Understanding people's prosocial attitude and behavior for the betterment of the society: Case studies in disaster resilience and waste management

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Abstract

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An individual's behavior is influenced not only by economic decisions, but also by social preferences (i.e. human tendency to be concerned not only with his/her own payoff, but also with others pay off). However, in the current world of uncertainty, people try to maximize their own benefits without considering how such behavior can affect other people and society as a whole. In these situations, there is a need to understand human prosociality, which may contribute to the long-term development of the society. Therefore, the purpose of this thesis is to identify the mechanisms that support prosociality in two distinct situations: natural disasters that emerge and dissipate quickly and human caused disasters (i.e. solid waste management problems) that emerge slowly, persist for a longer period of time with no clear endpoint in sight. In this research, questionnaire surveys and experimental methods are used to collect primary data on an individual's prosocial attitude and behavior.

Chapter 2 in this thesis scrutinized the mutual helping behavior of the people which is one of the essences of prosociality. This research examined the cumulative effects (over the few years since the occurrence of the earthquake 2015) of mutual exchange of social support on depression among survivors in an earthquake-damaged community in rural Nepal. A questionnaire survey was administered among the 295 survivors to collect information on socio-demographic variables, mutual helping behavior of survivors and a depression measuring scale using Patient Health Questionnaire (PHQ-9). The results of the statistical analysis showed that the relationship between reciprocal support exchange and depression varied depending upon the types of support. The

findings indicate that emotional support is possible during disasters, but instrumental support is difficult and problematic to implement. This is due to the fact that, during the disaster situations people lose their physical resources and are unable to help others instrumentally. Therefore, in the disaster affected community where external aid is limited people depend on each other for survival. Hence, in such conditions, emotional support can help to create good relationships among each other and motivate them to cope with the adverse effects of disasters.

In *chapter 3* this thesis examines an individual's waste related attitude (preferences are considered as attitudes). A new strategy is designed and developed with reference to future design studies and tests its efficacy with the deliberative field experiment. For this purpose, case method materials were developed and three treatment groups were set up. A total of 290 participants took part in the experiment. In this experiment, individuals are asked to play a role of the imaginary future perspectives and devise strategies to be implemented by the people living today. The statistical analysis shows that the strategy employed influences people's attitudes toward sustainable policy options for solid waste management problems. It also suggests that such strategies influence people to internalize the new social norms for outcomes that benefit others and help instrumentally. Overall, the findings suggest that this intervention influences individuals to self-reflect on the new social norms which motivates them to act prosocially.

Following the interventions implemented in *Chapter 3*, Chapter 4 investigated the role of visioning on an individual's donation preferences. A dictator game (donation game), social value orientation (SVO) game and socio-demographic questionnaire were administered in each treatment group to collect the necessary information on donation preferences, prosociality and socio-demographic variables and to test whether vision influences young people's donation preferences for solid waste management problems. A total of 253 subjects participated in an experiment. A

statistical analysis reveals that when the intervention is accompanied by deliberation and vision creation, young people are more likely to donate to options that differ from the status quo. Overall the results show that vision motivates young people to change their preferences in favor of the option that benefits others and the society.

The conclusion section is included in *Chapter 5* of the thesis. Finally, the present thesis demonstrates human prosociality in two different situations. In the event of natural disasters people can quickly recognize the situations and assist one another in dealing with the negative effect of disasters. However, in case of slowly- evolving environmental problems such as solid waste management issues, people fail to recognize even the minor environmental changes that are occurring in their surroundings in the short term; instead, they prioritize their priorities that provide short term gains over possible future consequences which cannot be visualized. In such cases, a new mechanism may play an important role in influencing an individual's thinking process and motivates them to change their attitudes and take actions that will benefit people not only in distant future but also in distant locations. Thus, the findings reveal the possibility that there is a need for a social mechanism to govern and internalize new social norms that motivates people to work for the betterment of society.

Keywords: emotional support; instrumental support; internalization of new norms; prosociality; natural disasters; solid waste management; preferences; visioning; Nepal

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Chapter 1 : Introduction

An individual's behavior is influenced not only by economic decisions, but also by social preferences (i.e. human tendency to care not only about his/her own payoff, but also care about others pay off) (Urda and Loch, 2013). These social preferences are often driven by individual's prosocial attitude and behavior. However, in the current world of uncertainty, individuals desire to maximize their self-interest for a specific target without considering how such activities might affect others or society as a whole. Furthermore, people tend to prioritize short-term gains over long-term environmental and societal consequences. As a result, it is necessary to understand the mechanism of prosociality and how such a mechanism induces people to work for the betterment of the society. This research seeks to uncover the mechanisms that underpin prosociality in two distinct cases: natural disasters that emerge and end quickly and man-made disasters (i.e. solid waste management problems) that emerge slowly, persist for a longer period of time without a clear endpoint in sight.

Prosociality is an important aspect of human life and a major research area in behavioral science. Prosocial behavior is defined as a voluntary action for the benefit of other individuals or society as a whole (Aronson, E., et al., 2005; Eisenberg et al., 2007) through engaging in activities such as helping, sharing, donating, comforting and volunteering. These outward behaviors, in turn, are sustained by internal prosocial preferences for outcomes that benefit others or uphold prosocial norms (Bolton and Ockenfels, 2000; Zaki and Mitchell, 2013). Previous research has used several approaches to identify the various motivational factors that influence prosocial attitude and behavior actions. Some studies have examined prosocial behavior from an evolutionary perspective, and found that reciprocal altruism is one of the motivating factors for prosocial behavior (Paço, 2019; Straubhaar JD and LaRose R, 2015). Septianto and Soegianto (2017) have examined prosocial behavior from a moral perspective and stated that moral emotions, identity and judgments lead to

the higher intentions for prosocial behavior. Furthermore, several studies have examined the prosocial behavior and intentions using Norm activation model and found that awareness of consequences, ascription of responsibility and personal norms are the three antecedents that predict a wide range of prosocial intentions and behavior in social and environmental context such as volunteering (Schwartz and Fleishman, 1982; Schwartz and Howard, 1980) and helping in emergency situations (Schwartz and David, 1976; Schwartz and Clausen, 1970). Most of the past studies have examined helping behavior using the empathy-altruism model (Batson, C. D., & Coke, 1981; Batson, 1987) and found that empathic concern is responsible for helping behavior. Furthermore, some have examined prosocial motivation from a developmental perspective (Cialdini, R. B., Kenrick, D. T., & Baumann, 1982). The developmental perspective refers to the intellectual and cognitive changes that a person undergoes over the course of his or her lifespan from childhood to adolescence and adulthood. Following the developmental perspective, some studies have identified key psychological motivational mechanisms for prosocial actions (Davidov et al., 2016). These motivational mechanisms include (i) Concern for a distressed other, which refers to the natural ability to perceive and respond to others' emotional states combined with the motivation to care. This behavior increases with age, with matured adults tending to be more helpful and empathetic than younger ones (Sze et al., 2012) (ii) Concern about what the others want, this motivating mechanism reflects a genuine desire to help others achieve their goals. The internal tensions are triggered by the need of others and subside when others are satisfied (Hepach et al., 2016). Such mechanisms involve low-cost instrumental helping that does not require encouragement and external rewards (Brownell et al., 2013; Warneken and Tomasello 2013). People engage in such types of behavior to enhance their self-esteem and competence (Eisenberg et al., 2016) (iii) Concern for doing the right things *"vis-à-vis"* others refers to an individual's internal desire to act in accordance with

the prosocial norms and values that govern behavior for the benefits of others. These prosocial values and norms are internalized in adulthood with the increase in age and development of cognitive functions. Notably, matured adults can reflect their own prosocial norms and values, including the ability to distinguish self-oriented desires and needs from internalized norm of kindness, fairness and justice (Eisenberg et al., 2006; Malti and Noam, 2016) and these types of norms motivate people to act prosocially, even if it is costly to the self. In general, prior research has suggested some psychological mechanisms that influence people to help others.

Davidov et al., (2016) developed three motivational mechanisms to promote prosocial and cooperative behavior in various ways because humans need to cooperate in a variety of situations and no single mechanism is flexible enough to facilitate all forms of cooperation that are important to humans. For example: Humans can feel compassion for those who are suffering, feel compelled to help others in achieving their unfulfilled goal and can act according to norms and values that benefit others in the community. However, all of these motivational mechanisms reflect concern for others in different ways and each mechanism is focused on a different element.

Despite the distinct characteristics of each motivational mechanism, mechanism such as i) "concerned for distressed others" and iii) "concern for doing the right things *"vis-à-vis"* to others" both share a common element i.e. sense of increased arousal or discomfort (Davidov et al., 2016), and this drives people to engage in prosocial behavior. Consequently, in line with a developmental perspective, this research focuses on Davidov et al.'s (2016) two psychological mechanisms for prosocial actions: i) "concern for distressed others" and iii) "concerned for doing the right things "vis-à-vis" others", for the following two reasons: a) As adults, the motivation for helping appears to be more about doing good for society and less about satisfying one's' own personal needs (Tang, 2006). b) The case studies conducted in different situations in this research are related to individual

attitudes and behaviors and can be linked to Davidov et al.'s (2016) prosocial motivations. The first case in this research concerns a natural disaster, which may elicit a shared identity that may foster a willingness to help others. Sharing similar experiences, ability to feel what another person is feeling or sharing the other's emotion can create an empathy to help others. Therefore, considering such situations the first case focuses on Davidov et al.'s (2016) i :) "Concerned for distressed others". Furthermore, the case of natural disaster can be related to Maslow's hierarchy of needs theory (Maslow 1943). Maslow's hierarchy of needs theory categorized human behavior into five tiers and further categorized them into two groups 1) Deficiency needs and 2) Growth needs. Deficiency needs are the basic needs that arises due to deprivation. It consists of the first four needs in the hierarchy. These needs are 1) Physiological needs which includes the basic needs like food, water, air, shelter sleep (McLeod 2007); 2) Safety needs: which arises once the physiological needs are fulfilled and this includes the safe environment and such type of needs is more apparent in disaster and crisis (McLeod 2007). 3) Social needs: This need includes sense of belonging, where behavior is motivated by the need for establishing the interpersonal relationships and gaining the acceptance in the society. This needs also encompasses both feeling loved and feeling love towards others (McLeod 2007). 4) Esteem needs: These needs are defined as the need for both self-esteem and appreciation from others. When these needs are met, people feel more confident in themselves and feel valued by others and the society. However when they are not satisfied, one feels worthless and helpless (Poston, 2009). In general, individuals tend to focus on satisfying the vital needs before progressing to upper levels of need. This instinctive human behavior becomes more apparent during stressful condition such as in emergency, crisis and disasters when the basic needs are compromised, and cognitive function are impaired (Yuen et al., 2021). Therefore, in such situations, psychological needs such as a sense of belonging may play an important role in mitigating the negative effects of

disasters. Furthermore, since a sense of belonging is conceptualized by Maslow (1954) as a basic human need and is associated with human relationships, individuals with a strong sense of belonging may have feeling of empathy to those who are in distress. Thus, Maslow's theory (1943) can be linked to Davidov et al.'s (2016) prosocial motivation. The second case, on the other hand, relates to man-made disasters, which are often characterized by ambiguity and conflicts regarding their nature and impact, as well as criteria for defining “victims" and their needs (Cuthbertson & Nigg, 1987). For example: solid waste management problems are considered to be the result of human behavior. Therefore, people’s behavior needs to be modified to achieve sustainable waste management. To address these problems, this research focuses on Davidov et al.’s (2016) mechanism of ii) “concern about doing the right things ``vis-à-vis'' others” through norms internalization, which has the ability to enable individuals to put their prosocial tendencies to work for others. This requires minimizing competing behavioral tendencies, such as the desire to maximize one’s own interest in a specific target. Based on the above facts, this research reflects Davidov et al.’s (2016) two motivational mechanisms of i) “concerned for a distressed other” and ii) “concerned for doing the right things “vis-a vis” others,” in two cases, such as disaster situations and solid waste management problems.

Thus, in the first case, where natural disasters occurred quickly and subsided, we conducted a questionnaire survey to examine people’s mutual helping behavior (instrumental and emotional support) and it was found that in disaster situations, emotional support is possible during disasters, while instrumental support is more difficult. In the second case, where the solid waste management problem emerges slowly, persists for a longer period of time without a clear endpoint in sight, we conducted an experiment to assess peoples’ ability to internalize the norms for the prosocial actions and found that instrumental support is possible only when people can internalize the norms for outcomes that benefits others. By combining these two cases, we can speculate that there is a sense

of empathy and discomfort in both situations which may motivate different forms of help such as emotional helping and instrumental helping. Furthermore, in case of an earthquake or rapid onset of environmental problems, adults can quickly recognize the situations and take appropriate action against it. However, when it comes to solid waste management issues, adults are not capable of recognizing the minor environmental changes that are occurring in the community and society in the short-term, instead prioritizing their priorities that provide short term gains over possible future consequences which cannot be visualized. In such cases it is critical to intervene in a new mechanism that influences people to internalize and self-reflect the prosocial norms for the outcomes that benefit others and the community. Thus, the various studies reported here provide answers to the following main research question.

1. **What facilitates people's prosocial attitude and behavior in different situations?**

The later part of the thesis is organized as follows. Chapter 2 titled "How does reciprocal exchanges of social support enhance the happiness of individuals in the earthquake damaged community?" presents the details of the survey conducted in Nepal and the main results. Chapter 3 entitled "Taking the perspective of future generations as an effective measure for achieving sustainable waste management" covers the details of experiments on individual preferences for the management of solid waste management problems and the main findings. In chapter 4, this research measures the peoples' donation behavior for the management of solid waste. Chapter 5 presents the conclusion of this thesis.

Chapter 2 : How does reciprocal exchange of social support alleviate individuals' depression in an earthquake damaged community?

2.1. Introduction

Natural disasters such as earthquakes cause loss of life, damage to property, destruction of infrastructure, and a range of harmful psychological disorders, including depression, posttraumatic stress disorder, and anxiety (Mamun et al., 2019; Welton et al. 2018; Xu & Wei, 2013). It has been reported that 15–20 percent of survivors will experience mild or moderate psychological disorders, while 3–4 percent will suffer severe disorders, including severe depression or severe anxiety after a natural disaster (Sherchan et al., 2018; World Health Organization, 2013). These mental health issues can significantly impact quality of life and living conditions in disaster-affected areas. It is therefore necessary to take the mental health of survivors into account following an earthquake.

Depression is the second most commonly reported psychiatric problem in disaster research (Dar et al. 2018). A 2011 systematic review of mental health problems after the Great East Japan earthquake reported a prevalence of depression ranging from 3.0% to 43.7% following the disaster (Ando S, et al. 2017). According to the 10th edition of the International Classification of Disease (ICD-10), depressive disorders can be categorized as mild, moderate, and severe episodes in relation to the degree that the patient suffers from a low mood, reduced energy, and decreased activity. The individual's capacity for enjoyment, level of interest, and degree of concentration are reduced, and marked fatigue is seen. Sleep is generally disturbed, and appetite is diminished. Self-esteem and self-confidence are reduced, and ideas of guilt and worthlessness are often present even in mild depression(WHO, 2019). Depression is associated with multiple factors, including sociodemographic factors, sociocultural influences, disaster-induced economic losses, posttraumatic exposure, cognitive and physical impairment, and loss of social connection (Santini et al. 2015).

In recent decades, a range of evidence has shown that social support modifies the mental health (Holt-Lunstad & Smith, 2012; Thoits, 2011; Uchino et al. 2012), and as a result, the role of social support has attracted a great deal of attention in disaster studies. In fact, earlier studies have found that receiving social support has a positive relationship to post-disaster mental health (Arnberg et al. 2012; K. Kaniasty & Norris, 1995; K. Z. Kaniasty, et al. 1990; McGuire et al., 2018; Norris, et al. 2007; Platt et al. 2016; Shakespeare-Finch & Green, 2013) . Some studies have adopted a more refined way of conceptualizing social support, distinguishing instrumental support (e.g., someone being available to offer help with issues that require physical effort or financial aid) and emotional support (e.g., someone being available to listen or offer sympathy during crisis and hardship) (Santini et al., 2015; Semmer et al., 2008; Shakespeare-Finch and Obst, 2011). These dimensions of social support have different implications for mental health (Nurullah, 2012; Shakespeare-Finch and Green, 2013) . Some studies have identified the positive effects of receiving social support on mental health (Kaniasty, 2020; Poudel-tandukar et al., 2011), while others have identified positive effects of providing social support (Bokszczanin, 2011; Brown et al., 2003; Momtaz et al., 2014; P A Thomas, 2009).

In addition, a few studies have been conducted that focus particularly on depression and social support following disasters (Feder et al., 2013; Hall, 2017; A. Lebowitz et al., 2019; McGuire et al., 2018; Shakespeare-Finch, Obst, & Rogers, 2019; Watanabe et al. 2004; Xu & Wei 2013; Zhen, Quan, & Zhou, 2018). Empirical research reveals mixed findings regarding the impact of giving and receiving social support on depression. Regarding the impacts of receiving social support, some studies have found that receiving emotional support and informational support can alleviate depressive symptoms of survivors following natural disasters (Feder et al., 2013; Zhen et al., 2018). Others have found that receiving emotional support can reduce the risk of developing depressive

symptoms after an earthquake (Lebowitz et al., 2019; Xu and Wei, 2013). Watanabe et al., (2004) found that receiving social support from neighbors reduced depressive symptoms among displaced older survivors following the 1999 Taiwan earthquake. By contrast, Hall, (2017) demonstrated that receiving social support sometimes increases depression among disaster survivors. Regarding the impact of providing social support, Shakespeare-Finch et al., (2019) found that providing social support increases the risk of depression severity among post-flood survivors.

In spite of this accumulation of studies, however, there is still room for further research for the following reason. Earlier studies on equity theory (Adams, 1965, 1963; Walster et al., 1973) and the norms of reciprocity (Gouldner, 1960) (see the following section for details) demonstrate that establishing a reciprocal relationship with others is important for individuals' mental health and thus strongly suggests the insufficiency of investigating the individual effects of giving or receiving social support under the assumption that they independently influence mental health (that is, assuming there is no interaction effect between giving and receiving support). While the association of reciprocity of social support (i.e., balance receipt and provision of social support) on the mental health is a well-investigated research topic in the psychological literature of (Antonucci et al., 1990; Keyes, 2002; Liang et al., 2001; Maton, 1987; Mizuno et al., 2019; Nahum-Shani et al., 2011; Rook, 1987; Wang & Gruenewald, 2017), little work on this has been done in the natural disaster. It is true that there are some valuable exceptions, such as Shakespeare-Finch and Green (2013) and Lebowitz (2016),who found that bidirectional social support (giving and receiving) enhances psychological well-being and relational satisfaction. Even if this is the case, to the authors' knowledge, the interaction effects of giving and receiving social support on depression of individuals impacted by natural disaster have never been investigated; further, the distinction between instrumental and emotional social support has also been neglected. This study was conducted to fill this gap. Pursuing

an investigation of this type must be considered to be essential, due to the nature of instrumental and emotional social support. By definition, giving and receiving instrumental support has negative and positive practical value, respectively, and thus, it seems likely that the net amount of support given (rather than reciprocity) would matter more for instrumental support, and reciprocity would matter more for emotional support.

