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Authors: Zhou, Yue, Du, Fangjuan, Xiong, Kangning, Li, Wei, and Zou, Xixia

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The Development of Rural Residents' Sense of Place in an Ecological Restoration Area: A Case Study From Huajiang Gorge, China

Yue Zhou^{1,2}, Fangjuan Du^{2,3*}, Kangning Xiong^{2,3}, Wei Li^{1,2}, and Xixia Zou⁴

* Corresponding author: 810669432@qq.com

¹ School of Geography and Environmental Sciences, Guizhou Normal University, Baoshan North Road, Guiyang 550001, China

² School of Karst Science, Guizhou Normal University, Baoshan North Road, Guiyang 550001, China

³ State Engineering Technology Institute for Karst Desertification Control, Baoshan North Road, Guiyang 550001, China

⁴ Bijie Circular Economy Research Institute, Guizhou University of Engineering Science, Xueyuan Road, Bijie 551700, China

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Sense of place and environmental problems have received increased attention in recent years; however, there is limited understanding of the dynamics of sense of place under gradual environmental changes.

Using fieldwork and in-depth interviews, we explored the changes in rural residents' sense of place during the processes of ecological degradation and restoration in Huajiang Gorge, China. Our findings show that residents' sense of place is dynamic and complex. In the environmental degradation period, karst rocky desertification aggravated by human activities caused the slow spread of a negative sense of place; as rocky desertification

governance developed, positive and negative or ambivalent feelings coexisted. We argue that the dimension of place dependence is the most sensitive to environmental change and affects farmers' sense of place positively or negatively, which may form a locked-in sense of place. Consideration of the dynamics and complex sense of place in karst rocky desertification governance could contribute to the effectiveness of decision-making and promote residents' wellbeing.

Keywords: sense of place; ecological degradation; karst rocky desertification; combating karst rocky desertification; environmental change; Huajiang Gorge.

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Introduction

Mountain regions are key environments for sustainable development (Wehrli 2014) and are critical to sustaining global ecosystems (UN 1992). As changes occur in mountain ecosystems, further understanding of people–environment relationships may enrich our understanding of human responses to environmental change. This is essential for inclusive and participatory policy and management strategies and proenvironmental behavior (Scannell and Gifford 2010; Devine-Wright 2013).

Because of their specific ecological and geological conditions, some karst mountain regions are vulnerable to disturbance by irrational, intensive development, resulting in a process of land degradation that transforms a previously vegetation- and soil-covered karst area into a rocky landscape—a process known as karst rocky desertification (Yuan 1997; Wang et al 2004). This has occurred in various countries and regions, especially in the karst mountain region of southwest China (Jiang et al 2014). Despite active efforts by the Chinese government and academia and benefits achieved since the 1980s, some problems, such as residents' low enthusiasm for participation and difficulties in consolidating rehabilitation achievements, still threaten the sustainability of karst mountain regions (Xiong et al 2016; Zhang et al 2016).

For a deeper understanding of these phenomena and effective ecological governance, we need to understand the local people; their attitudes, emotions, and behaviors; and how these affect people–place relationships. As Tuan (1990: 1) argues, “Without self-understanding we cannot hope for enduring solutions to environmental problems.”

The relationship between environmental change and sense of place is a relatively new area of study (Smith and Cartlidge 2011). The literature discusses the dynamic aspects of sense of place in disaster environments, focusing mainly on environmental change and negative emotional responses. Environmental disaster—whether sudden, such as a flood or fire, or gradual, such as global warming, sea-level rise, or environmental degradation—changes the characteristics of a place and consequently changes everyday life and cultural practices. This can complicate and undermine people–place relationships and lead to negative social and psychological outcomes (Brown and Perkins 1992; Hess et al 2008; Tapsell and Tunstall 2008; Cox and Perry 2011; Cunsolo Willox et al 2012; Durkalec et al 2015). In particular, people who have a close living and working relationship with their land, such as farmers, may be highly sensitive to such changes (Albrecht et al 2007; Tschakert et al 2013; Ellis and Albrecht 2017) and suffer more from them (Stain et al 2008). A few authors also think environmental change can trigger place attachment

(Dentzman 2018) and significantly affect postdisaster reconstruction (Chamlee-Wright and Storr 2009). Although existing research has provided important insights, local farmers' dynamic sense of place during gradual land degradation and restoration has been insufficiently explored (Rogan et al 2005; Tschakert et al 2013; Ellis and Albrecht 2017).

Taking Huajiang Gorge as a case study, this research aims to explore the impact of the changes in place characteristics on the sense of place of rural community residents in a rocky desertification environment. We aim to capture the multiple aspects of sense of place and their correlation with one another to contribute to the literature on sense of place.

The conceptual and analytical framework

Sense of place was first defined in human geography as the center of felt value and meaning, emphasizing how people transform biophysical space into meaningful places through existing practices and subjective daily space experience (Tuan 1977). Much research has focused on the social construction of place meaning and sense of place (Brandenburg and Carroll 1995; Davenport and Anderson 2005; Kely and Chick 2007) as "a product of shared behavioral and cultural processes" (Lewicka 2011: 214).

