $24.3\,\%$ of the total urban population in Nepal. Big cities such as Kathmandu and Pokhara are the centers for businesses and services. The rural areas consist of different villages of the Western Hills and Central Terai, such as the Parbat and Chitwan districts (figure 1). The population densities of Chitwan and Parbat are 261 people per km^2 and 297 people per km^2, respectively

(Central Bureau of Statistics, 2011). These villages consist of mostly farmers who engage in small scale farming, generation after generation, and a very limited number of businesses and services, typically small-scale ones, are available.

[Figure 1 about here.]

2.2 Experimental setup

We have conducted an intergenerational sustainability dilemma game (ISDG) with deliberation and collected questionnaire surveys to obtain sociodemographic data in rural and urban areas.

Intergenerational sustainability dilemma game with deliberation

The ISDG was implemented, basically following the laboratory and field experiments employed in Kamijo et al. (2017) and Shahrier et al. (2017). Three subjects in a group are called a generation, and each generation needs to choose between options A and B. The generation receives a payoff of X by choosing option A and a payoff $X - 300$ by choosing option B. After making a choice between A and B, the generation is asked to split the payoff associated with the option they choose among the generation members. Each of the subject's payoffs in the ISDG is the sum of their generation share plus the initial experimental endowment of 300. For instance, by choosing A, the generation earns 1200 experimental points ($X = 1200$), whereas by choosing B, the generation earns 900 points ($= X - 300 = 1200 - 300$). Consequently, if members of this generation split the payoff equally among them, each member earns 400 by choosing A and 300 by choosing B as a generation share. Therefore, the total payoff of each subject with generation choice A becomes 700 ($= 400 + 300$), whereas it becomes 600 ($= 300 + 300$) with generation choice B.

Each generation is allowed to deliberate the decision between A and B as well as how to split the generation payoff up to 10 minutes of discussion. However, when the decisions cannot be made within 10 minutes, the following rules have been applied, (1) if the generation share the group receives is positive, each member receives an initial endowment of 300 points only, (2) if the

generation share the group receives is negative, say, $-Z$, each member equally splits $-Z$ by three and receives the payment of $-\frac{Z}{3}$ plus an initial endowment of 300 points, (see Appendix for the details).

Each session consists of $18 \sim 24$ subjects, organizing a sequence of $6 \sim 8$ generations. Each generation is randomly assigned to one of the $1\text{st}, 2\text{nd}, \ldots$ and 6th generations. When the number of subjects that participated in a session are 21 or 24, we organize 7th and even 8th generations. However, they are assigned as 1st and 2nd in another sequence of generations as indicated in figure 2. One generation's decision affects the subsequent generations such that subsequent generations' payoffs decrease uniformly by 300 when the generation chooses option A, otherwise not. For instance, suppose that $X = 1200$ and the 1st generation chooses A. Then, the 2nd generation will face a game in which they can receive 900 and 600 by choosing A and B, respectively. However, if the 1st generation chooses B, the next generation can have the same decision environment as the 1st generation faced. When the 1st generation chooses B, the 2nd generation can have the game in which they can receive 1200 and 900 by choosing A and B, respectively. Following the same rule, the game continues for the rest of the subsequent two generations (i.e., between ith and $i + 1$th generation). Hence, option B can be considered an intergenerational "sustainable option," whereas option A is the choice that compromises intergenerational sustainability and can be considered an "unsustainable option." In each session, the 1st generation starts the ISDG game with $X = 1200$, implying that the 5th and 6th generations may face the game in which options A and B are associated with payoffs of 0 and -300, respectively, when previous generations keep choosing option A.[1] In ISDG, subjects are paid $550\,\mathrm{NPR}$ ($\approx 5.00\,\mathrm{USD}$) at maximum and $350\,\mathrm{NPR}$ ($\approx 3.50\,\mathrm{USD}$) on average.

[1] When the 5th and 6th generations face the game in which options A and B are associated with zero or a negative payoff of -300, the generation members can refund themselves equally from their initial endowment of 300 to make the individual payoff be at least zero.