This study investigates these concerns in a village damaged by the 2015 earthquake in Nepal (known as the Gorkha earthquake), which killed nearly 9,000 people and injured nearly 22,000, all over the country (NPC, 2015).

2.2. Aim of the study

This study aims to assess the impact of the reciprocal exchange of social support (emotional and instrumental support) on depression among the survivors of an earthquake-damaged community.

2.3. Theoretical Perspective

This study is guided by equity theory (Adams, 1965, 1963; Walster et al., 1973) and the notion of the reciprocity of norms (Gouldner, 1960). Equity theory indicates that individuals experience emotional and psychological distress when the amount of support given and received by an individual is not equal to another (Adams, 1965, 1963; Walster et al., 1973). This implies that relationships are considered to be the most satisfying in the case of a perception of balance and equality in what each partner contributes to and receives from a particular social relationship (Arvanitis & Hantzi, 2016). Here, it is also seen individuals become dissatisfied in social exchange within a relationship if they feel either under-benefited (giving more than receiving) or over-benefited (receiving more than giving) (Davey & Eggebeen, 1998; Li, Fok, & Fung, 2011; Nahum-Shani et al. 2011; Wang & Gruenewald, 2017).

Previous studies have shown the importance of reciprocity for the maintenance of mental

health and psychological well-being in an individual. For example, Roberto and Scott (1986) examined the relationship between older friendships and perceived distress within a relationship and found that individuals who perceive their relationships to be equitable express less distress with all aspects of their friendships than those who perceived their friendship not to be equitable. Rook (1987) found that older widowed women who reported balance exchanges within their adult children and their friends felt less lonely. Buunk and Prins (1998) found that students who enjoyed reciprocal social exchanges with their best friends had lower loneliness than those who felt under-benefited or over- benefited. Other studies have examined patterns of supportive exchanges among employed older adults and found that receiving emotional support adversely affected psychological well-being among employees when support exchanges are considered to involve over-reciprocating (Nahum-Shani et al. 2011). Prior studies have examined the association between social support and psychological well-being and found that imbalances in the ratio of support given and received are associated with poor psychological well-being (Keyes, 2002; Nahum-Shani et al., 2011). Taken together, these findings indicate that people have a deeply rooted tendency to pursue reciprocity in interpersonal relationships and that they feel distressed if they perceive their relationships to be inequitable. Buunk and Schaufeli (1999) argued that reciprocity is universal and an evolutionarily rooted psychological principle, which increased the likelihood of our ancestors' survival in the evolutionary past. Therefore, equity or reciprocity in relationships is important for maintaining social status in the community.

Pursuing another line of study, Gouldner (1960) presents a set of norms of reciprocity in social exchange. Gouldner (1960) , reciprocity norms form a moral code that obliges people to reciprocate benefits or assistance in their social relationships. This assessment implies that individuals are more opposed to being over-benefited, as they are motivated to reciprocate in their

social relationships by internalized moral norms (Chen et al., 2009; Nahum-Shani et al., 2011; Phan et al., 2009; Uehara, 1995). A few studies have suggested that norms of reciprocity should be incorporated when the aspects of social support are assessed (Nemoto, 1998). When reciprocity norms are widely recognized, the degree to which reciprocity applies to people and cultures varies (Cropanzano and Mitchell, 2005). Reciprocity is more likely to evolve in species with longer life spans who live in small groups and are highly dependent upon each other for survival (Buunk and Schaufeli, 1999). As Hawkes (1992) found, past mutual trust is not what makes friends and neighbors better candidates for reciprocity than strangers but the greater likelihood that they will be around tomorrow. These events help create mutual consciousness among groups, a spirit of solidarity to cope with any traumatic or stressful condition, and the capacity to embrace interdependence. Reciprocity in relationships is therefore critical to maintain both the physical as well as the psychological well-being of individuals.

These theories pursue different lines, but their mutual consistency is obvious. Nahum-Shani et al.(2011) , acknowledging this, have developed a framework that incorporates both theories, centering the role of social norms as a mechanism that underlies the way that the pattern of support exchange affects individual well-being. Given this state of affairs, in this paper, authors seek to integrate equity theory and norms of reciprocity. As these theories imply the existence of interactions, we set the following research questions and confirm negative answers for both questions.

Research Questions:

In light of previous findings, we derive the following research questions:

In a community severely damaged by an earthquake,

Question 1. Does the amount of emotional support that an individual receives decrease depression, regardless of the amount of emotional support that that person gives to others?

Question 2. Does the amount of instrumental support that an individual receives decrease depression, regardless of the amount of instrumental support that that person gives to others?

Our expectations regarding the answers are as follows. Following Mizuno et al., (2019), we create four categories according to the amount of support provided and received by a given individual. The categories are as follows: low in giving and low in receiving, group 1; low in giving and high in receiving, group 2; high in giving and low in receiving, group 3; and high in giving and high in receiving, group 4, for each type of social support. On the basis of this classification, as well as the existing theory, we expect to have the following answers for the above-mentioned questions.

With regard to Question 1, equity theory states that individuals who are high or low in reciprocal exchanges have the same level of depression, whereas two other groups (low in giving and high in receiving; high in giving and low in receiving) may have higher levels of depression. However, with regards to emotional support, if social connectedness is considered, using equity theory and norms of reciprocity, it is predicted that individuals with a high degree of reciprocal exchange may have lower depression levels, and thus the answer is expected to be negative.

With regard to Question 2, equity theory states that individuals high in reciprocal exchanges and low in reciprocal exchanges will have the same level of depression, whereas the two other groups (low in giving & high in receiving; high in giving & low in receiving) may have a higher level of depression. So, if the amount of support provided is high or low in a relationship, we check whether the interaction effect holds true for instrumental support. It is predicted that individuals with high levels of giving and low levels of receiving may have higher depression levels, and thus the answer is expected to be negative.

2.4. Materials and methods

2.4.1. Data Collection

The data were collected in the municipality of Melamchi in the district of Sindhupalchowk, about 80 km northeast of Kathmandu, the capital of Nepal (Fig. 1), which was one of the worst-affected districts in the 2015 earthquake. In this district, 3440 were killed, and 2101 were injured [(Commission, 2015)]. Melamchi, an administrative unit in Sindhupalchowk, consists of 13 wards. Wards 7 and 8 were chosen as the study area because (i) they were heavily affected by the earthquake, (ii) external support and resources were limited in this area, and (iii) people depended entirely on mutual assistance after the 2015 earthquake. The 2011 census found the population, total area, and population density per square km to be 5713 people, 20.37 km^2, and 280.46 people per km^2, respectively (Central Bureau Of Statistics, 2012).

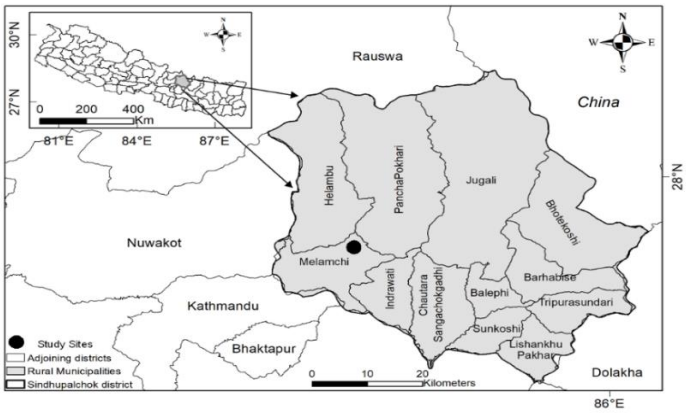

Figure 2.1: Map of Nepal showing the Study Area

A cross-sectional, face-to-face questionnaire survey was conducted from February 2019 to March 2019 among 295 subjects. The inclusion criteria were as follows: (i) 18 years of age or older, (ii) living in the current place for at least 6 months, (iii) mentally healthy to participate in the survey,

(iv) head of a household, and (v) living in the village when the earthquake occurred. We used systematic random sampling to collect data satisfying all of these criteria. Eligibility criterion (iv) entailed that the household was the primary analytical unit. This was done because households are closely bound together and cooperated in disaster recovery. In rural Nepal in particular, it is common practice for the head of a household to be the primary spokesperson for the family. Because they have a strong sense of their household's vulnerability to disaster(Islam and Walkerden, 2014) , and are the main decision makers of their households and are well informed about their family affairs(He et al. 2018), this choice was supported. The survey response rate was 96%.

2.4.2. Measures

The questionnaire included the items regarding (i) demographic characteristics of the respondents (including their age, gender, education level, religion, marital status, occupation, income, and the number of family members), (2) earthquake exposure (damage and losses from the earthquake), (3) mutual support activities (including the two dimensions of giving and receiving social support) and (4) individual responses to the Patient Health Questionnaire-9 (PHQ-9).

2.4.3. Earthquake Exposure

Six variables were used to assess the damage caused by the earthquake, measured with six questions: (i) injury to the respondent, (ii) injuries to respondent's family members, (iii) loss/death of family members, iv) damage to the house, v) loss of food items, and vi) loss of livestock. The respondents were requested to provide binary answers (yes or no responses) for all questions.

2.4.4. 2-Way Social Support Scale

Shakespeare-Finch and Obst (2011) assessed the amount of instrumental and emotional support in two-way relationships (i.e., support that is given and received by individuals), and Bokszczanin (2011) measured the amount of support provided and received in areas damaged by

flood. This present study utilized 11 of 21 items regarding emotional support created by Shakespeare-Finch and Obst (2011), and four of the nine items on instrumental support created by (Bokszczanin 2011). Instrumental items of the former were not included because they were not appropriate for earthquake recovery and five items of the latter were deleted because they duplicated other items on emotional support and informational support. An additional 13 items were created following our field observations and an interview with a government official at the District Health Office and an official of the Nepal Red Cross Society of Sindhupalchowk. These officers had a comprehensive understanding of the damage to the district that the study site belongs to. Both of these interviews lasted for approximately 30–45 minutes and were conducted on December 15, 2018. It was found that the damage to be measured at the study site could not be accounted for by the two scales chosen. The emotional support items published by Shakespeare-Finch and Obst, (2011) were directly applicable to the earthquake recovery, but the instrumental items were not. Similarly, items on instrumental support from the Bokszczanin, (2011) did not cover all aspects of the damage or the support provided and received by the participants. Thus, further questions on instrumental support were developed, making 28 items in total.

Shakespeare-Finch and Obst (2011) used a 4-point Likert scale, from 1 (strongly disagree) to 4 (strongly agree), and Bokszczanin (2011) used a 4-point scale, from 0 (never) to 3 (many times), but in this study, participants were requested to provide binary answers, answering 1 if they had the experience of providing or receiving the social support described in the item since the earthquake and 0 otherwise. This was to avoid answers relying on individuals' subjective feeling.

Not all of the 28 items were utilized in the statistical analysis. Specifically, to determine the set of items needed to define each of the four (2*2) subscales (i.e., giving vs. receiving and instrumental vs. emotional), the item-total-correlations were calculated, and items with correlations less than 0.30

were deleted (Mahler et al. 2014). This produced a final list of 19 items. (See Table 1 for details). The items not utilized in the final analysis are given in the Appendix (See Appendix for details).

Table 2.1: Measures of 2-way social support

Giving emotional support
1. Did people confide in you when they had problems? *
2. Did you look for ways to cheer people up when they were feeling low and down during and after the earthquake? *
3. Did you provide a sense of comfort to others during and after the earthquake? *
4. Did you provide help to others by listening to their earthquake-induced problems? *
5. Did people close to you share their fear and worries caused by the earthquake? *
Receiving emotional support
6. Did you share your fear and anxiety caused by the earthquake with others? *
7. After the earthquake, did you feel that there was someone whom you could trust? *
8. Did you share your thoughts with someone close to you when you felt low or down after the earthquake?*
9. Do you have someone who makes your life feel worthwhile after the earthquake? *
10. After the earthquake, did you feel that you had a circle of people who valued you? *
11. Did you tell someone close to you about the problems you had caused by the earthquake? *
Giving instrumental support
12. Did you provide rescue support to those who were injured after the earthquake? ***
13. After the earthquake, did you help to dig victims out of damaged houses? **
14. After the earthquake, did you help an injured person seek medical attention? ***
15. After the earthquake, did you provide support to others to dig out their food and clothes from their damaged home? **
Receiving instrumental support
16. Did you receive rescue support from others following the earthquake to save your injured family members? ***
17. Did you receive support from others to seek medical attention when you or your family member was injured after the earthquake? ***
18. Did you receive support from others to dig victims out of your damaged house after the earthquake?**
19. Did you receive support from others to dig out your food and clothes from your damaged home? **

Note: * items adopted from Shakespeare-Finch and Obst (2011); ** items adopted from Bokszczanin (2011); ***

Items created by authors.

2.4.5. Patient Health Questionnaire (PHQ-9)

The PHQ-9 is used to screen and diagnose depression in community settings (Kroenke et al., 2001) .We used the validated Nepali version of the PHQ-9 from an earlier study (Mishra et al. 2015). This tool has nine items used to record the frequency of depression symptoms over the previous 2 weeks, such as 1) little interest or pleasure in doing things and 2) feeling down depressed or hopeless. The responses were reported on a 4-point Likert scale (0 = not at all, 1 = several days, 2 = more than half of the days, and 3 = nearly every day), making the possible cumulative range from 0 to 27. Higher scores are associated with more serious depression. The two-week period here refers to the time period when the data were collected in 2019, rather than immediately after the occurrence of the earthquake in 2015. This strategy is validated from two perspectives.

First, the distress associated with the disaster may persist for a long period of time after the incident of the earthquake. Some studies have found that a bereaved family may carry a lifelong burden of depression, anxiety, and posttraumatic stress compared to the general population (Thoresen et al. 2019). Furthermore, longitudinal studies after the 2011 Great East Japan Earthquake showed that posttraumatic stress decreases over time in affected areas, but depression did not (Ando et al.2017). Thus, it was considered important to identify factors predicting depression well after the earthquake (i.e., after the period of a few years in this study).

Second, the items presented in Table 1 include social support given or received, not only immediately after the earthquake but also over the period until 2019. Inclusion of the latter makes it reasonable to investigate the combined effects of social support given or received over the short and long run to the depression well in the longer run (i.e., a few years in this study).

2.4.6. Statistical Analysis

Multivariate regression analyses were conducted to describe the PHQ-9 score in terms of the four subscale scores of the 2-Way Social Support Scale, damage due to the earthquake, and sociodemographic variables. Among the 295 respondents, the questionnaires of nine were not usable, leaving the data from 286 for the analysis.

Including the four subscales of the 2-Way Social Support Scale that were highly correlated with one another (correlation coefficients for the six pairs of four items ranged between 0.13 and 0.48), the present study followed Mizuno et al. (2019) , who examined the relationship between the reciprocity of social support and psychological distress among Japanese older adults. (Note that, unlike the present study, Mizuno et al. (2019) did not distinguish between types of social support.) Specifically, for both emotional and instrumental social support, the entire sample was divided into four subgroups, and three dummy variables were defined, corresponding to groups 2, 3, and 4. (Note that group 1 was considered to be the base group in this study.)

Group 1: Low in giving and low in receiving social support

Group 2: Low in giving and high in receiving social support

Group 3: High in giving and low in receiving social support

Group 4: High in giving and high in receiving social support

2.4.7. Ethics Approval

This study was approved by the Ethics Committee of Kochi University of Technology (Application number 156/2018). Written informed consent was obtained from the participants after the objective and purpose of the study were presented on an information sheet.

The questionnaires were collected by the first author, who is a trained psychosocial support facilitator. She received the Community Based Psychosocial Support Facilitators' Training (CBPSS)

from the Nepal Red Cross society. She assured the participants that they could withdraw from the survey at any time if they feel uncomfortable. Consequently, four participants reported feeling uncomfortable and withdrew from the survey. Counseling was offered to those participants immediately after their withdrawal. Counseling includes listening to the problems of the participants related to the earthquake, giving them advice and making them feel comfortable.

2.5. Results

2.5.1. Demographic and psychological characteristics of the sample

The demographic and psychological characteristics of the participants in this study are given in Table 1. The 286 effective responses, from individuals aged 19 to 82 years, with an average age of 44.17 and a standard deviation (SD) of 14.02 years, were recruited for this survey. About 73.4% of respondents were male, and 26.6% were female. About 88.4 % were married, and 11.5% were single. The annual average income of the households was 47360.14 Nepali rupees (NPR). There were 40.2% participants with no education, 36.4% had only informal education, and 23.4% had primary education or higher. The average family size was 4.3 individuals. Following the natural disaster, it appeared that 43.2% of the respondents did not have depression, 42.5% had mild depression, 12.5% had moderate depression, and 1.7% had severe depression.

The Cronbach alpha values were 0.73 for giving instrumental support, 0.69 for receiving instrumental support, 0.79 for giving emotional support, 0.82 for receiving emotional support, and 0.63 for the PHQ 9, suggesting that the internal consistency of the measures was acceptable.

Table 2.2: Demographic and psychological characteristics of the sample

Variables	n	%	M	SD	Cronbach's alpha
Gender					
Male	210	73.4%			
Female	76	26.6%			
Age			44.17	14.02	
Marital status					
Married	253	88.5%			
Single	33	11.5%			
Household income (NPR)			47360.14		
Education status					
No education	115	40.2%			
Informal education	104	36.4%			
Primary education or above	67	23.4%			
Family size			4.3		
Severity of depression					
None (0–4)	124	43.4%			
Mild depression (5–9)	122	42. 7%			
Moderate depression (10–14)	36	12.6%			
Severe depression (≥15)	4	1.4%			
Social support scale					
Giving instrumental support (4 items)					0.73
Receiving instrumental support (4 items)					0.68
Giving emotional support (5 items)					0.79
Receiving emotional support (6 items)					0.82
Patient Health Questionnaire-9 (PHQ-9)					0.63

2.5.2. Earthquake Exposure Variables

Injuries were suffered by 5.6% of respondents, and 7.3% of respondents reported an injury to a family member. The percentage of the respondents who lost a family member was 8.4%. The houses of 96.5% of respondents were reported to be damaged in the earthquake, and 89.5% lost food stocks and reserves. 46.5% lost their livestock.