However, physical place also matters. Place is an entity that has a physical and a social dimension (Lewicka 2011). Some authors have argued that landscape attributes are not only containers for meanings but also important for constructing meanings by shaping and constraining behaviors (Stedman 2003; Sampson and Goodrich 2009). As Stedman (2003: 671) points out, "although social constructions are important, they hardly arise out of thin air: The local environment sets bounds and gives form to these constructions." Therefore, when discussing the sense of place in environmental change, physical environment and landscape attributes (tangible versus intangible, natural versus built, etc) should be considered, in addition to aspects of personal (family) biography, memory, perception, social history, and social relationships.

When the physical environment of a place changes because of certain activities or processes, the bonds between people and the environment may change (Brown and Perkins 1992). To better understand these changes, we should consider the range of experience and meanings of place (Kaltenborn 1998; Kaján 2014). Emotional bonds with places can be formed or changed through negative or ambivalent experiences; place meanings are also developed by negative or ambivalent experiences (Manzo 2003, 2005). Therefore, we focus not only on positive but also on negative and ambivalent experience and meanings.

Above all, we support the notion that sense of place is a meaning-based concept (Tuan 1977; Stedman 2003; Cresswell 2008). These meanings are constructed by individual and group subjectivity and shaped by environmental attributes in the biophysical world, and they are always in the process of change and development (Stedman 2003; Sampson and Goodrich 2009). Sense of place is expressed in the relationships among materiality, practice, and meanings (Urquhart and Acott 2013).

Despite widespread attention in many fields, such as environmental psychology, human geography, and sociology,

there is still a lack of consensus on the understanding of sense of place. This paper defines sense of place as encompassing multiple independent and interrelated dimensions, among which place attachment, place identity, and place dependence are the core of the study (Jorgensen and Stedman 2006). In this research, place attachment is understood as positive emotional bonds between people and the environment (Stedman 2003); place identity emphasizes the extent to which the environment supports one's sense of self and is a component of self-identity, with more spiritual meanings (Proshansky et al 1983; Stokols 1990; Stedman et al 2004); and place dependence describes instrumental bonds with place. It is generally believed that people become dependent on a place when it meets certain goals better than alternatives (Shumaker and Taylor 1983). However, choosing a place may not necessarily mean a positive evaluation of local functions (Mullendore et al 2015), especially if alternatives are lacking. Dependence on place can be either a positive choice or a necessity. This dependence is also not necessarily related to the activities taking place but may also be based on considerations of future needs (Cross et al 2011). Huajiang rural communities obtain all sorts of resources from local areas, and their dependence on their surroundings is obvious. These links can be expressed through livelihood-related activities (economic gain activities and consumption activities, such as access to subsistence agricultural products) and nonlivelihood activities (a particular lifestyle related to the physical attributes of the living place), which are related to place dependence (Cross et al 2011; Abrams and Bliss 2013). Therefore, place dependence is also an important concept in this study.