2.3 Experimental procedure

In the experiments, we hire local supporting staffs and research assistants (the first author is a chief administrator for the experiment). We apply the same experimental procedures between urban and rural areas except for recruitment of subjects. In rural areas, subjects are informed in advance (a week ago) and asked to show up at a village school and/or government agricultural community hall at a given date and time. To collect subjects, we are supported by local government offices known as village development committees and randomly select the household from the list of residents in rural areas (Central Bureau of Statistics, 2011). Based on the random selection, we send an invitation letter to the selected households and one member in a household is invited to participate in our experiments. The participation rate is approximately $95\,\%$ which becomes high due to the pecuniary incentive written in the invitation letter.

In urban areas, we conducted occupation-based randomization by taking the desired number of subjects from each occupation such as banking, government, health, education, business, transportation and entertainment. The experiment is conducted at district health organization training halls in the urban areas that are in the center of the cities consisting of many rooms. We send invitation letters to different offices requesting people to participate in our experiments. One week prior to the experiment, the letters are dispatched to the selected organization. We conduct experiments on the weekend and, due to proper incentives, the participation rate is high that is $80\,\%$. On an average, we paid $550\,\mathrm{NPR}$ ($\approx 5.00\,\mathrm{USD}$) to each subject including a fixed participation fee of $100\,\mathrm{NPR}$ ($\approx 1\,\mathrm{USD}$).

[Figure 2 about here.]

Upon arriving at the location, subjects are gathered in one hall and they are given experimental instructions in their native language (Nepali). Once everybody is present in a room, an experimenter (the first author) gives subject a verbal explanation about the experimental rules. To maintain anonymity across generations, first, we confirm that subjects have fully understood the rules, and second, they are asked to proceed toward a door and pick up a chip out of a bag that contains their

generation ID and individual ID. According to the IDs, each subject goes to and sits in a specific room. In the end, we place the generations in separate rooms by their generation IDs. In this way, each subject can not observe and identify which person belong to a specific generation in a sequence (she knows only the members of her generation), however, they can realize that they are assigned to one generation within a sequence. However, they are not informed of which generation is the last within a sequence of generations.

The research assistants distribute questionnaires and explain the experimental procedures once again to subjects. In ISDG, the 1st generation makes deliberation up to 10 minutes where it is recorded and their generation decision is confirmed. Once a generation finishes making her decision after the deliberation, the members are asked to move to a different room and this process is necessary to assure anonymity. After the 1st generation decision, we proceed to the 2nd generation with the same procedures. A series of these routines are applied to the rest of the next generations from 3rd to 6th ones. The previous generation decisions are written on a white-board and the subsequent generations can see them if they are other than the 1st generation. Each subject in a generation is asked to confirm which generation they belong to in a sequence and the payoffs associated with options A and B. Therefore, each generation is able to calculate how many times options A and B have been chosen by the previous generations. With this information, each generation deliberates and decides between intergenerational unsustainable option A and sustainable option B from the 1st generation to 6th generation. After ISDG, we conduct questionnaire surveys to elicit subjects' sociodemographic information.

2.4 Qualitative-deliberative analysis

We analyze the statements made by each subject in a generation during deliberation in ISDG through a qualitative-deliberative analysis following Nakagawa et al. (2016). In this process, we hire and ask external coders, who are neither related to our research project nor in the authorship of this paper, for qualitative coding of arguments. The external coders independently go through all the statements made by 363 subjects and 121 generations during deliberation in ISDG and conduct

qualitatively deliberative analysis. First, we record the deliberation in the Nepali language as it occurs in the fields. Later, by hiring professionals, the deliberation contents are translated from the Nepali language to English. The first author confirms that the transcriptions and translation outcomes are consistent. These coders are initially given a series of pilot tests to see whether they can analyze the statements coherently and independently.