Table 2.3: Earthquake exposure variables

Variables	Frequency	Percentage (%)
Suffered injury	16	5.6
Injured family members	22	7.3
Loss of family member	24	8.4
Damaged home	276	96.5
Loss of livestock	133	46.5
Loss of food stocks	256	89.5

2.5.3. Preliminary Regression Analysis Result

Before the analysis described in the Materials and Methods section, regression analysis was conducted to interpret the results of the PHQ-9 in terms of the four subscales of social support, assuming that they linearly and independently affected PHQ-9. It was found that the amount of emotional support received was a significant predictor at the 5% level (beta = −0.17, $p < 0.015$). The association fell in a reasonable direction (i.e., more support was associated with lower depression). Regarding instrumental support, the amount of the instrumental support given increased the PHQ-9 scores of individuals at the 1% level (beta = 0.21, $p < 0.001$). See Table 4 for details.

Table 2.4: Linear regression analysis predicting depression severity

Variables	β		p-value	Std. err.
Giving instrumental support	0.21	***	0.001	0.07
Receiving instrumental support	-0.09		0.264	0.07
Giving emotional support	0.00		0.913	0.07
Receiving emotional support	-0.17	**	0.015	0.07
Sociodemographic variables				
Age	0.06		0.352	0.07
Sex	-0.11		0.092	0.06
Household Income[1]	0.07		0.272	0.07
Married	-0.11		-0.11	0.06
Family size	-0.004		0.945	0.07
Education status				
No education (base group)				
Informal education	0.02		0.763	0.07
Primary and above	-0.09		0.192	0.08
Earthquake exposure variables				
Suffered injuries	-0.06		0.337	0.07
Injured family members	0.00		0.998	0.06
Loss of family members	0.08		0.175	0.06
Damaged home	-0.03		0.652	0.06
Loss of food stocks	0.06		0.333	0.06
Loss of livestock	-0.11		0.055	0.06
Total observations	286			
R-squared = 0.12; Adj. R-squared = 0.07				

Notes: *** $p < 0.01$, ** $p < 0.05$. No education is taken as the base group for education. 1. Regression analysis is computed with the natural logarithm of annual household income.

2.5.4. Main Regression Analysis Result

As mentioned in the Materials and Methods section, three dummy variables were defined in relation to the amount of instrumental and emotional support given and received by the respondents, and these were included in the regression model in addition to other covariates. For emotional support, it was found that being high both in giving and receiving support was found to be the only predictor for lower PHQ-9 scores with reference to being low both in giving and receiving at 5% level (beta = −0.17, $p < 0.024$). This suggests an interaction effect of giving and receiving because receiving alleviated depression only if accompanied by giving. With regard to instrumental support, being high in giving and low in receiving increased the PHQ-9 scores for respondents at the 5% level (beta = 0.14, $p < 0.027$), with reference to being low in both giving and receiving. These

findings suggest that being high in giving increased the PHQ-9 scores of an individual. See full results in Table 5. Thus, the answers to research questions 1 and 2 were both negative.

Table 2.5: Interaction effects of social support on depression severity

Variables	β		p-value	Std. err.
Emotional support				
Low giving - low receiving (base group)				
Low giving - high receiving	-0.02		0.707	0.06
High giving- low receiving	0.10		0.129	0.06
High giving - high receiving	-0.17	**	0.024	0.08
Instrumental support				
Low giving - low receiving (base group)				
Low giving - high receiving	-0.14		0.065	0.07
High giving - low receiving	0.14	**	0.027	0.06
High giving - high receiving	0.09		0.178	0.07
Sociodemographic variables				
Age	0.10		0.203	0.07
Sex	-0.10		0.126	0.06
Household Income[1]	0.08		0.237	0.07
Married	-0.11		0.070	0.06
Family size	-0.07		0.323	0.07
Number of children	0.11		0.167	0.07
Education status				
No education (base group)				
Informal education	0.02		0.759	0.06
Primary education or above	-0.09		0.227	0.07
Earthquake exposure variables				
Suffered injury	-0.03		0.656	0.07
Injured family members	-0.03		0.653	0.07
Loss of family members	0.09		0.124	0.06
Damage household	-0.02		0.702	0.06
Loss of food stocks	0.08		0.229	0.06
Loss of livestock	-0.09		0.096	0.05
Total observations	286			
R-squared = 0.15; Adj. R- squared = 0.09				

Notes: ** $p < 0.05$, No education is taken as the base group for education. 1. Regression analysis is computed with the natural logarithm of annual household income.

2.5. Discussion

This study explored the interaction effects of giving and receiving support on depression severity among earthquake survivors. A quantitative survey was conducted in a rural village of Nepal where external support was limited, and people relied on each other to cope with the effects of the

earthquake. This study was guided by the principles of equity theory and norms of reciprocity, which indicate that reciprocal relationships enhance mental health. There were four major findings.

First, when the interaction effects of giving and receiving support were neglected, it was found that the depression level of the survivors decreased with the emotional support received. This indicates the significant beneficial effects of receiving emotional support after a disaster on depression. This result is in line with those of Shakespeare-Finch & Green (2013), who reported similar findings in a post-flood scenario in Australia. It seems evident that traumatic events in disaster-affected areas tend to overwhelm the internal resources of individuals (self-esteem, mastery, and purpose in life) (Cropanzano and Mitchell, 2005; Shakespeare-Finch and Green, 2013). Emotional support is effective in such cases, as it provides a strong message of self-worth and competence that can help cope with disaster-induced negative and psychological stress (Shakespeare-Finch and Green, 2013; Tsuboi et al., 2016).

Second, with regard to instrumental support, we found that the depression level of survivors increased when instrumental support was given. This result is in contrast to the findings of Tsuboi et al., (2016) , Patricia A Thomas (2010) , and Momtaz et al., (2014) , who found that giving instrumental support to others enhanced the psychological well-being of individuals in non-disaster settings. This study was conducted in a disaster setting, and thus the difference may be due to the fact that individuals who experience disasters may face additional psychological challenges or may be in poor health as a result, such that if they provide instrumental support to others in these circumstances, they themselves may experience increased distress. Previous studies have shown that providing instrumental support enhances the psychological well-being of individuals only when they are emotionally engaged in providing instrumental support(Brown et al., 2003; Liang et al., 2001; Sylvia A. Morelli, Ihno A. Lee, Molly E. Arnn, 2015).

Third, once the interaction effects of giving and receiving social support are considered, our findings suggest that receiving additional emotional support alleviates depression only when it is accompanied by giving additional support within a reciprocal relationship. This finding is consistent with that of Maton (1987), who found that individuals high in bidirectional support or reciprocity showed the highest level of well-being. Our finding is also consistent with those of Mizuno et al.(2019) , who found that reciprocal exchange of social support is associated with a low risk of depressive symptoms. This is the first time where equity theory and a theoretical construct of reciprocity have been used to explain the mental health of natural disaster survivors.

An additional aspect should be noted. Strictly speaking, the theories of equity and reciprocity predict that individuals who are high in both giving and receiving emotional support and individuals who are low in both are indifferent to each other with respect to depression severity. However, this study found that the former had better mental health than the latter. This result is clear in relation to the literature of social connectedness and social interaction. In a disaster-affected community, community members may acquire psychological problems and to cope with them, they may participate in mutual helping behavior, which determines the amount of support that they receive and provide (Kaniasty, 2020; Cutrona 1990). In such cases, it seems clear that those with large social networks and strong social connectedness would reciprocate additional support to cope with the negative effects of the disaster they experienced (Kaniasty and Norris, 1995; Santini et al., 2015; Tsuboi et al., 2016; Sylvia A. Morelli, Ihno A. Lee, Molly E. Arnn, 2015). In addition, survivors who participate in mutual exchanges to a greater extent have increased interconnectedness, faith in attitudes toward others, sense of belonging, and social cohesion, all of which decreases depression and increases the individual's psychological well-being (Andrighetto et al., 2016; K. Kaniasty & Norris, 1993, 1995; R. M. Lee, Draper, & Lee, 2001; Townsend & McWhirter, 2005) .This suggests

that individuals in high reciprocal exchanges have a lower level of depression relative to individuals who have lower levels of reciprocity or non-reciprocal relationships.

Fourth, unlike findings on emotional support, findings regarding instrumental support suggest that net amounts of instrumental support given (rather than the balance between the amount received and that given) matters for the instrumental support, as our statistical results suggest that individuals who are high in giving and low in receiving instrumental support and individuals who are low in both giving and receiving instrumental support are different to each other with respect to the severity of depression. This result seems consistent with Hobfoll's Conservation of Resources model (Hobfoll, 1989), which posits that a loss of resources (e.g., home, food stocks, mastery, or self-esteem etc.) is related to psychological distress and declining mental health (Lebowitz, 2016; Nguyen-Trung et al., 2020). Disaster research shows that survivors are at risk for mental health morbidity, such as anxiety, depression, and psychological stress due to damage to or loss of the resources (Adeola, 2009; Norris et al., 1999). In these situations, the value of instrumental support for a natural disaster survivor is obvious. However, according to Social Exchange Theory (SET), if the cost of support is higher than the benefits received, individuals feel more distressed (Homan 1958). Thus, the net amount of support given increased the depression level of individuals. Our findings are also consistent with equity theory, which suggest that people who provide more support than they receive in the reciprocal relationship, such that they may have higher levels of depression than people in other groups.

2.6. Limitations of the study

This research has some important limitations, which suggest possible directions for future research. First, this research applied a cross-sectional approach. Therefore, future work should investigate the causal effects of giving and receiving support on depression, using a longitudinal

study design. Second, we lack pre-earthquake prevalence estimates for depression and estimates of support level from that period, so desirable comparative data is difficult to obtain. Third, the data were collected in a single earthquake-affected village, with a small sample size of 295. Expanding the study to a larger sample and in other disaster-affected areas could develop a clearer picture of mutual helping behavior.

2.7. Conclusion

This study analyzed the impact of reciprocal exchanges of types of social support in the depression status of the survivors in earthquake-damaged communities. The results show that the prevalence of depression among the survivors were 42.5 percent with mild depression, 12.5 percent with moderate depression, and 1.7 percent with severe depression. In addition, the results also indicated that the amount of emotional support received by the individual alleviated his or her depression only if it was accompanied by giving emotional support. By contrast, the net amount of instrumental support given by the individual increased his or her depression. Overall, this paper demonstrated that reciprocal exchanges of social support are important for minimizing the depression of survivors and to build a disaster-resilient society.

This research has several practical implications. As far as emotional support is concerned, reciprocity in post disaster recovery is important for maintaining psychological health. In disaster-affected communities, where external aid is limited, people are highly dependent on each other for survival. In fact, they share a common vision for how disaster can be tackled to create a resilient community. In such situations, reciprocal exchanges can help create good relationships among individuals and motivate them to cope with the negative effects of disasters. This may reduce the risk of depression as well as other psychological problems among disaster-affected individuals over the long run.

Second, this study found that, so far as instrumental support is concerned, the net amount of instrumental support given in post disaster recovery increases the depression severity of the survivors. In a disaster-affected community, where both the providers and receivers of support are victims, providing more support in this condition makes people more distressed. Therefore, more research is needed to further understand the differences in support imbalances and the costs and benefits of providing support in the context of disaster.

Third, although several years have passed since the earthquake, the effects still persist. Therefore, attention to the affected area should be paid continuously, not only in terms of the provision of tangible support but also with a focus on the mental health of the survivors. Furthermore, local authorities should take the initiative to identify pre-existing support and strengthen them (youth clubs, women groups, and religious institutions) to improve their cohesion to minimize mental health problems. Humanistic concerns such as early identification of cases, ongoing monitoring, and sustained psychosocial support should be offered.

Chapter 3 : Taking the perspective of future generations as an effective method for achieving sustainable waste management

3.1 Introduction

Solid waste management (SWM) has become a global concern with the increase in economic development, population growth, and shifts in patterns of consumption (Marshall and Farahbakhsh, 2013). The amount of solid waste generation from urban areas around the world is 2.01 billion metric tons per year, and is projected to increase to 3.40 billion tons per year by 2050 (Kaza et al., 2018). However, the issue of SWM is more critical in the metropolises of developing and low-income countries, including Nepal. Rapid and unplanned urbanization as well as the poor management of waste by municipalities has increased environmental pressures, including unorganized disposal in these cities (Dangi et al., 2011). An ADB (2013) report revealed that, out of a total of 58 municipalities in Nepal, only six use sanitary landfills for the final disposal of waste and 45, including Kathmandu city (the capital of Nepal), practice open dumping, including in low-lying areas along riverbanks and abandoned land. Moreover, six landfill sites are not guaranteed to be well operated.

Such practices related to solid waste not only threaten the health of urban citizens through communicable diseases but also adversely have an impact on the environment as well as the aesthetic value of cities (Rodić and Wilson, 2017; Serge Kubanza and Simatele, 2020). The frequent dumping of waste in public and open spaces may be a result of the poor waste management systems of municipalities, such as irregular collection, lack of resources to provide effective and efficient services to their citizens, lack of technical expertise, insufficient financial resources, and a complex administrative structure (Sujauddin et al., 2008). Another potential explanation for this problem is the low awareness of the necessity of waste separation (Babaei et al., 2015) and waste disposal

among the residents of municipalities (Srun and Kurisu, 2019). Therefore, it is essential to understand how waste-related preferences and behaviors might be changed to maintain a sound and sustainable city environment. With reference to the literature on future design, this study develops a new strategy to modify peoples' waste-related preferences and behaviors and tests its efficacy through a deliberative field experiment.

The structure of the paper is as follows. 3.2 presents the literature review and the conceptual framework and identifies the main hypotheses, as well as clarifies the novelty of the intervention measure of modifying individuals' waste management behavior, in comparison with the literature. 3.3 describes the design details of the deliberative experiment and the results of the statistical analyses of the data collected in the experiment, whose objective is to test the derived hypotheses shown in section 3.4. Section 3.5 presents the discussion. 3.6 presents the conclusion of the study. Hereafter, the term "sustainability" is used to describe the nature of policy alternatives that are preferred by individuals with both a broad time range in the future and a broad spatial range.

3.2. Literature Review

A burgeoning literature has used various strategies to address the challenges of SWM. Following Varotto and Spagnolli (2017) and Knickmeyer (2020), we identified seven persuasive strategies to modify individuals' waste handling behavior. The following sections briefly discuss each strategy and its limitations.

Prompts and information: "Prompts and Information" is one of the interventions that influence individuals' waste separation and recycling behavior. This strategy consists of providing information on recycling to targeted individuals to encourage their recycling behavior. The information can be written or delivered face-to-face. Some researchers have demonstrated that written information

represents the most common type of intervention to promote recycling, as it can reach a considerable number of people with low efforts and cost (Miranda and Blanco, 2010; Schultz et al., 1995, Shearer et al., 2017). Previous studies have identified the two forms of written information. The first consists of informative fliers and brochures that advocate recycling and explain how/why/when to carry it out (Chong et al., 2015; Rhodes et al., 2015). Currently, these traditional methods are complemented with the use of internet and mass media (Zhou et al., 2014) and SMS (Chong et al., 2015; Iyer & Kashyap 2007). Alternatively, as a second form, information can be delivered face-to-face as in door-to-door visits (Bernstad, 2014; Bernstad et al., 2013; Willman, 2015) or during in-person demonstrations where brochures, recycling bins, bags, and other educational resources are distributed (Chase et al., 2009; Iyer & Kashyap 2007). Door-stepping campaigns are often considered to be more effective than fliers and brochures (Knickmeyer, 2020; Timlett and Williams, 2008), though they seem preferable to use only under specific conditions (low participation, low awareness) and a targeted population.

Economic strategies: Economic incentives refer to any kind of benefit (e.g., monetary rewards, refund and unit pricing programs, gifts, prizes, lottery, tickets, discounts coupons) received by consumers as a result of their participation in a waste recycling program (Varotto and Spagnolli, 2017). Recycling activities can be controlled by adequate manipulation of rewards and punishments in accordance with the utility maximization approach (Miafodzyeva et al., 2013). Financial rewards are popular among the public, while penalties seem less politically acceptable (Widdowson et al., 2014; Xu et al., 2017a; Yau, 2012). Yet although economic incentives are common strategies, they also have drawbacks. First, they require the continuous monitoring of recycling behavior. Second, their cost often outweighs the economic benefits of recycling (Burn, 1991; Schultz et al., 1995) Third, there is no empirical proof of the impact of recycling incentives on intrinsic motivations (Xu et al.,

2017b). ***Environmental alterations:*** Interventions that make recycling simpler and more convenient by modifying the physical environment are called environment alterations. These include, for example, raising the proximity or number of bins, changing their appearance, or providing home facilities for sorting waste (Knickmeyer, 2020; Varotto and Spagnolli, 2017) and changing the appropriate distance for waste collection and separation (Leeabai et al., 2019). Nudge is one strategy of environmental alteration that relies on subtle cues to affect how people behave without realizing it (Parajuly et al., 2020). According to Thaler and Sunstein (2009), Nudge is characterized as any aspect of the choice architecture that alters individual's behavior in a predictable way without preventing any options or altering their economic incentive. It is considered an important solution for the reduction of food waste (Kallbekken and Sælen, 2013), the separation of household waste (Zhang and Wang 2020), and plastic waste (Rivers et al., 2017). However, there are controversies and criticisms of Nudging-based behavioral approaches, including the accusation that they are deceptive and unethical or that nudges are unfit for tackling society's major ills such as climate change (Goodwin, 2012).

Modeling: Modeling interventions involve the use of models that demonstrate the recommended behavior. The assumption is that individuals will begin to engage in a behavior when they observe other people doing it (Osbaldiston and Schott, 2012; Varotto and Spagnolli, 2017). This is one of the persuasive strategies used to promote household recycling behavior. The idea of social modeling is "learning to imitate based on Bandura's social learning theory" (Bandura 1977; Knickmeyer, 2020; Varotto and Spagnolli, 2017). The efficacy of modeling to encourage behavioral changes is assumed to occur through social learning. An example of this approach is to recruit community members as "block leaders" for model recycling behavior and to inform and convince non-recycling participants via communication demonstrations or door stepping (Knickmeyer, 2020; Osbaldiston

and Schott, 2012; Varotto and Spagnolli, 2017). Previous studies have used this strategy by employing the volunteer's advisers to stand beside the waste stations every morning and evening and encourage resident recycling by physical demonstration and clarification in a constructive and friendly manner (Xu et al., 2016). Likewise, Becker, (2014) suggested that employing recycling ambassadors within strong social groups such as families, clusters, and students in housing would have a broad range of influence. This model acts as an interactive source of information, tailored to the needs of each individual. All such models are cost effective. A possible weakness is that they are contingent upon the extent to which residents see themselves as part of the community (Schultz et al., 1995).

Feedback: As an intervention strategy, feedback can be used to provide information about the recycling behavior of individuals and groups with a comparison to a predefined standard that can motivate households to fill the gap and fulfill the standard (Knickmeyer, 2020; Varotto and Spagnolli, 2017). Socially comparative feedback has been shown to dramatically increase recycling activities and minimize sorting errors (Dupré and Meineri, 2016). Historical comparison (i.e., comparison of self-past behavior with the predefined standard behavior) is also an efficient method of waste recycling and separation (Knickmeyer, 2020; Timlett and Williams, 2008; Varotto and Spagnolli, 2017). In recent years, new communication channels such as websites and social networking sites have been employed in addition to conventional strategies (e.g., newsletter, mails, leaflets and door hangers) to convey feedback on recycling. Luo et al., (2019) found that providing immediate feedback through a digital sorting game is an effective tool to increase waste recycling and compost rates among students at the University of British Columbia. However, some researchers have argued that feedback systems can be impractical (especially when referring to the performance of single

individuals/households) since they required continuous monitoring of recycling behavior (Katzev and Mishima, 1992).

Commitment: In the commitment intervention, individuals are committed to show a certain behavior or reach a certain goal. This technique is believed to work due to the motivations of individuals to appear consistent, since inconsistency (e.g., a person says s/he will do something and then does not do it) is commonly viewed as a socially undesirable trait (Cialdini et al., 1990). Previous studies have highlighted that commitment is more effective in changing recycling behavior than information provision via fliers and brochures (Mickaël, 2014; Werner et al., 1995) and economic incentives (Owusu et al., 2013). Despite these results, the number of studies applying commitment to promote household recycling behavior has declined since the 1990s. The main problem with commitment as a strategy is that it is difficult to be applied to a society at large (Varotto and Spagnolli, 2017).

Presentation of social norms : Social influence and social pressure may be used to further facilitate waste reuse and separation as a catalyst (Ekere et al., 2009). Some psychologists have shown that presenting social norms related to recycling is a powerful influence technique to affect recycling action (Cialdini et al., 1990). Individuals are expected to have such a strong desire for conformity that if they think their neighbors are doing something, they are likely to change their ways to do the same (Knickmeyer, 2020).

The position of the present study

In spite of the accumulated knowledge on how people's waste-related behaviors can be modified, as mentioned above, this study aims to develop a new strategy in reference to future design. Future design is an emerging methodology in the field of future studies and sustainability science, which induce people to adopt presentism and care for future generations by imaginatively

experiencing the role of future generations. The future design framework employed in this study ask subjects to act as a member of future generations (hence called imaginary future generations) (Kamijo et al., 2017; Saijo, 2020, 2014; Shahrier et al., 2017a) and requests that they design strategies to be adopted by the present generations (Shahrier et al., 2017b). Prior experimental studies have statistically shown how future design methodology influences ways of thinking about and preferences for policy options in a manner sympathetic to future generations and, thus, in a sustainable manner (Nakagawa et al., 2019a, 2019b; Shahrier, 2017b; Timilsina et al., 2020). As the methodology intervenes with individuals' values by taking the perspective of the future generation, it can be classified into the category of "Presentation of social norms." This study explores the possibility that a new waste management intervention incorporating the methodology of future design can overcome the criticism of "Presentation of social norms."

While previous studies have found that the presentation of social norms is an effective persuasive strategy to promote individuals' waste recycling behavior (Cialdini et al., 1990; Wan et al., 2017), some studies have pointed out the limitation of this strategy from at least four different perspectives. First, social norms are unwritten codes defining how people behave in specific situations (empirical expectations) and what other people think one should do in such situations (normative expectations) (Young, 2015), and people in a community may have difficulty understanding what such an implicit code actually means in the community (e.g., Tankard and Paluck, 2016). Second, even if social norms are made explicit by means such as notice boards, the problem will not be resolved because norms transformed in fairly one-way manners may fail to reach the intended audience or spark the public dialog needed to change peoples' perceptions of what others in their group do and approve of (Cislaghi et al., 2019). Third, individuals have preferences for complying with social norms that are conditional on both types of expectations (empirical and

normative expectations) being present as, however, they ignore it in their absence (Bicchieri, 2010; Farrow et al., 2017). Fourth, some studies have argued that this approach is effective only for the duration period of the intervention itself and may not persist after its discontinuation (Abrahamse and Steg, 2013; Schnelle et al., 1980), providing negative implications for policy makers and community leaders.

In reference to the literature of future design, the intervention strategy developed here has the potential to be a new member of the category of "Presentation of social norms" that may overcome several of the above-mentioned limitations inherent in this category. Specifically, the discussion on the second limitation (i.e., the one-way transmission of social norms toward individuals) implicitly assumes that a social norm is something forced or at least recommended to adopt by others external to the individual. In contrast, a recent qualitative study (Nakagawa and Saijo, 2020) demonstrated that future design enables individuals to possess a new metacognition (i.e., higher-level cognition regarding more concrete level cognitions) concerning how one chooses a temporal reference point from which to view the past, present, and future of society. By doing so, this intervention enables one to internalize new social norms that are against presentism. Thus, it has the potential to avoid problems that arise due to the externality of the social norms.

The intervention to be developed by this study also has the potential to resolve the fourth limitation on the duration of the intervention effects. In fact, Nakagawa and Saijo (2020) argue that the new metacognition adopted by future design has the function of harmonizing two potentially conflicting identities (i.e., identities as the present and future generations) and that this function remains active well after the intervention period.

3.2.1. Conceptual framework and hypotheses

The Theory of Planned Behavior (TPB; Ajzen, 1991) provides the theoretical framework for

investigating individuals' sustainable behavioral intentions and behaviors. This theory postulates three distinct constructs: attitude, subjective norms, and perceived behavioral control (PBC). These three constructs together can shape individuals' behavior intentions and behaviors. Attitude refers to individuals' positive or negative assessment of a behavioral option. Subjective norm refers to the perceived social pressure from family, friends, and peers on an individual to perform or not to perform a specific behavior. PBC determines the degree of difficulty in executing a specific behavior. Most studies have stated that a positive attitude, subjective norms, and strong PBC should strengthen the individuals' intention to perform a behavior under certain circumstances (Ajzen, 1991; Liebe et al., 2011). The TPB has been considered the most popular theory for predicting individuals' behavior, and it has been widely applied to waste-related behavior such as waste separation and recycling (Liu et al., 2020, 2019; Wang et al., 2020) and waste disposal (Meng et al., 2019; Srun and Kurisu, 2019).

Earlier empirical studies seem to imply that future design interventions can influence the two predecessors of the TPB: (1) attitude and (2) PBC. In fact, Hara et al., (2019) demonstrated how future design interventions induce people to change their priorities on policy issues that take a longer time to resolve, such as global environmental problems and climate change issues, and make constructive decisions that take into account future generations' interests, suggesting that imaginary future people discount the time cost, which is less likely to be accepted by the present generations. Similarly, Nakagawa et al., (2020), Nishimura et al., (2020), and Shahen et al., (2021) clarified how taking the viewpoint of future generations relaxes the sense of burden on the present generations in realizing a desirable future. It appears that by means of temporal discounting, future design interventions can influence how individuals perceive the level of the present generations' behavior control.

Future design interventions may also have an impact on individuals' attitudes toward sustainable waste management behavior. In laboratory experiments, Nakagawa et al., (2019a) and Nakagawa et al., (2019b) found that people who experienced the perspective of future generations tend to prefer sustainable options, suggesting that they acquired a sympathetic attitude toward members of future generations. They became sympathetic in the sense that they would like to avoid future generations' inaction regret (regret caused by actions that were not taken, rather than that were implemented), which may be perceived by future generations. Above all, this implies that future design interventions may impact the attitude of an individual to move toward sustainable behaviors.

To summarize, future design interventions may influence people's behavior intention through two pathways: PBC and attitude of the TPB model. Taken together with the assumption that sympathy toward future generations spills over to sympathy toward geographically distant people at least to some extent, we hypothesize the following:

Hypothesis: People who experience future generations' perspective are likely to enhance their behavioral intentions or preferences for alternatives that are beneficial to people distant with respect to space and time in the future, but are burdensome to themselves.

One thing should be noted regarding this hypothesis. We consider the benefit of policy alternatives and individuals' behaviors toward people who are distant from the individuals not only temporally but also spatially. The reason is that the producer and the sufferer of waste management problems may not coincide spatially, and the former should think about the benefit of the latter. For example, as mentioned in Section 3, the behavior of urban citizens such as those in Kathmandu city, Nepal, strongly affects the natural environment of its peripheral area with the waste disposal site.

3.3. Methods and Materials

A deliberative field experiment was conducted from July 2019 to August 2019, with men and women aged 16–70 years in Kathmandu as the study population. Kathmandu is the capital and the largest city of Nepal, with a population of approximately one million (CBS, 2012). The city is considered an urban core of the Kathmandu Valley, which also contains two major cities, Lalitpur (5 kilometers to its southwest) and Bhaktapur (14 kilometers to its east). The city has been facing waste management issues with the rapid growth of the urban population and unplanned urbanization for decades. Household waste generation accounts for 50–75% of the total solid waste generation in municipalities. It is reported that 66% of organic waste is generated by households, followed by plastic at 12%, and paper and paper products at 9%. In total, only 37% of the municipal solid waste in Nepal is disposed of in what are supposed to be sanitary landfills, many of which do not actually operate as such (ADB, 2013). Hence, over the years, a major concern has been how to sort out waste management problems.

3.3.1. Sampling Method and Sampling Size

Purposive sampling was used to choose the areas inside the city. The areas were selected in such a way that they represent the diverse nature of Kathmandu's population. Second, they cover the overall status of waste management in the entire city. Accordingly, we selected six places: four from the central area of Kathmandu, namely, Swoyambhu, Teku, Balaju, and Samakhusi and two from the peripheral areas, namely, Thali and Chandragiri. Furthermore, to recruit the subjects, we placed an advertisement through a key resource person in each ward office (a local administrative office) of the selected areas.

The criteria for the selection of the sample were the following: (i) he/she must have lived in the current place for at least six months; (ii) he/she must be aged 16 years old or above; and (iii)

he/she must be acquainted with the municipalities' current waste management services. Accordingly, a key resource person in each ward office (a local administrative office) of the selected areas listed all the eligible candidates willing to participate, and then we randomly selected the subjects from the list.

The sample size of 290 was calculated assuming that the household generates 50−75% of the household waste (ADB, 2013). We took 65% prevalence from the ADB (2013) as a baseline indicator with a 95% confidence interval and 5.5 % error, given the population of Kathmandu (approximately 1 million according to CBS, 2011).

3.3.2. Experimental setup

Case-Method Material

For the deliberative field experiment, the strategy of (Nakagawa et al., 2019a, 2019b) was adopted. Specifically, a case-method approach was developed and employed to provide local residents with sufficient scientific information and facts regarding the policy agenda of SWM in Kathmandu city within 30 minutes. Before the experiment, for the development and validation of the questionnaires, the study team consulted with stakeholders, municipality officers, professors, and experts in the field of solid waste management in Nepal. The consultations were aimed at recognizing the situations of SWM in the past and present as well as the current problems faced by service providers and consumers. In addition, the study team visited the landfill site with the municipal workers and observed the situation there. The team also conducted an interview with local key persons and the person in charge of the landfill site to understand the situation of the landfill site, how the unorganized disposal of waste is carried out, and how it affects the living conditions of the people nearby. During the consultations, the study team found that resource constraints, financial

constraints, problems of the landfill sites, and conflicts among the people living nearby and in the municipalities were prominent issues. In addition, before performing an experiment, pretesting was conducted among the stakeholders and official staff, and essential feedback was obtained for the further improvement of the material.

The case material developed for the present study consists of three parts. In the first part, a document related to the history and current status of SWM in Kathmandu city was described to show (1) how the urban environment of Kathmandu city has been degraded, (2) the history of waste management in Kathmandu city from 1970 to 2018, and (3) the reality of how the Sisdol landfill site, where the waste of Kathmandu city is disposed of, is poorly operated (for detailed descriptions of document 1, see Appendix A).

With regard to the second part, a material (with narrative and pictures) was created to help subjects better understand the current status of the environmental situation of the Sisdol landfill site which lies in the Nuwakot district from the viewpoint of a villager living next to the site. The protagonist of the story was recruited after satisfying the following criteria: (1) he has lived continuously in the village where the landfill site is operated, (2) he has witnessed the landfill site status from its opening to the present, and (3) he has experience working in the landfill area and is familiar with the clear history of how the landfill operates. One candidate was identified and an interview survey was conducted for two hours. A glimpse of the narrative is shown in Figure 1. The story was written so that participants in the experiment with a lower educational background could fully understand it. (For a detailed description of this story, see Appendix B). The objective of including this material was to show to the research participants that, while they can narrowly view the waste management issue in Kathmandu city as a source of urban environmental problems, they

can also broaden the spatial range of concern by viewing the same issue as a problem related to the relationship between Kathmandu city and its peripheral rural villages (20 kilometers away from the city) that are subject to environmental degradation.

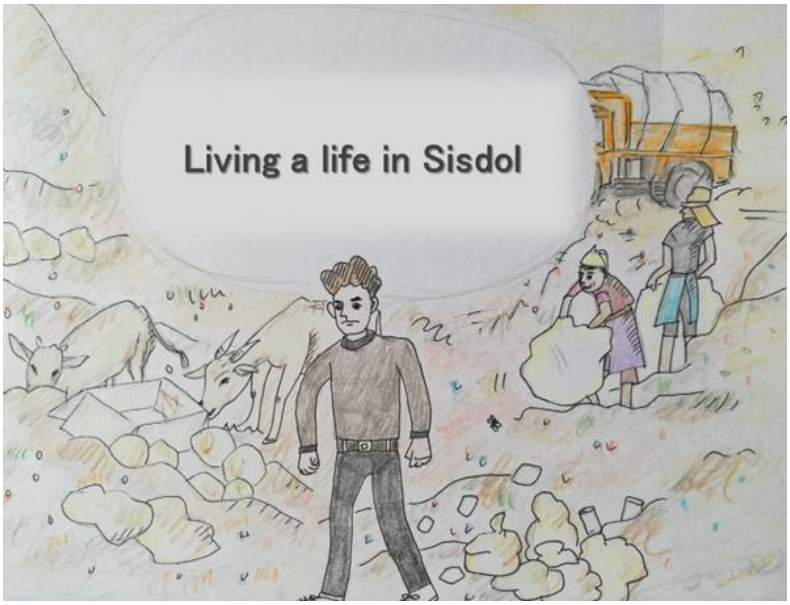

Figure 3.1: Living a life in Sisdol

Here is the Sisdol landfill site in the suburbs of Kathmandu city, the capital of Nepal. There are dump truck drivers engaging in landfill operations, day workers collecting reusable waste such as plastic, and goats and cows gathering to scavenge food from garbage. A young man is walking through this environment with a serious and firm look. He is a 27-year-old man named Gyan. He runs a restaurant in Chaletar Village near the landfill site. This story is about Gyan's life until now.

In relation to the third part of the material, we prepared four policy options that Kathmandu city and its citizens might adopt as of 2019, as shown in Table 1. Each policy option is designed to have pros and cons in the way that each option can be justified in one respect and cannot be justified in another respect. The four policy options were as follows:

Option 1: Status Quo

This is the baseline option. The city continues all its current waste management services. This option seeks no improvement, with the understanding that the current situation of Kathmandu city is acceptable. In fact, Kathmandu city collects as much as 87% of 466 tons of waste generated in the city every day (ADB, 2013). This percentage is higher than those of other urban municipalities in Nepal. From this viewpoint, this option does not assume additional investment to improve waste management. Further, it should be noted that this option does not show any impacts on the environment of Kathmandu city and the landfill site. This is the option to be preferred by those with a narrow spatial perspective and a narrow temporal perspective.

Option 2: Recovering Beauty

The city is responsible for collecting waste, and the ratio of collected waste is increased up to 100% due to households' efforts. Households dispose of waste only in front of their houses or at fixed collection points rather than on streets or on riverbanks. We assumed that in order to implement this option, each household needed to share the annual burden of NPR 2,400 (see Appendix C). By doing so, implementation of this option contributes to the cleanliness of Kathmandu city by removing waste that would otherwise be left behind in streets or on riverbanks and makes the city environment beautiful, although it does not contribute to the environment of the landfill site. This is the option to be preferred by those with a narrow spatial perspective and a relatively broad temporal perspective.

Option 3: Moderate Recycling of Solid Waste

In addition to the requirement in Option 2, households are required to separate (1) recyclable

waste, which includes bottles, cans, plastic and plastic-related materials, waste paper, and old clothes; (2) hazardous waste, which consists of batteries, lead, electric bulbs, pesticides and their containers, and expired medicine; and (3) other waste, which includes kitchen waste and inert debris (e.g., sanitary pads and diapers), and to dispose of it on designated days of a week or month. Then cans and plastics (accounting for 15% of the entire waste in 2012) are recycled and the toxic hazardous waste is removed before landfilling it, which is the responsibility of the municipal government. Regarding the investment amount, each household needs to share the annual burden of NPR 3,600, and this also requires the troublesome separation of waste. It should be noted that this option has a slight impact on the environment of the Sisdol landfill site. This is the option to be preferred by those with a narrow spatial perspective and a relatively broad temporal perspective.

Option 4: Strict Recycling of Solid Waste

In addition to the requirements in Option 3, this option requires households to separate organic kitchen waste from other burnable waste. Then, this organic waste (accounting for 66% of the entire waste in 2012) is collected and composted (and thus not sent to the landfill site), which is the responsibility of the municipal government. Economically, each household needs to share the annual burden of NPR 4,800, in addition to a charge of NPR 1,300 annually for the operation and depreciation costs of composting plants. Once this option is implemented, the environment of Kathmandu city and the Sisdol landfill site will be dramatically improved and there will be no water contamination due to organic waste in the landfill site. This is the most sustainable option in the sense that it is to be preferred by those with the broadest spatial perspective and a relatively broad temporal perspective.