Second, each coder independently conducts qualitative deliberative analysis by going through all of the transcribed discussions per generation and submit her coding results, following sections 2.4.1 and 2.4.2. These coders are unaware of the research questions in this research and asked to code the transcriptions in a conservative way such that the statement is "empty" whenever the intention of a statement is not clear.[2] After the three coders submit their results, an interrater reliability analysis using the Kappa statistics has been performed to determine consistency among the three coders, following Cohen (1960), Krippendorff (2003) and Cason and Mui (2015). Finally, three coders gather together, discuss about their results and/or vote for deciding how they should finally interpret the arguments when there are significant disagreements in their coding. After resolving such disagreements, they give us a final coding result, which we use for reporting our results in what follows.

2.4.1 Analysis 1: Determination of subjects' types

To identify patterns of the shifts in subjects' attitudes for supporting sustainable or unsustainable options, the arguments in deliberations are qualitatively analyzed following Corbin and Strauss (2014). An important factor to identify subjects' attitudes from an unstructured deliberation is to understand and classify subjects' arguments that emerge during the deliberation (Kaplan, 1985, Dillard, 2013). The qualitative deliberative analysis identifies each subject's argument and its change for supporting sustainable or unsustainable options during deliberation. For example, a subject makes her initial argument as a preliminary remark to support sustainable option, but she might change her support from the initial point in the middle of deliberation after listening to what

[2]The detailed procedures performed by the coders are provided in the appendices.

other members argue. Deliberative analysis is useful to track such a change in arguments made by each subject and for identifying the attitudes of subjects at each moment of deliberation.

Based on Analysis 1, the attitudes of each subject's toward the sustainable option and the shifts are determined from the transcribed generation deliberation. In what follows, we describe the definitions of the subjects' statuses and then define the typologies of subjects with respect to how they change their statuses throughout the deliberation. The states of subjects in deliberation are classified into the following four types.

- **State $\boldsymbol{\varphi}$**: This state refers to the situation where a subject has not displayed her attitudes regarding which option to support.
- **State $\boldsymbol{A}$** or **$\boldsymbol{a}$**: This state refers to the situation where a subject has expressed her support for option A (i.e., the unsustainable option).
- **State $\boldsymbol{B}$** or **$\boldsymbol{b}$**: This state refers to the situation where a subject has expressed her support for option B (i.e., the sustainable option).
- **State $\boldsymbol{Amb}$**: This state refers to the situation where a subject has expressed her ambivalent position regarding which option to support.

The distinction between A and a (B and b) is defined as follows: a subject is regarded as having moved to state A (B) only if (i) she did not follow a specific subject in expressing her support of option A (B) or (ii) she expressed her own reason to support option A (B). In contrast, if a subject follows other subjects and expresses that she supports A (B) without any reasons, her new state will be denoted as a (b). It should be noted that at the beginning of deliberation, all subjects are in state φ. In addition, they are in state a, b, A, B or Amb at the end of the deliberation. On the basis of the aforementioned subjects' states, we classify subjects into three types according to how she changes her own states throughout the deliberation.

Definition 2.1 (Dependent subjects) *Subjects of this type start with φ and end with a or b.* ■

Subjects who are not classified into "dependent subjects" shall be classified into either of the following types.

Definition 2.2 (Stable subjects) *Subjects of this type start with φ and end with A, and during the process, they do not take states b, B or Amb, or they start with φ and end with B, and during the process, they do not take states a, A or Amb. Examples of the status changes are $\varphi \to A$, $\varphi \to B$, and $\varphi \to a \to A$ where "$\to$" denotes the temporal order of changes.* ■

Definition 2.3 (Unstable subjects) *Subjects of this type start with φ and end with A, and during the process, they take state b, B or Amb, or they start with φ and end with B, and during the process, they take state a, A or Amb. Examples of the status changes are $\varphi \to A \to B$, $\varphi \to B \to A$, $\varphi \to Amb \to A$, $\varphi \to Amb \to B$ and $\varphi \to a \to B$.* ■

Categorization of subjects by "dependent," "stable" and "unstable" types with their final support or attitude for sustainable or unsustainable options based on the above definitions enables us to clarify how deliberation is made to decide in ISD as well as to characterize how subjects consistently support one option or not during deliberation in rural and urban areas.