Table 3.1. Policy options

Policy Options				**Environmental implications**	
	Responsibilities of household	**Responsibilities of Kathmandu Metropolitan City**	**Financial Responsibilities**	**Kathmandu City**	**Landfill site**
Option 1: Status Quo	NA	The city continues all its current services related to waste management.	This option does not need any investment.	Kathmandu city and its environment are not changed.	The landfill site and its environment are not affected.
Option 2: Recovering beauty	Households dispose of waste only in front of their houses or at fixed collection points rather than on streets or on riverbanks.	The city is responsible for collecting waste, whose amount is increased due to the households' efforts.	Each household needs to share the annual burden of NPR 2,400.	Kathmandu city becomes beautiful, because no waste remains on streets or on riverbanks.	The landfill site and its environment are not affected.
Option 3: Partial Recycling of solid waste	In addition to option 2, households separate (1) recyclable, (2) hazardous, and (3) other waste and dispose of it on designated days of a week or month.	In addition to option 2, among the efficiently collected waste, the city recycles cans and plastics, and the toxicity of hazardous waste is removed before landfilling.	Each household needs to share the annual burden of NPR 3,600, and this option requires troublesome recyclable segregation.	Kathmandu city becomes beautiful, because no waste remains on streets or on riverbanks.	The environment of the landfill site is slightly improved: the amount and the toxicity of the inorganic wastes are reduced.
Option 4: Complete Recycling of solid waste	In addition to option 3, households separate organic kitchen waste from other waste, and all the organic components of the collected waste are composted.	In addition to option 3, the city installs and operates composting plants to recycle all organic waste within the city.	Each household needs to share the annual burden of NPR 4,800 along with an additional charge of NPR 1,300 annually for the operation and depreciation costs of composting plants. This option requires more troublesome recyclable segregation.	Kathmandu city becomes beautiful, because no waste remains on streets or on riverbanks.	The environment of the landfill site is greatly improved: there is no water contamination due to organic waste.

3.3.3. Experimental Procedure

We adopted the future design intervention (Hara et al., 2019; Kamijo et al., 2017; Nakagawa et al., 2019a, 2019b; Saijo, 2014) and examined its effectiveness through a deliberative field experiment. For the deliberative field experiments, we prepared three treatments: Treatment 1 (subjects do not experience the perspective of future generations), Treatment 2 (subjects experience the perspective of future generations only to look back on the present [i.e., 2019]), and Treatment 3 (subjects experience the perspective of future generations to create future visions of 2049 and look back on the present), to determine how experiencing the perspective of future generations might influence subjects to choose sustainable preferences for policies on SWM in Kathmandu city.

The procedures for the three different treatments are summarized in Figure 3.2. Specifically, subjects in all three different treatments started with reading the case-method material and watching the picture-story show, and ended with participants individually choosing the most preferable option from the standpoint of people living today. In between, subjects in three different groups experienced different procedures. Subjects in each of the three treatment groups were divided into groups of four for discussion. Then, the group of treatment 1 discussed the most preferable options from the standpoint of people living today. The group of treatment 2 only discussed the most preferable options from the standpoint of people of the future. The group of treatment 3 discussed the vision of waste management of the city from the viewpoint of people of the future in 2049, and then talked about the most preferable options to choose as a group from the same point.

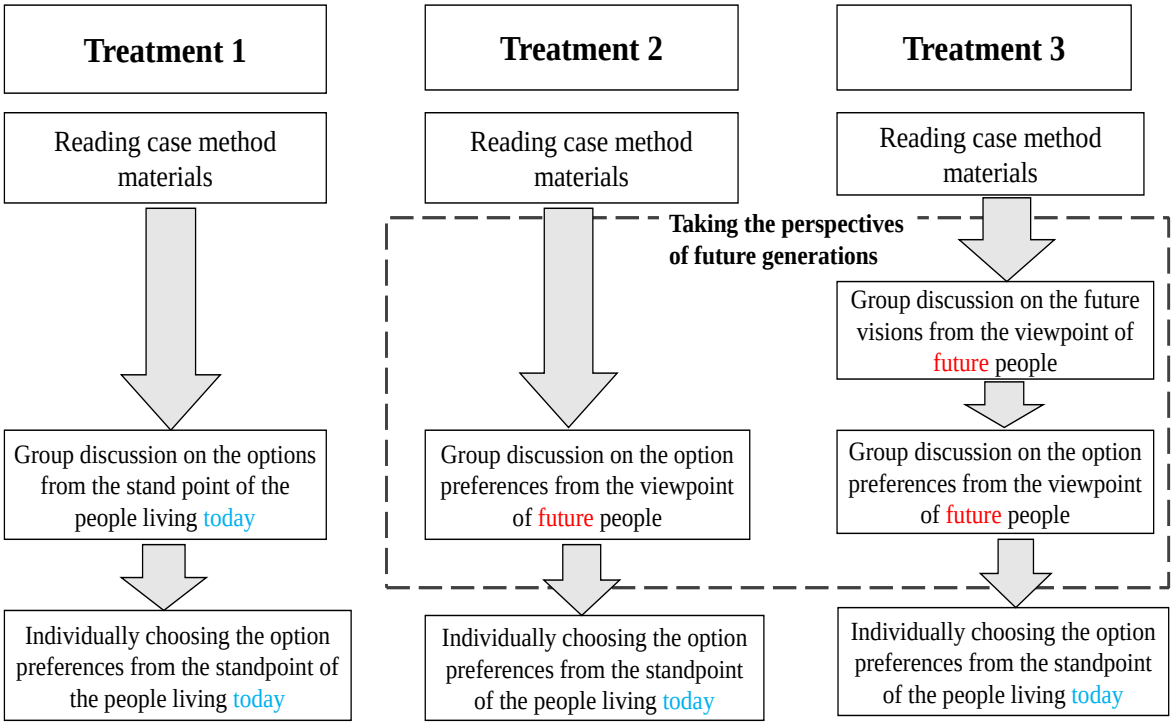

Figure 3.2: Flow chart showing three treatment groups

After these procedures, all three groups completed a post questionnaire that included items related to sociodemographic information about the subjects (i.e., gender, age, educational status, employment status, household income, marital status, and religion). In total, the experiment and the questionnaire took approximately 3 hours and 30 minutes. [1]

In total, 12 sessions were conducted, and 290 local residents participated in the experiments. Of the total of 290 subjects, 86 subjects participated in treatment 1; 109 subjects participated in treatment 2; and 95 subjects participated in treatment 3. These subjects were recruited through a

[1] The overall length of the experiment is 3 hours and 30 minutes; the "**Intervention period**" is one hour, which includes reading the case method, watching a picture story, having group discussions, and choosing policy preferences.

key resource person in the field area of Kathmandu city, and each participant received a reward of NPR 600 on average. Figure 3, shows the map of Nepal indicating the study area and the Sisdol landfill site.

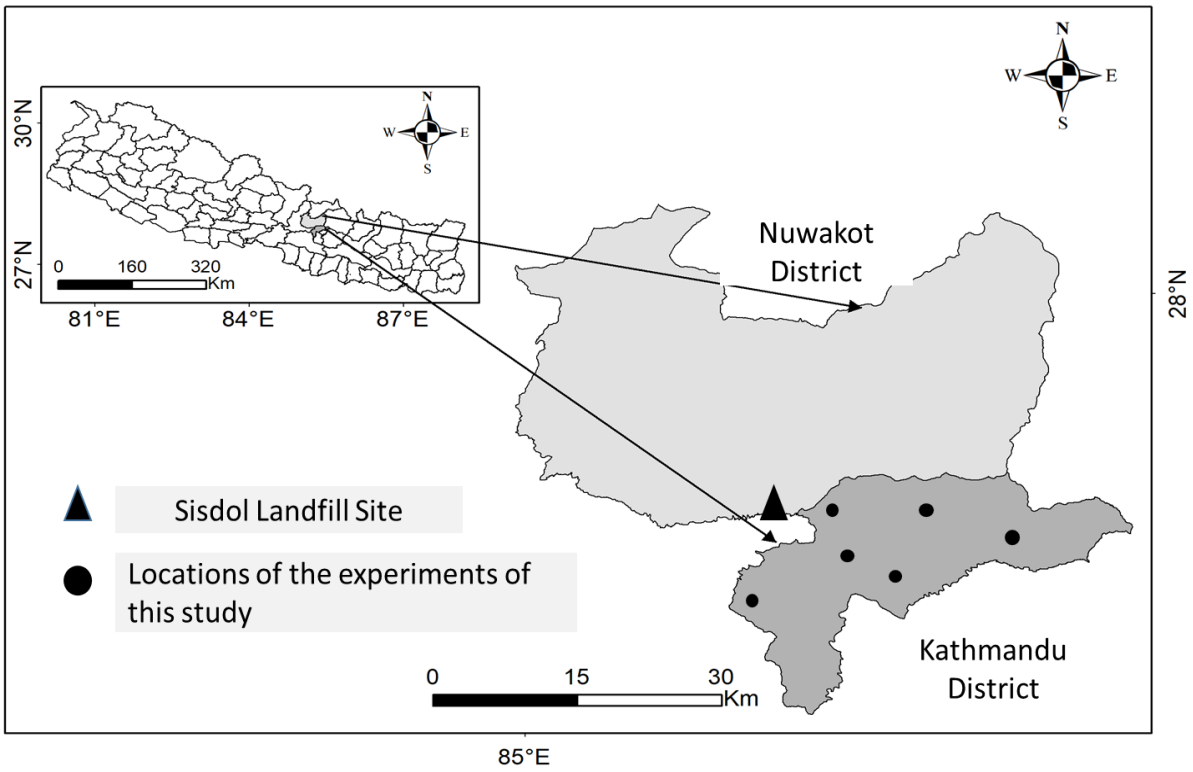

Figure 3.3: Map of showing the study area and Sisdol landfill site

3.4. Results

Table 2 shows summary statistics of the sociodemographic information for the subjects. Among the 290 questionnaire responses received, the data of 26 responses were not usable, leaving the data of 264 responses for the analysis. Approximately 80% of the subjects are female. About 33% of the subjects are between 29 and 39 years old and 29% of the subjects are between 40 and 50, while the percentage of subjects younger than 28 and older than 50 are 23% and 15%, respectively. With respect to education, only 22% of the subjects have a higher education background (i.e., high school degree and above). The results also indicate that 77% of the subjects

are married. The average monthly income of a family is approximately 36000 Nepali Rupee (NPR). About 90% of the subjects follow the Hindu religion.

Table 3.2: Summary statistics of socio-demographic data for subjects

Independent Variable	**n**	**%**	**Mean**	**SD**
Gender				
Female	210	80		
Male	54	20		
Age			36	10.9
Age ≤ 28	64	24		
Age = 29-39	88	33		
Age = 40-50	76	29		
Age ≥ 51	36	14		
Education Status				
Higher	59	22		
Others	205	78		
Income				
Family Monthly Income (NPR)			36000	
Marital Status				
Single	60	23		
Married	204	77		
Religion				
Hindu	237	90		
Others (Buddhist Muslim, Kirant, Christian)	37	10		

Table 3 indicates the distributions of the subjects' most favorable options as chosen at the individual level. The percentage of participants choosing the most demanding and sustainable option (i.e., Option 4) was higher in the groups of treatments 2 and 3, compared with that of treatment 1. The chi-squared test of independence showed that in reference to the group of treatment 1, that of treatment 2 had statistically significantly different frequency distributions at the 5% level ($p = 0.02$), whereas that of treatment 3 did not ($p = 0.4$).

Table 3.3: Distribution of Individual most favorite policy chosen by subjects per treatment

Policy option	1	2	3	4	Total	p-value*
Treatment 1[a]						
n	2	16	30	32	80	
%	2.5	20.0	37.5	40.0	100.0	
Treatment 2[b]						
n	8	13	24	58	103	0.02
%	7.8	12.6	23.3	56.3	100.0	
Treatment 3[c]						
n	1	10	30	40	81	0.4
%	1.2	12.3	37.0	49.4	100.0	

Notes. Option 1: Status quo; Option 2: Recovering beauty; Option 3: Partial recycling of waste; Option 4: Complete recycling of waste. a: Subjects do not experience the perspective of future generations; b: Subjects experience the perspective of future generations only to lookback on the present; c: Subjects experience the perspective of future generations to create the future visions of 2049 and to look back on the present. *p -value in Chi square test of independence between frequency distributions of Treatment 1 and Treatment 3; Treatment 2 &3.

To better understand the influence of the future design treatment, logistic regression analysis was conducted at the individual (rather than group) level, where the objective variable *y* took 1 value when individuals chose option 4 (the most demanding for the present generations and thus the most sustainable), and 0 otherwise. The independent variable included two dummy variables regarding the treatment the subject took (treatment 1 as the reference group), as well as demographic and socioeconomic variables.

Table 4 findings indicate that treatment 2 and treatment 3 are statistically significant at the 5% level in reference to treatment 1. The odds ratios of treatment 2 and treatment 3 were 2.05 (95% CI: 1.11-3.82) and 2. 23 (95% CI: 1.05-4.76), respectively. (Roughly speaking, these ratios show many times that subjects in the groups of treatments 2 and 3 were more likely to choose option 4 than those in the group of treatment 1.) This suggests that experiencing the perspective of future generations positively has an impact on individuals' likelihood of preferring demanding and sustainable options as members of the present generations. Regarding other independent variables, being 51 years of age or older was a significant predictor at the 10% level, compared to being 28

years of age or younger. The odds ratio of this predictor was 2.44 (95% CI: 0.97-6.15).

Table 3.4: Logistic regression results

Independent variable	Odds Ratio		S.E.	95 % CI
Gender	0.64		0.22	(0.33 - 1.26)
Age				
Age ≤ 28 (Base Group)				
Age=29-39	1.97		0.81	(0.88 - 4.42)
Age = 40-50	1.83		0.74	(0.82 - 4.05)
Age ≥51	2.44	*	1.15	(0.97 - 6.15)
Married	0.93		0.34	(0.45 - 1.93)
Education Status	0.77		0.29	(0.37 - 1.62)
Income	0.78		0.14	(0.54 - 1.12)
Religion[1]	0.69		0.31	(0.28 - 1.69)
Treatment Type				
Treatment 1 [a] (Base Group)				
Treatment 2 [b]	2.05	**	0.64	(1.11 - 3.82)
Treatment 3 [c]	2.23	**	0.86	(1.05 - 4.76)

Note: ** significant at 5 % *significant at 10%; S.E: standard error. a: subjects do not experience the perspective of future generation; b: subjects experience the perspective of future generation to look back on the present; c: Subjects experience the perspective of future generations to create future visions of 2049 and to look back on present1: Hindu is considered as a major religion in this study.

3.5. Discussion

This study conducted a deliberative experiment in Kathmandu city, Nepal, on the issue of SWM to evaluate the future design intervention regarding individuals' preferences for options incorporating municipal governments' and households' behaviors. The present study adopted the experimental design of Nakagawa et al., (2019a) and Nakagawa et al., (2019b) to do so. It succeeded in confirming the effectiveness of this new intervention methodology, which can be regarded as a new member of the category of interventions "Presentation of social norms" (see Section 2). This new intervention is peculiar and quite different from existing interventions in the same category because it does not force or even recommend individuals to adopt specific social norms relating to waste management: it only encourages individuals to take the perspective of

future generations. There were four major findings.

First, future design intervention was found to influence individual preferences concerning SWM policy options in a sustainable manner. While this is in line with Nakagawa et al., (2019a) and Nakagawa et al., (2019b), who observed similar effects of the future design intervention in policy issues related to forest management and finance, respectively, the present study is distinct in the sense that it observed individuals' stimulated sympathy toward people who were distant not only in the future but also geographically. Specifically, all of our participants were urban residents in Kathmandu city whose daily lives were maintained at the sacrifice of a peripheral landfill site 20 kilometers away, and when they experienced the perspective of future generations, they acquired a stronger tendency to choose an alternative beneficial to future residents of both of these places. This also suggests that the intervention we adopted has the potential to relax the tension generated by not-in-my-backyard (NIMBY) syndrome, (which is described as the opposition of local citizens to the construction and operation of a civic project in their neighborhood) (Shen and Yu, 1997), with the stakeholders and the local citizens residing near the landfill sites having conflicting interests.

Second, our statistical results indicate that the intervention of taking the perspective of future generations was effective in inducing individuals to modify their preferences in a sustainable manner, irrespective of whether the intervention was accompanied by group deliberations to create visions of the future, and this addition did not enhance the intervention effect. This was unexpected, because it was thought that this deliberation would help the research participants be more thoroughly absorbed in the standpoint of future generations and thus strengthen the intervention effect. While the present study does not have evidence to clarify the reason behind this result, it

might be that the nature of the vision itself determined the treatment effect. We observed that some groups depicted optimistic futures (e.g., a clean Kathmandu city), whereas others did the opposite. It might be that optimism and pessimism either strengthened or weakened the main treatment effect of perspective taking and that these two additional effects might have cancelled out.

Third, with regard to sociodemographic variables, older age groups are more likely to choose sustainable preferences at a 10% level of significance compared to other age groups. This finding is consistent with the findings of Yuan and Yabe (2015), who found that older people show a positive and significant preference at a 10% level for willingness to accept compensation for improved services for waste separation. This suggests that older people are more likely to accept high cost options and show pro-environmental behavior compared to young groups (Casaló and Escario, 2018). The reason behind this might be the past experience of older people. In our study we have introduced the situation of Kathmandu city in the past and the past activities of households. So, for older people, it must be relatively easier to adopt such pro-environmental behavior compared to young groups.

Fourth, we have developed a story of a youth to suggest that urban waste management as currently carried out is causing injustice. We have not measured the effectiveness of a picture story in modifying people's behavioral intentions or preferences, and it is important in the future to measure the effect of presenting this material alone. While Vassanadumrongdee and Kittipongvises (2018) found that knowledge of environmental issues does not significantly predict individuals' intentions to behave pro-environmentally, there is reason to assume that our material may modify individuals' behavioral intentions, because what this material conveys to the audience is not confined to information. The storytelling/narrative communication theory posits that the

quality, cultural relevance, and logic of storytelling effects changes in the participant's behavior, attitude, and motivation through the interactions of (i) transportation into the story world, (ii) identification with the protagonist, and (iii) realism (Lee, Fawcett, & DeMarco, 2016). Thus, storytelling is one powerful way to raise awareness of injustice and those suffering from it, such as the protagonist of our story.

3.6. Conclusion

We designed and executed a deliberative field experiment to test whether the acquisition and experience of taking the perspective of imaginary future generations affects individual policy preferences. The results revealed that taking the viewpoints of future generations influenced individual preferences concerning SWM policy options in a sustainable way. Moreover, participants who experienced the perspective of future generations tended to choose the sustainable option (complete segregation of waste) that fundamentally changed the status quo for a better future. Overall, this study is the first to confirm that without economic incentives, the viewpoints of individuals from which to consider a waste management issue can be broadened both spatially and temporarily.