2.4.2 Analysis 2: Concepts — ideas, motivations and reasoning

To understand ideas, motivations and reasoning subjects bring during deliberation, we use "concepts" for considering (not considering) about future generations in ISDG. Following the laboratory and field experiments employed in Nakagawa et al. (2016), Kamijo et al. (2017) and Shahrier et al. (2017), the 15 concepts for considering (not considering) future generations have been developed as a basis for coders to follow in qualitative deliberative analysis (table 5). With the 15 concepts in table 5 in mind, external coders read transcribed deliberations, statements and arguments made by each subject. When coders identify that a subject makes some argument that is consistent with or based on one concept i in table 5, the argument is coded and counted as 1 for concept i. We ask the coders to be very conservative with this process and they are advised to suggest any new category if they think something missing as a concept. After this analysis, we can find how many

times concept i emerges through arguments made by subjects in each generation's deliberation. Following Analyses 1 and 2, we summarize and compare the basic statistics of subjects' types, attitudes and concepts subjects argue during deliberation to support sustainable or unsustainable options.

3 Results

The sociodemographic information of urban and rural subjects is presented in table 1, demonstrating the differences between urban and rural areas in terms of gender, education, employment and income level. In urban areas, $66\,\%$ of subjects are male, while only $44\,\%$ are male in rural areas. This result reflects that many males migrate from their home villages to urban areas or to foreign countries for employment. With respect to education, more than $50\,\%$ of the subjects in urban areas have a university degree (16 years of schooling), while subjects in the rural areas possess 10 years of schooling as the median. In urban areas, $63\,\%$ of subjects are engaged in the business and service sectors, while $88\,\%$ of rural subjects are involved in farming and forestry as their main occupation. Thus, income is higher in urban areas than in rural areas. Overall, the summary statistics suggest that there are some differences between the two areas.

[Table 1 about here.]

Table 2 summarizes the frequencies and percentages of generation choices for intergenerational unsustainable option A and sustainable option B in ISDG between rural and urban areas. It shows that $10\,(16.13\,\%)$ generations choose option A and $52\,(83.87\,\%)$ generations choose option B in rural areas, whereas in the urban $21\,(35.59\,\%)$ generations choose option A and $38\,(64.41\,\%)$ generations choose option B. Given the result shown in table 2, we run a chi-square test to statistically confirm that the distributions in generation choices of A and B between rural and urban areas are the same as a null hypothesis. We reject the null hypothesis at $5\,\%$ significance level ($\chi^2 = 6.01, p = 0.014$), implying that the frequency distributions in generation choices of A and B

between rural and urban area are different. Overall, generations in rural areas choose sustainable option B more often than those in the urban areas.

[Table 2 about here.]

To understand concepts behind generation decisions, the arguments in deliberations are qualitatively analyzed. In particular, we look at shifts in subjects' attitudes for supporting sustainable or unsustainable options by finding subject types defined in Analysis 2 of Section 2. Table 3 shows the distributions of subject types in generations, following the definitions of subject statuses in analysis 1, "dependent," i.e., a subject who does not bring any ideas, motivations or reasons to show her support, "stable," i.e., a subject who consistently shows and brings ideas, motivations and reasons for her support and "unstable," i.e., a subject who changes her support during a course of generation deliberation. In coding deliberation per generation, an interrater reliability measure is used to see consistency among three coders on the identification of subject types (or of an unordered categorical variable). We confirm that the reliability measures are Kappa $= 0.43$ and 0.40 with $p < 0.01$ for rural and urban areas, respectively, suggesting that they are statistically significant and moderately consistent (Landis and Koch, 1977). We run a chi-squared test with a null hypothesis that frequency distributions in subject types between rural and urban areas are the same. The test does not reject the null hypothesis, demonstrating that the distributions of subject types do not differ between rural and urban areas.

Table 4 summarizes the frequencies and percentages of "subject types" who finally support unsustainable option A or sustainable option B in both urban and rural areas. The "stable" type of subjects who support unsustainable option A in urban areas is $14\,\%$ and the "dependent" type is $15\,\%$, while the stable and dependent types occupy $6\,\%$ and $3\,\%$, respectively, in rural areas. The chi-squared test examines a null hypothesis that the distributions of subject types between rural and urban areas are the same for the sample of subjects supporting option A. The result rejects the null hypothesis at $5\,\%$ significance level ($\chi^2 = 6.66, p = 0.035$). However, we could not reject the null hypothesis for the sample of subjects supporting sustainable option B. This implies that the distributions of subject types differ between urban and rural areas only for the sample of subjects

supporting option A, being consistent with the fact that the proportions of stable and dependent subjects who support A are higher in urban areas than in rural areas (table 4).