The present study has several important practical implications. First, the study found that individuals' preferences or behavioral intentions can be modified in a sustainable manner by an intervention that takes no more than one hour or so. Such an intervention may be able to play a crucial role in current situations in developing countries such as Nepal, where decision-making systems tend to be inclined toward the preferences of the present generations. In these countries, priorities are mainly focused on infrastructure development and other public services, as opposed to SWM issues, and little attention is paid to the development of sustainable solid waste management. A necessary condition that will allow municipal governments (usually responsible

for SWM in countries such as Nepal) to resolve this problem is to overcome the shortsightedness of the general public. The intervention measure adopted by the study serves as a promising candidate for doing so.

Second, for SWM practitioners and engineers to implement innovative and sustainable technology in the market, it is equally essential to understand individuals' behavior intentions and preferences to adopt particular technologies along with their techno-economic aspects. Thus, in such cases, the future design methodology could be a promising strategy to induce people to think in a new way by taking the perspective of imaginary future generations. This is a novel technique that interferes with the time scale acceptance and is explicitly designed in relation to how people adopt the time scale. Furthermore, taking the perspective of imaginary future generations influences people to choose sustainable options (i.e., reduce, reuse, and recycle waste) that completely change the status quo for a better future. Thus, though this study has been conducted in field settings in hypothetical scenarios, the findings might play an important role in influencing the thinking process and preferences of the individual to adopt sustainable waste management policies in actual settings. Hence, future design methodology could be an innovative technique to facilitate a circular economy in waste management.

The present study has some limitations and indicates potential future directions. First, this study is based on the measurement of participants' preferences or behavioral intentions rather than their actual behaviors. Thus, even if a participant chooses the most sustainable alternative in this study, this does not guarantee that he or she really engages with household waste-related behaviors described in the alternative. This is obviously the greatest weakness of the study. Nevertheless, previous studies on household waste separation showed a positive correlation between behavioral intentions and actual waste separation behavior. Thus, these studies might support our

experimental design, at least to some extent. However, it is important to confirm further the actual behavior of people within the scenario of future design interventions.

A second limitation is the bias of our sample, in which females are overrepresented (n = 231; 80%). This might be partly because many sessions of our experiment were conducted in the daytime and it was difficult for males to participate, and partly because the topic of waste management was more familiar to females, who are mainly responsible for waste-related household behaviors in the urban areas of Nepal. It is important in the future to further confirm that males are equally sensitive to the intervention adopted by the study.

Third, most importantly, this research is a cross-sectional experimental study, and thus it cannot identify the prolonged effects of the intervention. While an earlier study on future design (Nakagawa and Saijo, 2020) suggests that the intervention developed here can affect individuals well after the intervention period, it is an important future task to verify whether it really overcomes the limitations of earlier interventions concerning the insufficient duration of their effects (Abrahamse and Steg, 2013; Schnelle et al., 1980).

Chapter 4 : Role of visioning in donation preferences: A field experiment

4.1. Introduction

A vision is defined as a desired future state (Shipley, 2000; Wiek et al., 2014) and can direct plans, decisions, actions, and behaviors. Visioning is the process of developing a vision, i.e., a representation of a desirable future, as opposed to forecasting (likely future states) and is a part of back casting (pathways to desirable future states) (McPhearson et al., 2016; Wiek et al., 2014). Visions are regarded as important for transitions, because they provide a common ground for action and guide actors in their actions and behaviors towards the desired outcomes. (Loorbach et al., 2017; van der Voorn and Quist, 2018). Vision motivates people and helps organizational members to coordinate and direct collective efforts toward desired outcomes (Berson et al., 2016; Carton et al., 2014). Indeed, numerous studies have shown that positive visions can predict employee behavior (Fiset and Boies, 2019; Sosik and Dinger, 2007) and organizational performance outcomes (Fiset and Boies, 2019; Kantabutra and Avery, 2007). Furthermore, some researchers have identified the effects of vision in community planning through public engagement (Nam, 2013; Okubo, 2000), while others have identified the effects of vision within the domains of planning and research (Shipley and Michela, 2006; Wiek and Larson, 2012). Several studies have shown that vision has an impact on environmental and sustainability issues (Shipley and Michela, 2006; van der Helm, 2009). Therefore, vision plays an important role in motivating and encouraging change.

The role of visions has been recognized in the variety of contexts including business or organizations, communities, research projects and in a variety of forms (elaborated or brief, pictorial or written, slogan-like or utopia-like) (van der Helm, 2009). Unlike previous research,

this study focuses on societal fields and in social issues such as solid waste management problems; but does not investigate vision as a corporate or organizational concept, or as a personal concept that is important in determining individuals' life direction and career plans. We consider the actions and behaviors of individuals in social settings who exist outside of the organizational boundaries.

Previous studies have used a variety of visioning approaches to make claims about the future and plan for it; Oels (2009) used future search conferences to improve the quality of local decision- making within the context of local agenda by engaging stakeholders in creating a shared vision. Senge (1993) applied the systems thinking and motivation approaches to corporate visioning, emphasizing the role of team learning and shared leadership. Some researchers used a back casting approach to envision the long term future (Holmberg and Robert, 2000; McDowall and Eames, 2007; Robinson, 1982; Vergragt and Quist, 2011). Okubo (2000) used planning approaches based on community visioning. Wiek and Binder (2005) developed Sustainability Solution Space methods to assess the coherence of vision through consistency analysis. Kim and Oki (2011) used a Visioneering (i.e. the engineering of clear vision) approach that emphasizes the system-based, propose-driven and concrete construction of sustainable future state. Potschin et al., (2010) use the Leitbild- process, which incorporates the system thinking and participatory engagement, as an essential criterion for developing normative states. Some of the researches used other participatory approaches to create and evaluate shared visions for policy development through stakeholders consensus (Costanza, 2000; Shipley, 2002). In general, prior research has proposed a variety of approaches for evaluating and designing future plans.

Prior research has shown a variety of approaches to envisioning future states, but less is known about what types of people are motivated by vision. With a few exceptions, several studies

in the field of urban planning have shown the positive impact of involving youth in visioning for urban planning and community redevelopment (Mallan and Green away 2011; Strachan 2018). Similarly, Caravita et al., (2020) studied the visions of young people living in Italy about the future of the European Union and found that young people can influence the policies and vision of the European Union. In the field of organizational business, Zeldin (2004) investigated the involvement of young people in organizational governance and found that involving young people in the decision-making process ensures their commitment to the organizational committees and also has a positive effect on their development. Khandelwal and Mohendra, (2010) investigated the awareness and understanding of organizational values, vision and corporate social responsibility among employees and found that there is no significant relationship between awareness and understanding of organizational vision among different age groups. Overall previous studies have mixed results on age in relation to vision research.

In spite of the accumulation of these studies, there is still room for further research for the following reasons. Some studies, with a few exceptions, have examined the impact of visioning in youth for urban planning and redevelopment. However, it remains unclear on which types of people are motivated by vision. Furthermore, empirical studies on the role of vision in addressing social issues remain scarce. As a result, in order to fill this gap, the current paper attempts to provide an answer to this question by focusing on social issues such as solid waste management problems. This paper contributes to the literature by emphasizing the motivating role of vision on social issues, which has the potential to inspire individuals in their actions and behavior in order to bring change in the environment.

Thus, the aim of this study is to investigate the role of visioning on donation preferences for solving solid waste problems. To this end, we design and implement a deliberative field

experiment to test whether visioning influences an individual's donation preferences.

4.2. Theoretical framework and hypothesis development

This study is based on the life span perspective of psychological literature, with a focus on generativity theory. Erikson (1950) defines generativity as an interest establishing and guiding future generations. Furthermore, McAdams D. P., & de St. Aubin, (1992) demonstrates generativity as a configuration of psychosocial features (cultural demand, inner desire, generative concern, belief in the species, commitment, generative action, and personal narration) constellated around the goal of providing for future generation. In general, research in lifespan and personality psychology has shown that generative concern increases between the young and middle adulthood and decreases thereafter (Stewart &Vandewater 1998). Furthermore, some studies have found that, when individuals care about other people, they are less likely to contemplate the personal consequences of helping them. In addition, McAdams (2018) argues that generative adults exhibit a variety of pro-social behaviors and attitudes, from demonstrating more effective parenting styles to engaging in meaningful ways within religious and civic communities.

Prior research in organizational psychology and management has focused on the relationship between the age and interpersonal aspects of generativity, with a meta-analysis by Kooij et al., (2011) showing that interest in helping others and contributing to society increases with age. Similarly, some studies have shown that age is positively related to nurturing forms of generativity among the university professor Zacher and Bal, (2012) and family business owners Zacher et al., (2011). On the other hand, Hastings et al., (2015) conducted a mixed method study to assess the level of generativity among young students and found that age is related to mentoring forms of generativity among the college students. Jia et al., (2015) conducted a longitudinal study on relationships between the generativity concern and the environmentalism in Canadian youth

and found the generativity in emerging adults positively predicted environmentalism. Thus, generativity represents the unique sets of concerns and behaviors associated with age.

Hypotheses

The following hypotheses are proposed in this study.

Hypothesis 1: Subjects who experience the future generation's perspective will be more likely to donate to solid waste management issues. Comparing the baseline group (subjects who did not experience the perspective of future generations) with the treatment group, it is expected that the effects of the future design intervention will result in increased donations to solid waste management issues. This is because by taking the perspective of future generations, individuals are more likely to be concerned about the needs of future generations, leading to empathy and, consequently, more likely to choose sustainable donation options to avoid inaction regret for future generations. Chapter 2 of this paper provides a detailed literature review on how hypothesis 1 was constructed. Note that this hypothesis is not directly related to the purpose of this study, but is intended to supplement it. By formulating Hypothesis 1, this chapter reiterates that taking the perspective of future generations influences individuals' donation behavior.

Furthermore, it is unclear on what types of people experience visioning and future generation perspectives. It is also expected that the experience of future generation perspective and visioning may vary by age. In Hypothesis 2, based on the literature review and theoretical framework related to age and generativity, we will identify interaction between age and treatment group and their impact on donation behavior. Based on the above facts, hypothesis 2 of this study is proposed as follows:

Hypothesis 2: Young people are more likely to donate for solid waste management issues only if they experience the perspectives of future generations and create a vision for the future. From this hypothesis it is predicted that visioning will affect the donation behavior of young people.

4.3. Methodology

4.3.1. Survey Area and Sampling Strategy

A deliberative field experiment was conducted with 253 subjects in Kathmandu city from July to August 2019. Kathmandu is the capital city of Nepal with a population of approximately 1 million (CBS, 2011). The city has been facing the problems of solid waste management for decades due to rapid urban population growth and unplanned urbanization. For this study a purposive sampling was used to select the areas within the city. The areas were selected in such a way that represent the diverse area of population and cover the overall solid waste management status of the Kathmandu city. Figure 3.1 in chapter 3 depicts the map of Nepal showing the study area.

In addition, to recruit the subjects, advertisements were released through a key resource person at each ward office (a local administrative office) in the target areas. The criteria for the selecting the subjects were: (1) he/she must have lived in the current place for at least six months; (ii) he/she must be aged 16 years old or above; and (iii) he/she must be acquainted with the municipalities' current waste management services. Therefore, a key resource person from each ward office (a local administrative office) in the target areas made a list of subjects who were all willing to participate, and subjects were randomly selected from the list. A total of 253 subjects took part in an experiment. Written consent form was obtained from the participants after confirming the purpose of the study. For the field experiments three treatment groups were prepared. Treatment 1 (where subjects do not experience the perspectives of the future generations), Treatment 2 (where subjects experienced the perspectives of future generations to look back at the

present) and Treatment 3 (where subjects experienced the perspectives of future generations to create the future visions and to look back at present).

4.3.2. Experimental Setup

In each treatment group, a dictator game (donation for the management of the solid waste), social value orientation (SVO) game and socio-demographic questionnaire were administered to collect the necessary information on donations, prosociality and socio-demographic variables. Socio-demographic variables include age, education status, gender, religion, household income and marital status. During the experiment, subjects in each treatment group were exposed to case method materials. The case materials include: i) document related to the history and current status of waste management in Kathmandu ii) the narrative and picture story show to help subjects better understand the current status of the environmental situation of the Sisdol landfill site which lies in the Nuwakot district from the viewpoint of a villager living next to the site. iii) Waste segregation chart to help subjects better understand the waste categorization and separation process. After explaining the case method materials to the subjects, three donation options were introduced to the subjects. Each donation option was designed to have pros and cons that could be justified from one aspect and cannot be justified from another aspect. The three donation options were as follows:

Donation Option 1: Donation for the betterment of the life of people living near Sisdol landfill site.It should be noted that this donation option contributes to the betterment of the lifestyle of the sufferer (i.e., people living in the Sisdol landfill site).

Donation Option 2: Donation for the management of the current situation of solid waste.

It should be noted that this donation option contributes to the cleanliness of Kathmandu city by removing waste that would otherwise be left behind in streets or on riverbanks and makes the city environment beautiful, it has a slight impact on the environment of the Sisdol landfill site.

Donation Option 3: Donation for the segregation of the waste.

It should be noted that this donation option contributes to the segregation of waste by which the environment of Kathmandu city and the Sisdol landfill site will be dramatically improved and there will be no water contamination due to organic waste in the landfill site.

Following the subjects' exposure to three donation options, the Solid Waste Donation Game (SWDG) was implemented to examine the effects of vision on donation preferences. A new variant of the dictator game was introduced with a two-player setting where one person is considered as the dictator and the other is the receiver. In this game, the dictator decides how to split a fixed amount of money between himself/herself and the receiver (Bolton and Ockenfels, 2000; Engel, 2011; Hirose, 2020). However, this donation game differs from the typical dictator game in the following ways: 1) each subject becomes a dictator and knows who the receiver is. 2) The receiver is a well-known organization who is responsible for the management of solid waste problems.

In the SWDG, each subject is given Nepalese Rupee (NPR) 1000 as an initial endowment for each donation option and asked to distribute money as he/she wishes "for himself/herself" and "for the organization working to solve waste problems". If he/she takes everything or nothing for himself/herself then the amount of money to be donated for the organization is either 0 NPR or 1000 NPR. If he/she takes NPR 400 for himself/herself then the amount of money to be donated for the organization is 600 NPR. Prior to the SWDG, subjects were assured about the procedure of the game and confidentiality was maintained by recording how each subject divided the money with his/her ID. Economists use the amount of money given to the receiver by the dictator in dictator games as a good proxy for altruism, or how much one person generally cares about unknown others (Andreoni Justin Rao Hannah Trachtman et al., 2011) (Bekkers 2007; Andreoni

et al., 2017). Similarly, we believe that the amount of money a dictator gives to an organization is a good proxy for how much a person cares about the management of solid waste problems. An experiment with the SWDG game is executed in all treatment groups to examine the effects of vision on SWDG donation.

The SVO of the "slider game" was used to determine the subjects' social preferences as prosocial and proself (Murphy et al., 2011). The slider game consists of six items that assign numbers to represent outcomes for oneself or others, the latter of which are not known to the subjects. Each item has nine choices from which the subjects choose options for oneself and the others. The mean allocation for oneself $\bar{A}_s$ and the mean allocation for the other A_0 is computed from all six items. Then, 50 is subtracted for $\bar{A}_s$ and $\bar{A}_0$ to shift the base of the resulting angle to the center of the circle (50, 50). The index of a subject's SVO is given by = arc tan $\frac{(\bar{A}_0)-50}{(\bar{A}_s)-50}$ we combine "altruist (SVO > 57.15^o) and "prosocial (22.5^o < SVO < 57.15^o)" type in a single category as "prosocial" and "individualistic (-12.04^o < SVO < 22.45^o) and competitive (SVO < -12.04^o) are categorized as "proself" as it is often done in the psychology for presenting results in the simple ways. The subjects are informed in detail that his/her total payoff is dependent on his/her choices and his/her anonymous pair. The subjects are instructed about the game's rules, points and total payoffs they receive from the games.

4.3.3. Experimental Procedures

We conducted the experiment following different procedures. Each treatment group started with reading the case methods materials and watching the picture-story show, and ended up with donation and SVO games. In between the three treatment groups followed different procedures. Subjects in Treatment 1 do not experience the perspective of imaginary future generations while subjects in Treatment 2 experienced the perspective of future generations to look back on the

present and subjects in Treatment 3 experienced the perspectives of future generations to create future vision and to look back at present. Then, experimental instructions regarding the SWDG were given to the subjects in all treatment groups and confirmed that subjects fully understand the rules of SWDG. After the SWDG games, subjects participated in the SVO games. The instruction about the SVO games was given to the subjects and confirmed their understanding. At the end of the SVO games, two subjects were randomly paired and their final payoffs for SVO was calculated. For the SWDG, one of the three donation options were randomly chosen for the final payoffs assuming that dictator payments remain constant for all donation options. On an average, a total payment of 750 NPR was paid to each subject. This consists of 150 NPR for the fixed participation fee, 200 NPR for the SVO game, and 400 NPR for the donation game. At the end of the experiment, all three groups completed a post questionnaire that included items related to sociodemographic information about the subjects (i.e., gender, age, educational status, employment status, household income, marital status, and religion). A total of 12 sessions were conducted, and 253 subjects participated in the experiments. Of the total of 253 subjects, 86 subjects participated in treatment 1; 81 subjects participated in treatment 2; and 86 subjects participated in treatment 3. After the field experiment, the donated amount of money was handed over to the organization that works for solid waste management.