[Table 3 about here.]

Through categorizing subject types, we find some consistency between generation choices and distributions of subject types that finally support options A or B. Recall that, as reported in table 2, urban generations choose option A more often than do rural ones, and stable subjects are defined to be the member in a generation that consistently shows her support for option A (or B) and explains her ideas, motivations and reasoning to the other members in her generation during deliberation of 10 minutes. With the idea in mind, we see that the "stable" type of subjects that support option A (or B) is key for generations to make a decision in that the proportions of stable types that support option A or B well reflect generation decisions between rural and urban areas. By definition, a stable subject in a generation could be interpreted or considered as an influencer to induce other members' opinions to follow or change. In urban areas, it is likely that an existence of stable subjects that support option A in generations function as an influencer to induce other members of dependent and/or unstable types in her generation to support option A, leading urban generations not to consider future generations (Chambers, 2009, Dickson et al., 2008, Niemeyer, 2011).

[Table 4 about here.]

The concepts of ideas, motivation, and reasoning regarding "not considering future generations," and "considering future generations," that emerge during deliberations in urban and rural areas identified by qualitative coding are summarized in table 5. The interrater reliability for the coders is found to be Kappa $= 0.33$ and 0.35 at $p < 0.01$ for rural and urban areas, respectively, with overall $40\,\%$ agreement among the coders. A total of 87 and 109 concepts of ideas, motivations and reasoning during deliberations are identified in rural and urban areas, respectively, and they are classified on the basis of 15 concepts. Table 6 presents the mean and standard deviations of how many concepts per generation are identified during deliberation in rural and urban areas. It

appears that urban generations bring more concepts during deliberation than do rural ones since the mean and standard deviation in the number of concepts per generation in urban areas are higher than in rural areas. To confirm the distributional difference between rural and urban areas, we perform a Pearson chi-squared test. The result rejects the null hypothesis at $1\,\%$ significance level ($\chi^2 = 27.36, p < 0.01$), implying that urban generations deliberate with more concepts or a wider variety of concepts during deliberation than do rural generations.[3]

[Table 5 about here.]

Based on the results shown in tables 5 and 6, the frequencies of concepts that emerge during deliberations in rural and urban ares are coded and shown as histograms in figure 3. The concepts are represented by positive integers from 1 to 15 in the way that each number from 1 to 7 corresponds to one concept for "not considering future generations," and each number from 8 to 15 does so for "considering future generations," as defined in table 5. Figure 3 demonstrates that distributions in the support between 8 and 15 do not differ between rural and urban areas, meaning that the concepts for considering future generations are deliberated by rural and urban subjects in the same way or same degree. In particular, concept 15 (hope to avoid future generations' disadvantages) is most frequently discussed in rural and urban areas.

A clear difference between rural and urban areas comes from histograms whose support ranges between 1 and 7 that is associated with concepts for not considering future generations (see and compare two histograms of black bars in figures 2(a) and 2(b)). We can see that concepts for NOT considering future generations during deliberations emerge more frequently and widely than in rural areas. The dominant concepts for not considering future generation in urban areas are concepts 1, 3 and 4 that correspond to "gratitude to earlier generations," "maximization of the current generations' benefit," and "acceptable disadvantage of future generations." Interestingly, urban generations tend to feel gratitude to earlier generations when they realize that previous generations chose sustainable option B by considering them. However, the gratitude does not motivate urban generations to

[3]Table 6 shows that mean deliberation lengths do not differ between rural and urban areas. However, the standard deviation in urban areas is higher than that in rural areas, meaning that some deliberations in urban areas become long.

choose sustainable option for future generations. Rather, they think "we are lucky to have a chance to choose A for high payoffs with the gratitude to earlier generations, and let us choose A."

Figure 3 also reveals that urban subjects bring some "concepts" for NOT considering future generations during deliberations that rural subjects do not, such as concepts 2, 6 and 7 that are "surprise at earlier generations' decisions," "senses of guilt relaxed by earlier generation's decision" and "non-negligible cost of considering future generation," respectively. This implies that some urban subjects have unique and/or new ways of thinking and interpreting issues in ISD that rural subjects never have. Frequencies and histograms of concepts that emerge during deliberations are quite consistent with generations decisions and the distributions of subject types between rural and urban areas shown in tables 2 and 4, respectively, demonstrating that urban subjects bring concepts not to consider future generations more frequently and widely during their deliberation than do rural subjects do, leading urban generations to choose unsustainable option A. Overall, our deliberative analysis finds that urban subjects may be losing sympathy and/or concerns for future generations.

[Figure 3 about here.]

Urban cities are future as claimed by recent researches, and Asia and Africa are predicted to have the largest and fastest growing "urban cities" in the future by attracting $65\,\% \sim 75\,\%$ of world population (see, e.g., Wigginton et al., 2016). Therefore, urban societies are expected to play more vital roles in shaping people's preferences and behaviors through daily practices and lifestyle, and urban people shall remain the main drivers of deciding policies that affect intergenerational sustainability (Van Lange et al., 2007, 2011, Golub et al., 2013, Shahrier et al., 2016, 2017). Based on our findings, it is more likely that urban people implement the policies that may leave irreversible costs on future generations (Henderson et al., 2016). Fischbacher et al. (2001) and Hauser et al. (2014) demonstrate an importance of having "conditional cooperators" in a group for providing and sustaining public goods in laboratory experiments especially when some person in a group first takes an initiative or leadership to cooperate.

Our results demonstrate the opposite scenario to explain how urban people choose to be intergenerationally unsustainable; a considerable portion of urban people may be "stable" to

consistently support unsustainable option A and such a stable urban person tends to be an influencer for other members to follow, that is, other members in a generation are influenced to be "conditional followers" for unsustainable options. To resolve ISD in urban areas, it shall be necessary to change the ways of thinking for stable people or influencers who consistently support an unsustainable option and the associated "conditional followers." A simple resolution may be introducing some new social device or mechanism for urban people to "recall more sympathy and concerns for future generations" through education or some policies when human societies want to ensure intergenerational sustainability.

4 Conclusion

This paper has addressed intergenerational sustainability dilemma (ISD) through field experiments where generations are asked to decide between sustainable and unsustainable options through deliberation. With deliberative analysis, we have clarified the attitudes and concepts, such as ideas, motivations and reasoning, that people discuss during the deliberation in ISD game (ISDG). We find that a considerable portion of urban people are identified to be "stable" as an "influencer" that consistently argues her support for unsustainable option, while another considerable portion of urban people are "dependent" as a "conditional follower." Together with this fact, urban subjects bring concepts not to consider future generations more frequently and widely during their deliberation than do rural people, leading urban generations to choose unsustainable option. Overall, our deliberative analysis finds that urban subjects may be losing concerns for future generations.

We note some important limitation and future avenues of research. In the present study, an agenda for deliberation is simplified as an ISDG and exogenously given to groups to discuss about choosing sustainable or unsustainable option. However, it does not fully reflect a realistic policy agenda that contains an issue of ISD. In the future, it is important to design and institute a deliberative experiment with real policy agendas that extend over multiple generations to deeply understand how people in societies deliberate about real problems of ISD, such as budgets or forest

405 management problems. These caveats notwithstanding, we believe that this work is an important
406 first step as a field experiment research as well as a qualitative-deliberative study that addresses
407 intergenerational sustainability. The experimental approach with deliberative analysis can provide
408 a rich insight into how people and groups decide on various issues. This research is considered
409 an illustration of how qualitative-deliberative analysis can be usefully combined with economic
410 experiments as a methodology to reveal human behaviors, arguments and motivations in collective
411 decision making such as ISD.