4.3.4. Statistical Analysis

This paper uses three types of donation options which consist of the following: Donation 1(donation for the living standard of the people living near Sisdol landfill areas), Donation 2 (management of the status quo situation) and Donation 3 (segregation of the waste) as the dependent variables. The independent variables include socio-demographic variables, the three treatment groups and SVO. Table 1 provides the definition of the variables

Table 4.1: Definition of the variables

Dependent Variables		
Donation 1	:	Donation for the betterment of the life of Sisdol people
Donation 2	:	Donation for the management of the current situation of Solid waste
Donation 3	:	Donation for the segregation of waste.
Independent Variables		
Treatment 1	:	Subjects do not experience the perspective of future generations
Treatment 2	:	Subjects experience the perspective of future generations to look back on present
Treatment 3	:	Subjects experience the perspective of future generations to create future visions of 2049 and to look back on present
Prosocial	:	Takes the value 1 when the subject is prosocial, otherwise 0
Socio-demographic Variables		
Age	:	Age in years
Gender	:	Takes the value 1 if subject is female otherwise 0
Education	:	Years of schooling, 0 and 1 (1 = subjects completed more than or equal to 12 years of schooling. otherwise 0)
Household income	:	Monthly income in Nepali Rupees
Religion	:	Takes the value 1 if subjects follow Hindu otherwise 0
Marital Status	:	Takes the value 1 if married, otherwise 0

The mean, median, standard deviation, minimum and maximum of the key variables are calculated and interpreted. Further we run the Mann-Whitney test to identify the qualitative differences of the key variables across the treatment. To quantitatively characterize the relationship between the dependent and the independent variables we used the Tobit regression analysis for each donation option separately because the data included a certain number of 0 donations. In the Tobit regression, the donation for the management of solid waste problems by subjects i is denoted by y_i and it is defined to be equal to the latent variable y_i^* when$y_i^* > 0$. Otherwise, $y_i = 0$ when $y_i^* \leq 0$. the Tobit regression model is expressed as:

$$y_i^* = \beta_0 + \beta_1 T_i + \beta_2 S_i + \beta_3 A_i + \beta_4 T_i \times A_i + \beta_5 Z_i + \varepsilon_i$$

where y_i^* is a latent variable of the donation satisfying the relation y_i = max $\{0, y_i^*\}$; T_i, S_i, and A_i are dummy variables associated with treatment groups, social value orientation and age respectively and Z_i is a vector of socio-demographic factors such as age, gender, education, religion, household income and marital status. (See table 1 for the definition of the variables) and ε_i is a normally distributed error term. The β_j for j = 0,1,2,3,4,5 are the parameters associated with the intercept, T_i, S_i, A_i and an interaction term of $T_i \times A_i$ while β_5 is a vector of the parameters associated with Z_i, respectively. These parameters are estimated via the maximum likelihood methods to characterize y_i with the equation (1) in the Tobit regression framework, enabling to calculate the marginal effect of an independent variable on the donations (Wooldridge 2010; 2019). A series of Tobit regression models are estimated by taking Donation 1, Donation 2 and Donation 3 as dependent variables for robustness check.

4.4. Results

Table 2 shows the summary statistics of the dependent variables across the three treatment groups. According to the findings, subjects in Treatment 1 donated an average of Nepalese Rupee

(NPR) 331.1, 287.5 and 273.43 for each donation option. Subjects in Treatment 2 donated an average of 439.81, 431.23 and 489.87 NPR. The subjects in treatment 3 donated an average of 437.87, 422.47 and 470.34 NPR respectively. These results show that subjects with the perspectives of the future generations donated more than their counterpart in each donation option.

Table 4.2: Summary statistics of dependent variable by treatment groups

	Treatment 1[a]			Treatment 2[b]			Treatment3[c]					
	Donation1	Donation2	Donation3	Donation1	Donation2	Donation3	Donation1	Donation2	Donation3	Total		
Mean	331.1	287.5	273.43	439.81	431.23	489.87	437.83	422.47	470.34	402.2	379.39	409.7
Min	0	0	0	20	30	30	0	0	0	0	0	0
Max	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
SD	231.61	214.12	250.52	232.29	270.02	319.57	401.55	385.73	397.73	303.7	305.25	341.5
Median	300	225	200	500	500	500	500	462.5	500	500	300	300
Total	86	86	86	81	81	81	86	86	86	253	253	253

Note: a: Subjects do not experience the perspective of future generations; b: Subjects experience the perspective of future generations only to lookback on the present; c: Subjects experience the perspective of future generations to create the future visions of 2049 and to look back on the present. Donation1: Donation for the betterment of the life of Sisdol people; Donation2: Management of current situation of solid waste; Donation3: Segregation of waste

Table 3 shows the basic summary statistics of the socio-demographic information for the subjects. The mean age of the subject does not vary across the three treatment groups. The mean age of the subjects is 37.11. In terms of gender, 79% of the female subjects participated in the experiment. In terms of education, 68% of the subjects completed 12th grade or higher. The average monthly household income of the subjects is about 37000 Nepalese Rupee (NPR). It is also found that 82% of the subjects are married. In terms of religion, about 89% of the subjects follow Hindu religion.

Table 4.3: Summary statistics of Independent variables by treatment groups

Variables	Treatment 1 [a]	Treatment2 [b]	Treatment3 [c]	Overall
Gender				
No. of Observation	86	81	86	253
Mean	0.09	0.31	0.2	0.2
Min	0	0	0	0
Max	1	1	1	1
SD	0.29	0.46	0.4	0.4
Median	0	0	0	0
Age				
No. of Observation	86	81	86	253
Mean	39.38	36.72	35.2	37.11
Min	16	19	17	16
Max	64	61	70	70
SD	9.8	9.6	12.78	10.9
Median	40	35	34.5	36
Education				
No.of Observation	86	81	86	253
Mean	0.68	0.61	0.74	0.68
Min	0	0	0	0
Max	1	1	1	1
SD	0.46	0.48	0.43	0.46
Median	1	1	1	1
HH_Income				
No.of Observation	86	81	86	253
Mean	36981.42	25127.16	46755.81	36981.4
Min	1000	1000	6000	10000
Max	800000	100000	300000	800000
SD	85097.74	17587.99	39864.75	56171.9
Median	25000	20000	37000	3000

Variables	Treatment 1 [a]	Treatment2 [b]	Treatment3 [c]	Overall
Marital Status				
No. of Observation	86	81	86	253
mean	0.89	0.91	0.67	0.82
min	0	0	0	0
max	1	1	1	1
SD	0.3	0.28	0.47	0.37
Median	1	1	1	1
Prosocial				
No. of Observation	86	81	86	253
Mean	0.45	0.43	0.55	0.48
min	0	0	0	0
max	1	1	1	1
SD	0.5	0.49	0.49	0.5
Median	0	0	1	0
Religion				
No. of Observation	86	81	86	253
Mean	0.98	0.95	0.7	0.88
min	0	0	0	0
max	1	1	1	1
SD	0.1	0.21	0.45	0.32
Median	1	1	1	1

Note: SD: Standard deviation. a: Subjects do not experience the perspective of future generations;
b: Subjects experience the perspective of future generations only to lookback on the present;
c: Subjects experience the perspective of future generations to create future visions of 2049 and to look back on the present.

Wilcoxon's rank-sum (Mann-Whitney) test was applied to identify the distributional differences for each of donation options across the three treatment groups. A null hypothesis is that the distribution of the donations among the treatment groups are the same. The results show that the null hypothesis is rejected and that there are differences in the distribution of donations among the three treatment groups. The results show that for donation 1 (i.e. for the betterment of the life of the people living in Sisdol landfill side), the difference in distribution between Treatment 1 and Treatment 2 is ($Z= -3.29$, $p<0.001$), and for donation 1, there is no difference in distribution between Treatment 2 and Treatment 3, or between Treatment 1 and Treatment 3. Similarly, for donation 2 (i.e. management of the current situation), the difference in distribution between

Treatment 1 and Treatment 2 is ($Z=-3.67$, $p<0.0002$). Similar to donation1, for donation 2, there is no difference in distribution between Treatment 2 and Treatment 3, or between Treatment 1 and Treatment 3. Regarding donation 3 (i.e. segregation of the waste), the result shows the difference in distribution between the Treatment 1 and Treatment 2 is ($Z=-4.58$, $p<0.000$) and Treatment 1 and 3 is ($Z= -2.34$, $p<0.018$) respectively. It appears that the donations for the management of the solid waste problems differs among the subjects in three different treatment groups.

Table 4.4: Differences in donations by Treatment groups using Man-Whitney test

Donations	N	z-value	p-value
Donation1			
Treatment 1[a]	86	-3.29	0.001***
Treatment 2[b]	81		
Treatment 1[a]	86	-0.65	0.51
Treatment 3[c]	86		
Treatment 2[b]	81	0.93	0.35
Treatment 3[c]	86		
Donation2			
Treatment1[a]	86	-3.67	0.0002***
Treatment2[b]	81		
Treatment 1[a]	86	-1.23	0.21
Treatment 3[c]	86		
Treatment 2[b]	81	1.07	0.28
Treatment 3[c]	86		
Donation 3			
Treatment 1[a]	86	-4.58	0***
Treatment 2[b]	81		
Treatment 1[a]	86	-2.34	0.018**
Treatment 3[c]	86		
Treatment2[b]	81	0.83	0.4
Treatment3[c]	86		

Note: ***p <0.01; **p<0.05; *p< 0.1. n: Number of Observations. a: Subjects do not experience the perspective of future generations; b: Subjects experience the perspective of future generations to look back on the present; c: Subjects experience the perspective of future generations to create the future vision of 2049 and to look back on the present. Donation1: Donation for the betterment of the life of Sisdol People; Donation2: Management of current situation of solid waste; Donation3: Segregation of waste.

Furthermore, to better understand the effect of the interventions on each donation option, Tobit regression model was conducted. Models 1-1, 2-1 and 3-1 report the estimated coefficient for independent variables in the Tobit regression. In model 1-1, it is identified that Treatment 2

and education have positive effects on donation 1 at 1%, religion, the interaction term between the category of age ≤ 30 and the treatment 3 have positive effect at 10% whereas marriage has negative effect on donation 1 at 5% level respectively. In Model 2-1, age, and the marriage indicates the negative effects on donation 2 at 1% and 10% respectively. While treatment 2, education, SVO and the interaction term between the category of age ≤ 30 and treatment 3 exhibit the positive effects at 1, 1, 10 and 5% significant levels respectively. In Model 3-1, treatment 2, education, religion and the interaction term between age and the treatment 3 exhibit the positive effects on donation 3 at 1, 5, 5, and 10% significant levels respectively. The overall result implies that treatment 2, education and the interaction term between age and treatment 3 are the dummy variables which are consistently significant at models 1-1, 2-1, and 3-1.

Models 1-2, 2-2, 3-2 present the estimated marginal probability (MP) of each independent variable based on the estimated coefficients in each model, indicating a change in the likelihood for a subject to donate a strictly positive amount of money when the independent variable increases by one unit, holding the other variables constant. The results show that subjects in treatment 2 are more likely to donate in all three options, with donation 3 being 17 percent more likely, donation 2 being 12 percent more likely, and donation 1 being 9 percent more likely respectively whereas subjects in treatment 3 are more likely to donate in donation option 2 by 8 percent and donation option 3 by 14 percent compared to the baseline treatment. Similarly, subjects with higher education are 11 percent more likely to donate in donation 1, 11 percent in donation 2 and 9 percent in donation 3 respectively. Similarly, subjects who follow Hindu religion are 16 % more likely to donate in donation 3 than those who practice other religions (See results for MP in table 5).

Table 4.5: Regression coefficients and marginal probability of the independent variables in the Tobit regression

	Donation 1				Donation 2				Donation 3			
	Coef.		MP[1]		Coef.		MP[1]		Coef.		MP[1]	
Variables	Model 1-1		Model 1-2		Model 2-1		Model 2-2		Model 3-1		Model 3-2	
Age												
<=30	-30.58		0.03		-143.12	***	-0.006	***	-50.19		0.0207	
>31 (Base Group)												
Treatment Groups												
Treatment 1[a](Base group)												
Treatment 2[b]	147.44	***	0.09	***	158.78	***	0.12	***	274.69	***	0.17	***
Treatment 3[c]	-52.56		0.02		10.72	*	0.08	*	138.59		0.14	***
Age (<=30) × Treatment 2[b]	0.7				80.21				-1.54			
Age (<=30) × Treatment 3[c]	245.53	*			316.99	**			253.007	*		
Prosocial	63.70		0.04		77.09	*	0.05	*	2.14		0.001	
Gender	-21.26		-0.01		1.81		0.001		-0.86		-0.0005	
Education	168.29	***	0.11	***	165.76	***	0.11	***	165.44	**	0.09	**
Household Income [2]	34.65		0.02		-37.89		-0.02		-22.99		-0.01	
Religion	172.24	*	0.11	*	150.87		0.102		273.66	**	0.16	**
Married	-175.22	**	-0.11	**	-134.05	*	-0.09	*	-105.32		-0.06	

Note: *** significant at the 1 percent level, ** at 5 percent level and * at the 10 percent level. Coef: Coefficient of values. 1. MP stands for a marginal probability to indicate a change in likelihood for a subject to donate (above zero) when an independent variable increases by one unit, holding other factors fixed. Donation1: Donation for the betterment of the life of Sisdol people. Donation2: Management of current situation of solid waste. Donation 3: Segregation of Solid waste a: Subjects do not experience the perspective of future generations. b: Subjects experience the perspective of future generations to look back on the present. c: Subjects experience the perspective of future generations to create future visions of 2049 and to look back on the present. 2: The Tobit regressions are computed with the natural logarithm of household monthly income.

4.5. Discussion

The purpose of this study was to investigate the interaction effects of age and vision on solid waste management donations among subjects. A field experiment was conducted in the Kathmandu city of Nepal. We executed a dictator game to determine the donation behavior among the subjects. There were four major findings.

First, regarding socio-demographic variables, the results show that the coefficient of the age is negatively significant for donation 2 (management of current situation of solid waste), at 1% level of significance but not significant for donation 1 (donation for the betterment of the lives of people living near Sisdol landfill site) and donation 3 (donation for the segregation of waste). The findings indicate that young people are less likely to donate for donation 2 than their older counterparts. This is because young people may have different social preferences (Martinsson et al., 2011). Also, previous studies have found that young people seem to be more interested in optimizing personal financial gain rather than in giving while older people are more likely to contribute to public goods (Freund and Blanchard-Fields, 2014). Second, education is consistently significant at the 1% level of significance for Donations 1 and 2, and at the 5% level of significance for Donations 3.

Second, statistical results show that subjects who experienced the perspectives of future generations are more likely to donate in all three donation options, being the highest amount of donation for donation 3 at a 1% level of significance when compared to the subjects who did not experience future generations' perspectives. This might be because when people take both the perspective (i.e. people living in the future as well as distant locations), they become more sympathetic and as a result, they are more likely to donate for the sustainable options that can relatively change the status quo situations. This findings can be further supported by the findings

of (Nakagawa et al., 2019a and 2019b) who observes that people taking the perspectives of future generations are more sympathetic towards the needs of distant others and hence likely to avoid inaction regret (i.e. regret of not having performed certain action in present) to be perceived by the present generations (Pandit et al., 2021), as a result they tends to choose the preferences that can be beneficial for people not living in the future but also distant locations.

However, in case of treatment 3 in which subjects experience the perspective of future generations to create future vision, subjects are more likely to donate in donation 3 at a 1% level significance, followed by donation 2 at 10% level of significance when compared with the baseline groups. It implies that deliberation in conjunction with vision creation assists people in recognizing the interaction between their current understanding of solid waste management problems and their vision of what it could be. As a result, people became more aware about the consequences that might affect the people living not only in the distant future but also people living in the distant locations; hence they are more likely to donate for the options that can fundamentally change the status quo situations for the betterment of the future.

Third, when the interaction effect of the age and treatment is considered, our findings suggest that young people (i.e., aged ≤30) are more likely to donate for all three options, with donation 2 being higher at a 5% level of significance followed by donation 3 and donation 1 at 10% level of significance only when the intervention is accompanied by deliberation in conjunction with vision creation. This suggests that visioning influences young people to donate more for donation option 2. Furthermore, deliberation with vision creation can inspire young people to donate for the options that can fundamentally change the status quo situation for the betterment of the future. Mallan and Greenaway, (2011) appear to support these findings, arguing that positive participation of young people in the vision creation process can lead to more utopian

possibilities for the redevelopment of the urban areas. Furthermore, the results of this study contradict generativity theory (Erikson 1994), which explains that people in midlife are concerned with nurturing, guiding, and ensuring the well-being of future generations. Therefore, future research needs to explore further generativity related to young adults and their responsibility to the society.

Fourth, our findings show that prosocial people are more likely to donate in donation 2 at a 10% level of significance. This findings is in line with the Hirose et al., (2020) and Asma et al., (2021) who found similar effects of prosociality in the issues related to climate change and salinity problems.

The current study has some limitations that suggest possible directions for future research. First, the subject's initial donation choice is not recorded making it difficult to determine the effect of deliberation with vision creation on donation choice (i.e. whether the donation choice of the people either increases or decreases before and after the future design interventions). For better results, future research should capture both initial and final donation choices.

4.6. Conclusion

We designed and implemented a field experiment to examine the effect of vision on donation for solid waste management problems. The findings show that young people are more likely to donate only when the intervention is accompanied by group deliberation and the creation of future vision. Furthermore, we found that future design interventions with vision creation are more effective at changing peoples' donation preferences towards sustainable options. Overall, this study is the first study to confirm the effects of deliberation and vision creation on young people when it comes to solid waste management issues.

The current study has some practical implications. According to the findings of this study,

creation of vision motivates young people to manage solid waste problems which can aid in changing the status quo situation. In the current decision- making process, young people's ability to contribute to discussions about public planning spaces and engagement processes is often overlooked or underestimated, resulting in them being disproportionately affected by decisions about the future planning of their communities. In this case, future design interventions that involve young people in deliberation and vision creation may be critical to addressing issues such as solid waste management. This is because young people are more aware of problems and their consequences in society and such interventions can influence them to recognize the interaction between their current understanding of the problems and their vision of what it should be. Thus, it is important to involve young people in visioning the process for the sustainable development of society.

Second, the results of this study show that including imaginary future generations in visioning can be effective against future failure. This is because future design interventions allow citizens to rethink elements of their legal and social systems in which they are deeply embedded by taking the temporal reference point. Furthermore, by envisioning a clean future city community can create a pathway to their desired future. This is because the collective creation and discussion of a shared vision serve as a guide to achieve societal goals.

Chapter 5 : Conclusion

This research examines individuals' prosocial attitudes and behaviors based on psychological insights and experimental methods. To this end, this research focuses on two social problems: natural disasters that occurred quickly and subsided quickly; and solid waste management that emerges gradually, persists for a longer period of time, and has no clear endpoint insight. The research is organized into 5 chapters, first describing relevant facts about the problems and then relevant facts about individual's behavior and attitude. This research concludes the similarities and differences of three case studies using Davidov et al., (2016) framework (see figure 5.1).

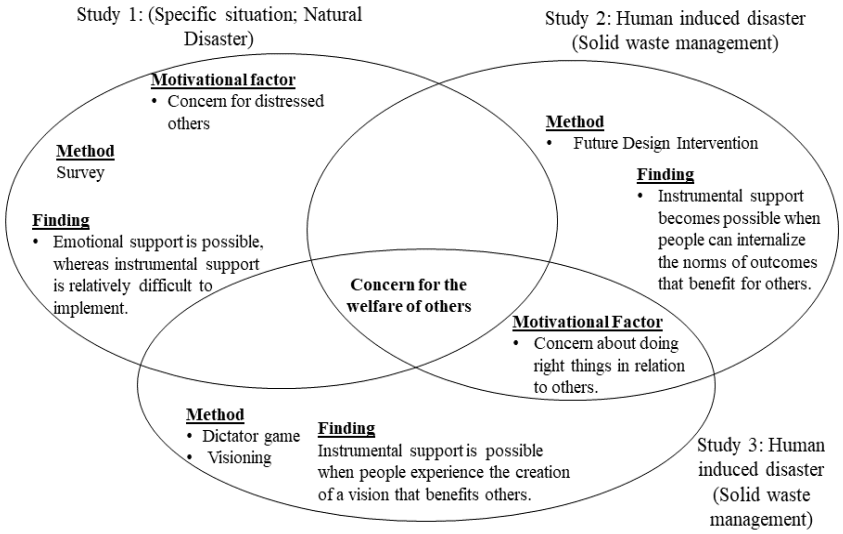

Figure 5.1: Summarized findings of the dissertation

The first chapter of this research examines the accumulative effects of mutual exchange of social support on the depression of the victims in an earthquake-affected community in rural Nepal

by examining the mutual helping behavior, PHQ-9 scales, damage variables and the socio-demographic variables. The results showed that mutual exchange of emotional support was possible, but implementation of instrumental support was relatively difficult. From this study we can say that under certain circumstances, such as earthquakes or any other pandemic, people become more concerned about others who are in distress and develop empathic feelings toward others, which encourages prosocial behavior. Also, emotional support is one of the important prosocial behavior of people to maintain harmonious and long-term relationships in the community through-out person's life.

Chapter 2 of this research addresses the issues of solid waste management in developing countries like Nepal. Solid waste management is given a low priority than infrastructure and other development works. This is because solid waste management issues are complex problems, emerge slowly, and persist for a longer period of time without a clear endpoint in sight. To address this problem, a new strategy in relation to future design studies was designed, developed and tested for its efficacy through deliberative field experiments. The results showed that people can instrumentally help others if they are able to internalize the social norms for outcomes that benefit others. From this study, we can say that future design intervention influences people to internalize new norms that are beneficial not only to the people living today, but also to those who live in temporal and spatial locations. Such interventions may help people to internalize and self-reflect the prosocial norms that motivate them to provide instrumental support.

Following the intervention in the second study, the third chapter examines the role of vision creation on donation using dictator game (donation game). The results of the experiment showed that when the intervention was accompanied by the deliberation and creation of vision, young people were more likely to donate to options that could fundamentally change the current situation

of solid waste management for a better future. Based on this finding, it can be concluded that visioning with future design intervention can motivate young people to donate more. Furthermore, in current decision-making process, the capacity of young people to contribute is often overlooked or undervalued in public planning and engagement discussions, resulting in a disproportionate impact on young people in decision-making about the future planning of their communities and society. Therefore, there is a need to involve the youth in the visioning process. This is because youth may have more knowledge that can generate creative ideas and solutions to complex problems such as solid waste management in the current scenario. Moreover, visioning influences and motivates people to work for the benefit of the society and community by creating a pathway to achieve the desired future they have set for themselves.

Finally, based on the framework of Davidov et al. (2016), through three case studies, this research identifies several non-monetary mechanisms that motivate people to work for the benefit of others and community. In the case of "concerned for distressed others" it is speculated that empathy and sense of belonging may facilitates emotional support. Such support can help maintain long-term harmonious relationships among the people in the community, reduce the risk of mental health problems caused by natural disasters, and make the community more resilient to disasters.

In the case of "concerned for doing the right things "vis-à-vis" others" it is speculated that the internalization of new social norms and the creation of a vision may facilitate instrumental support for working for others. Regarding the internalization of new social norms, this thesis identifies future design intervention as a potential strategy for do so. This type of intervention can be effective in solving complex problems such as climate change and solid waste management. This is one of the novel techniques that interfere with the acceptance of time frames and how people adopt the time scale. Thus, such types of interventions can influence people to change their

attitude towards the sustainable options that can be beneficial for not only the people living in the present, but also those living in temporal and spatial locations. The next mechanism is participatory visioning. The visioning process explored in this study provides a novel opportunity for individuals to create a vision of the future for the management of solid waste issues. Furthermore, by envisioning a clean future city, communities can create a pathway to the future they want. This is because the collective creation and discussion of a shared vision serves as a guide to achieving social goals. Therefore, such an approach encourages individuals to think in creative ways to solve complex problems such as solid waste management and climate change.

The current study revealed that the mechanisms that promote individuals' attitudes and behaviors vary from situation to situation, but overall, all of these mechanisms reflect a "concern for the welfare of others" that promotes people's prosocial attitudes and behaviors.

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Appendices

Appendix A

2-Way Social Support Measures
The following items were not included in the final analysis (***created by authors):

A. Providing social support (5 items)

1. Did you provide space for others to build temporary housing in your barren land? ***

2. Did you provide space for others to build their temporary housing in your farmland? ***

3. Did you provide monetary assistance to someone in the village while they faced any economic challenges during and after the earthquake without charging any interest rate? ***

4. Did you give financial assistance to someone while they face any economic challenges during and after the earthquake with charging the interest rate? ***

5. Did you provide financial support to the injured person/family to seek medical treatment? ***

B. Receiving social support (4 items)

1. Did anyone support you by providing space on their land for your temporary settlement after the earthquake? ***

2. After the earthquake, did you receive temporary shelter assistance from others? ***

3. Did you receive monetary assistance from others while faced with any economic challenges during and after the earthquake? (without being charged of interest rate) ***

4. Did you receive monetary assistance from others while faced with any economic challenges during and after the earthquake? (With being charged interest rate)? ***

Appendix B

B.1. A case of history and the current status of waste management in Kathmandu city

1. The Past and Present Kathmandu City

If you have a parent or grandparent aged 80 or above, he or she should know what the city of Kathmandu city was like in the 1950s. It was kept neat and clean. Rivers and riverbanks were so well maintained that people used to enjoy the beautiful riverside scenery. Seventy years later, the city center and the riverbanks are full of waste. You can compare old and current photos of the city center and the Bagmati River running through the Kathmandu Valley of Nepal. Let's deepen our understanding of the history and the current status of the waste management of Kathmandu city.

2. Waste Management in Kathmandu City before 1970

The population of Kathmandu city was only around 200,000 in 1970. Then the city witnessed an unprecedented rapid increase in its population. This led to a change in people's lifestyles and consumption patterns. Home composting pits gradually became unpopular. The percentage of waste other than kitchen waste increased, such as plastics and paper. In 1980, the city started implementing organized SWM to cope with the increased unrecycled waste. In 1986, the Gokarna landfill site started operations, and it continued to function until 1996, with the aid of Germany. Even the riverbanks of the Bishnumati and Bagmati Rivers were utilized as dumping sites.

3. Waste Management in Kathmandu (1970–2000)

The population of Kathmandu city was only around 200,000 in 1970. Then the city witnessed an

unprecedented rapid increase in its population. This led to a change in people's lifestyles and consumption patterns. Home composting pits gradually became unpopular. The percentage of waste other than kitchen waste increased, such as plastic and paper. In 1980, the city started implementing organized SWM to cope with the increased unrecycled waste. In 1986, the Gokarna landfill site started operations, and it continued to function until 1996, with the aid of Germany. Even the riverbanks of the Bishnumati and Bagmati Rivers were utilized as dumping sites.

4. Waste Management in Kathmandu 2000–Present

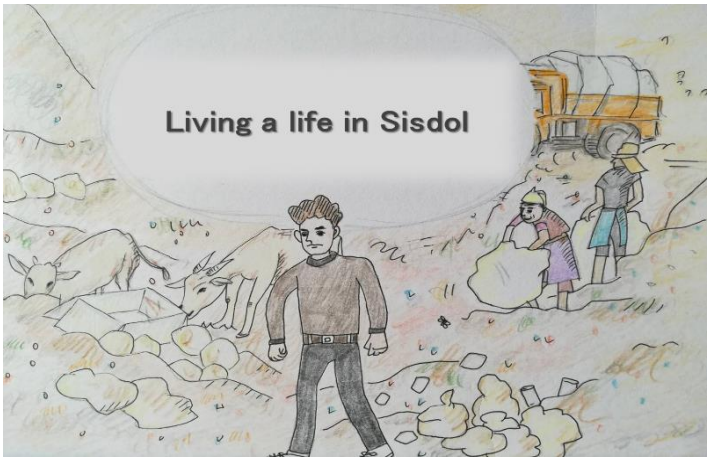
After the Gokarna landfill site was closed in 1996, the waste of Kathmandu was mainly dumped at riversides until a new landfill site was developed in Sisdol in 2005 with the aid of Japan. It was planned that this new landfill site would be closed in three years after it became full. As expected, it became full in 2008. However, Kathmandu city could not open a new site due to financial issues, and had no options but to continue using Sisdol in a problematic manner. As of 2019, the city was planning to develop a new landfill site in Banchare Danda. If we do not reduce the annual amount of waste, this site will become full in 10 years. However, if we try to reduce the annual waste generated by half, we can use the new site for 20 years. Reducing kitchen waste and promoting the recycling of non-kitchen waste (such as plastics and paper) are promising measures for decreasing waste.

5. The Tragedy of Sisdol

In what sense is the operation of Sisdol problematic? In an ideal case, plastic liners separate the dumped waste and the ground in a landfill. In this case, however, rain water contaminated by penetrating the waste is released into the environment only after it is collected and refined in a facility. Sisdol operated in this manner for the first three years with international aid. However,

after the period of international support ended, the water refinement facility failed to work any longer, and the contaminated water started flowing directly into the river. Additionally, the city had no option but to continue using Sisdol after it became full, by excavating slopes and dumping waste in such a way that it was not protected by the liners, as a result of which contaminated water oozes from the surface of the waste pile and flows into the river. This is causing serious health and environmental problems in a nearby village. One promising strategy to prevent such pollution is not to dump biodegradable kitchen waste at this site, as well as hazardous materials. In this way, rainwater will no longer be contaminated.

B2. A story of a villager living near the Sisdol landfill site



(1) Here is the Sisdol landfill site in the suburbs of Kathmandu city, the capital of Nepal. There are dump truck drivers engaging in landfill operations, day workers collecting reusable waste such as plastic, and goats and cows gathering to scavenge food from garbage. A young man is walking through this environment with a serious and firm look. He is a 27-year-old man named Gyan. He runs a restaurant in Chaletar Village near the landfill site. This story is about Gyan's life until now.

(2) The Sisdol landfill site is located about an hour's mountain pass drive from the center of Kathmandu city. Because the mountain pass is unpaved and uneven, one's field of vision can become poor due to clouds of dust when trucks transporting waste pass by. These trucks are carrying solid waste, which is

generated from Kathmandu city and the two neighboring cities, to the Sisdol landfill site. As of 2019, when you look down on the muddy river from the landfill site, you can see how much waste has been dumped on this mountain slope for about 14 years since the landfill operation was started in 2005. On the other side of the river, beautiful terraced paddy fields extend, which can typically be seen in rural agricultural areas of Nepal.

(3) Currently, this landfill site is causing serious problems for Chaletar Village, where Gyan lives.

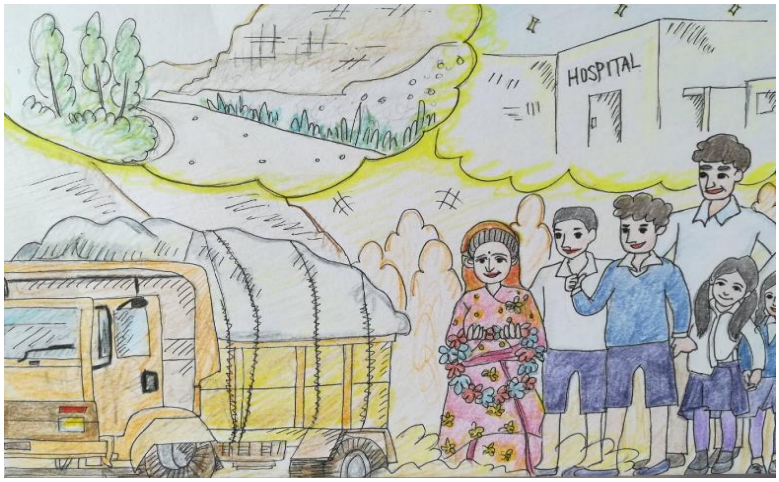
Black leachate, which is contaminated rainwater and groundwater permeated with waste, flows into the river near the landfill without being treated, and then flows toward Chaletar Village in the downstream area. This causes outbreaks of water-born infectious diseases, including cholera. The situation also leads to malodor and fly breeding. In addition, the garbage in this landfill is tasty feed for livestock, including goats from the village, so once they know the taste of it, they will not accept normal feed. This also results in damage to the health of the goats. It is humans who drink the goats' milk and eat their meat, so they too experience harm as a result of these circumstances.

(4) The reason why young Gyan comes to this landfill a few times a week is to patrol it himself.

He watches to see whether medical waste such as injection needles used in hospitals is landfilled illegally or not. He also checks whether insecticide, which should be sprayed to prevent malodor and fly breeding, is used properly or not. He wants to reduce damage to his village as much as possible through his regular self-patrol

and by keeping an eye on workers in the landfill. He was a 13-year-old boy when the landfill operation was started and he couldn't even guess that he would end up doing such a self-patrol in his adult life 14 years later. In fact, the villagers, including the boy Gyan, were so pleased at the start of the landfill operations that the whole village went out to celebrate it.

(5) On the morning of the start of the operations, the boy Gyan couldn't restrain his excitement



while attending a class at his school. What kinds of trucks transport waste from Kathmandu city? How do truck drivers unload the waste from the cargo beds? He let his imagination run like that. At 11 o'clock, the school finished early, and both the teachers and the students headed for the landfill. The villagers also gathered together at the site. Flower garlands to place around the neck were prepared as well for welcoming the drivers who brought the waste. One of the reasons why the villagers welcomed the start of the landfill operation so much was that this would improve road infrastructure in the inconvenient mountainous region. Before the construction of the landfill, villagers had to walk as far as nine kilometers to reach a bus route. Another reason why the village welcomed the landfill construction was that Kathmandu city had promised to build a new hospital in the village in exchange for approval of the landfill.

(6) At the beginning of 2005, the operation of the Sisdol landfill started off well. Under the instruction of the Japan International Cooperation Agency (JICA), the leachate from the waste was stored in a reservoir, and it went through the leachate treatment facility with power generation equipment. Then the treated leachate was discharged into the river. When the landfill was completed, the waste was covered with soil, and trees were planted on top. Then something unusual happened. Three years passed after the scheduled management period, with the JICA and the other authorities having gone. Even though the Sisdol landfill had reached capacity, the mountain was excavated repeatedly to receive waste due to the lack of a budget for the construction of another landfill. As a result, the contaminated leachate flowed directly into the river, and the leachate treatment facility, which had been fully operational before, was left unfunctional. In addition, Asara (snow trout), a kind of fish, had disappeared without the people noticing it.

(7) Finally, Gyan and the villagers' anger reached a boiling point regarding the various problems,

including the deterioration of water quality, and one day they decided to resort to force. They blocked the only route from Kathmandu city to the landfill, not allowing the transport trucks to bring in waste. This restriction went on for 19 days. In Kathmandu city, waste could not be collected and it overflowed everywhere, with the unsanitary environment also causing health problems, including infectious diseases. Then, the police intervened and it was decided that the waste transportation should be

restarted. In addition, Kathmandu city brought the matter to an end by promising the residents to provide water supply facilities and job opportunities at the landfill. However, the landfill operation problems have not yet improved.

(8) Gyan has two wishes now. First, he wishes that the Sisdol landfill site would be managed so that it does not have an impact on the environment and public health, and that the landfill should be covered thoroughly with soil and planted with trees after the area is completed as it was originally. Second, he wishes he could meet and speak with himself 14 years ago, when he was innocent and excited about the landfill construction. If he could do so, he would tell himself that the landfill site could negatively affect humans and the environment.

(9) Thank you.

B3. Technical Notes for deriving Cost

1. Evidence for the annual cost of NPR.2400, NPR 3600 and NPR 4800 per household in Options 2, 3, and 4

ADB (2013) estimates that 466 tons of household, institutional, and commercial waste are generated in a day in Kathmandu city. It is also estimated that only 405 tons of the 466 are currently collected by the public service. This suggests that 66 tons of waste are left somewhere every day, perhaps on streets or on riverbanks. Options 2–4 assume that all of this left-behind waste is collected by the public service. On average, municipalities spend about NPR. 2,840 ($30) per ton of waste for collection, transport, and disposal (ADB, 2013; p. xi). We also assumed, after a discussion with municipal workers and relevant stakeholders, that in the current situation, on average, each household pays NPR. 230 per month (7.6 per day) for waste collection. Thus, the daily increase of 66 tons of waste is associated with the increased cost of NPR. 2,840 *61*7.6 = 1,310,000 per day. Annually, the cost will be NPR. 480,560,000. ADB (2012) estimates that there are about 200,000 households in the city, and thus the annual cost per household is **2402.8[NPR/HH]**. We approximate this to **NPR 2400** for Option 2.

Furthermore, the additional cost for Options 3 and 4 will increase by 350 and 450 monthly charge as these options requires troublesome segregation of recyclables in addition to the cost of collecting the waste more frequently. In such cases, annually the cost of Option 3 will be 3,600 and Option 4 will be 4,800 respectively.

2. Evidence of the annual cost of NPR. 1,300 per household in Option 4

ADB (2013) estimates that when all three major sources of waste (household, commercial, and institutional) are combined, organic waste accounts for 66% of the total waste. Thus, if the amount of waste in Kathmandu city is 466 tons per day, the amount of organic waste is 261 tons per day. In a cross-national survey in developing Asian countries, Aleluia & Ferrão, (2017) found that the average of capital expenditure was 21,493 USD per ton for developing composting plants. Assuming that the depreciation period is 10 years, the annual depreciation cost per HH (household) of Kathmandu city is calculated as:

261[ton/day]*21,493[USD/ton]*100[NPR/USD]*(1/10)[year]*(1/200,000)[1/HH]
=280[NPR/HH]. They also found that the average of operational expenditure was 11.5 USD per ton. Thus, the annual operation cost per HH of Kathmandu city is calculated as follows:

261[ton/day]*11.5[USD/ton]*365[day/year]*100[NPR/USD]*(1/200,000)[1/HH]
=548[NPR/HH]. Thus, the summation of the depreciation and operation costs is 828[NPR/HH]**.** We approximate this to 830[NPR/HH]. However, the estimated cost was derived from price level for the fiscal year 2011/12 price level. Therefore, when implementing our experiment, we revised the cost based on the price level of fiscal year 2018/19 price level (annual market inflation rate 4.5, Nepal Rastra Bank 2018) to reflect the current financial burden which is approximately NPR 1300.