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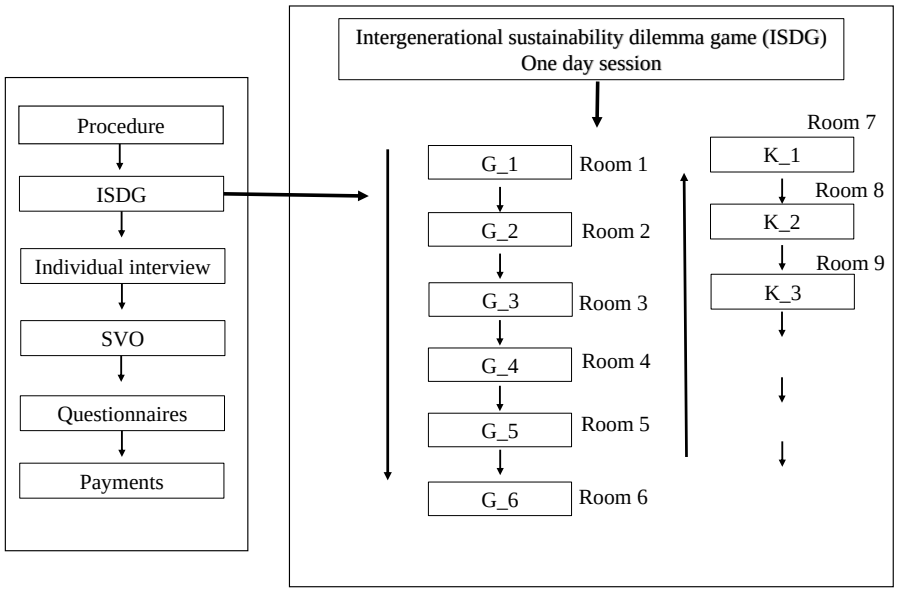
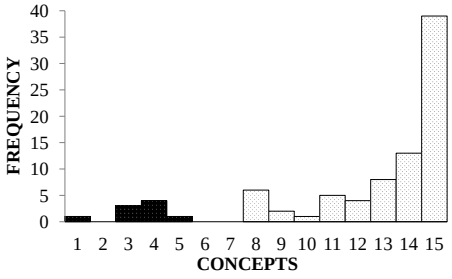
Figure 1: Urban and rural areas in Nepalese fields

Figure 2: Structure of experiment and data collection procedures



(a) Rural areas



(b) Urban areas

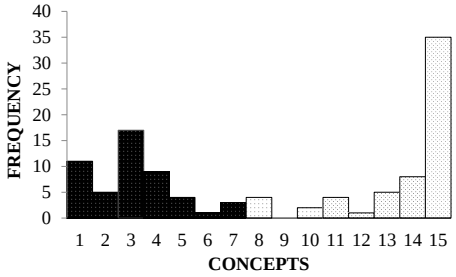


Figure 3: Distributions of concepts that emerge in rural and urban areas: Each number from 1 (8) to 7 (15) in the support of a histogram corresponds to one concept for not considering future generations (for considering future generations)

List of Tables

Table 1: Summary statistics of socio-demographic variables

Variables	Rural (62 generations, 186 subjects)					Urban (59 generations, 177 subjects)				
	Mean	SD[1]	Median	Min	Max	Mean	SD	Median	Min	Max
Age[2]	33.27	11.54	30.5	16.00	66.00	33.77	11.38	32.5	18.00	56.00
Gender[3]	0.44	0.50	0.00	0.00	1.00	0.66	0.47	0.00	0.00	1.00
Education[4]	10.18	2.86	10.00	1.00	18.00	15.20	3.42	16.00	5.00	18.00
Business and services [5]	0.12	0.37	0.00	0.00	1.00	0.63	0.48	0.00	0.00	1.00
Income (in NPR 1000)[6]	3.08461	40.49894	15.000	5.000	300.000	50.91917	80.50229	34.000	10.000	900.000

[1] The "SD" stands for standard deviation.
[2] Age is a continuous variable given in years.
[3] A dummy variable that takes 1 when the subject is male, otherwise 0.
[4] Education represents years of schooling.
[5] Business and services involvement is a dummy variable that takes 1 when the subject is engaged in business or another service sector otherwise0.
[6] Income is given in monthly Nepalese rupees (NPR).

Table 2: The frequency and percentage of generation choice of A and B (percentage in parenthesis are rounded up)

Choice of A or B	Region		Sample total
	Urban	Rural	
A	21 (36 %)	10 (16 %)	31 (26 %)
B	38 (64 %)	52 (84 %)	90 (74 %)
Total	59 (100 %)	62 (100 %)	121 (100 %)

The table shows generation choice of A and B with respect to urban and rural areas.

Table 3: The frequencies and percentages of "subject types" in rural and urban areas that finally support options A or B

Generations	Dependent	Stable	Unstable	Sub-total
Rural	87 (47 %)	84 (45 %)	15 (8 %)	186 (100 %)
Urban	75 (42 %)	81 (46 %)	21 (12 %)	177 (100 %)

Numbers in brackets indicate the corresponding proportions of "subject types."

Table 4: The frequency and percentage of "subject types" who finally support options A or B in urban and rural areas

Generation	Subjects who finally support A			Subjects who finally support B			Sub-total
	Dependent	Stable	Unstable	Dependent	Stable	Unstable	
Rural	5 (3 %)	11 (6 %)	11 (6 %)	82 (44 %)	73 (39 %)	4 (2 %)	186 (100 %)
Urban	27 (15 %)	24 (14 %)	12 (7 %)	48 (27 %)	57 (32 %)	9 (5 %)	177 (100 %)

Numbers in brackets indicate the corresponding proportions of subject types per generation type.

Table 5: Categories and concepts of ideas, motivations and reasoning during deliberation

Category	No.	Concepts	Example
Not considering future generations	1	Gratitude to earlier generations	Since some previous group has selected B, we have a good opportunity to get more by choosing A. We should select B.[1]
	2	Surprise at earlier generations' decisions	Wow! At the beginning, there were 1200 and 900 points as option for choosing A and B. The first group has selected A and stuck to more points for herself.
	3	Maximization of the current generations' benefit	First, we need to think about ourselves, then we can think about others.
	4	Acceptable disadvantage of future generations	We should do gambling. Let us choose A. We need to gamble, and future groups will at least get something
	5	Risk of unsucceeded goodwill	We need to win that is what it matters.
	6	Sense of guilt relaxed by earlier generations' decisions	There is no problem to choose A, previous group has also chosen A.
	7	Non-negligible cost of considering future generations	The cost from choosing B is 300, let's choose A.
Considering future generations	8	Hesitation to take advantage from a happenstance	We should not take advantage of the opportunity that come to us by chance.
	9	Expectation that goodwill will succeed	We expect that if we choose option B, groups coming later will do so.
	10	Sense of guilt not to consider future generations	It will not make big difference by choosing option B but if we choose A, it will gradually decreases 300 points of future groups .
	11	Negligible cost of considering future generations	We should not be selfish for just 300 points, we also need to think about other groups.
	12	Willingness to terminate the chain of badwill	Taking A decreases 300 points and, at the end, there might be zero or even negative. Some groups before us have already chosen A.
	13	Willingness to succeed goodwill	I think that the previous group has selected B, and groups before that have selected B. Let us choose B
	14	Maximization of the sum of all generations' benefits	Every group should get the same benefits. If all groups choose B, then the total points will be high.
	15	Hope to avoid future generations' disadvantages	There are many groups and as a previous group if we choose A then groups later will have a disadvantage. It is not fair that only previous groups get an advantage.

[1] Experimental instruction uses a neutral terminology of "groups" to represent "generations." Therefore, subjects use a word of groups in deliberation.
A total of 9 (50) and 78 (59) ideas, motivations and reasoning have been identified for not considering (considering) future generations in rural and urban areas, respectively.

Table 6: Summary statistics for a number of concept that emerge during deliberation and deliberation length per generation

Generations	Number of different concepts		Deliberation length (minutes)	
	Mean	SD	Mean	SD
Rural areas	1.61	0.56	1.52	0.95
Urban areas	2.01	1.01	1.57	1.24