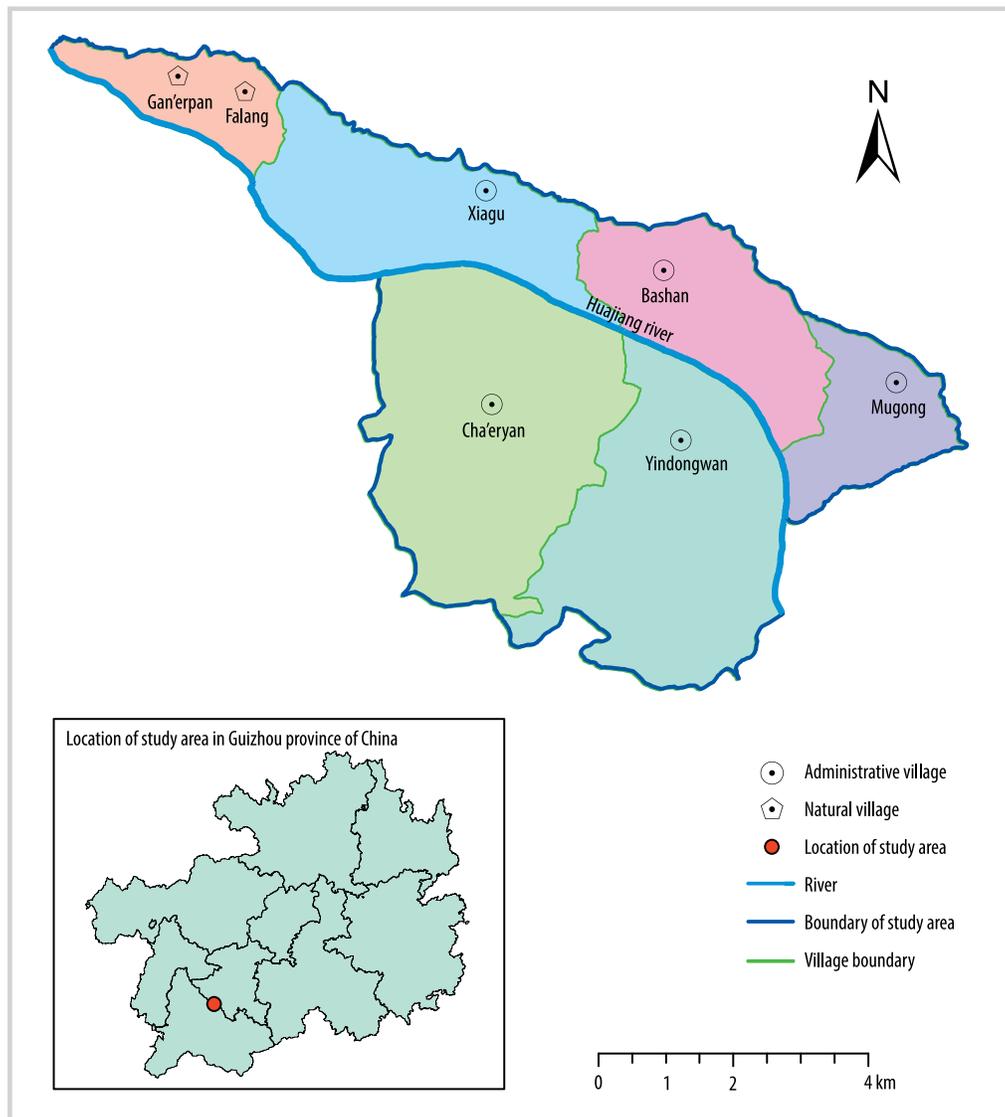
In the study, environmental governance refers to the set of regulatory processes, mechanisms, and organizations that influence environmental actions and outcomes (Lemos and Agrawal 2006). Similarly, rocky desertification governance is defined as the specific set of rules and organizations through which political actors positively address rocky desertification. Different forms of environmental governance reflect different political and economic relations, and key to different forms of environmental governance, as Lemos and Agrawal (2006) point out, is how these political and economic relations shape identity, actions, and outcomes. When discussing sense of place during environmental change, we focus not only on the negative aspects of human intervention but also on the positive aspects to address rocky desertification. Therefore, this paper analyzes 2 phases of environmental degradation and restoration. The policy design and practice of Huajiang rocky desertification governance considers not only ecological restoration but also overall local development and poverty alleviation. Therefore, the effects of governance must also be multifaceted and not limited to ecological aspects.

Research design

Study area

The research was conducted in the Huajiang karst gorge, located on both banks of the Huajiang River section of the Beipanjiang River in southwest Guizhou (105°36'30"–105°46'30"E, 25°39'13"–25°41'00"N). The total area is 51.62

FIGURE 1 Location of Huajiang Gorge and its villages in Guizhou. (Map by Yue Zhou)



km², with a population of 11,200 in 2018. The gorge includes 6 administrative villages (Figure 1): Cha'eryan and Yindongwan in Beipanjiang town of Zhenfeng county and Xiagu, Mugong, Bashan, and Wuli (comprising only 2 natural villages, Falang and Gan'erpan) in Huajiang town of Guanling county. The karst is distributed across 87.92% of the area, with elevations ranging from 650 to 1450 masl. The region is characterized by a dry and hot valley climate; the mean annual temperature is 18.4°C, and the annual extreme maximum temperature is 32.4°C. The mean annual precipitation is 1100 mm, falling mainly from May to October. Because of intense karst development, the region is characterized by a deep valley, deep-buried groundwater, shallow soil, an extremely dry surface, and a lack of water.

Environmental governance in Huajiang has been continuously carried out since the 1950s. Rocky desertification was the most serious ecological problem in the area. Because of its representativeness and typicality, Huajiang was selected as a key example of rocky desertification governance. Over the years, its physical environment and landscapes have undergone significant

changes, and the proportion of rocky desertification area has decreased from 89.79 to 59.60%. Based on this environmental change process, this study divided the environmental governance of Huajiang into an environmental degradation phase (1950s to early 1990s) and a restoration phase (early 1990s to the present).

Methods

A field survey was conducted from 21 to 28 August 2018. Face-to-face, in-depth interviews were used to collect data. With the help of village cadres, potential interviewees were identified through purposive sampling strategies and a snowballing method. The interviewees were contacted by telephone or by calling door to door. In this, 26 people were contacted, and 23 formal interviews were finally completed (Table 1). The interviewees were mainly middle-aged and elderly local residents, because they were familiar with and understood the whole process of environmental change in Huajiang and most young people were seasonal migrant workers. However, a few young people and outsiders who had been working in the area for a long time were

TABLE 1 General profiles of in-depth interviewees.

Sample no.	Gender	Age (y)	Occupation	Level of education	Birth status	Village
HJ1	Male	50	Farming	Elementary school	Native	Bashan
HJ2	Male	45	Residency cadres	Technical normal school	Nonnative	Xiagu
HJ3	Male	80	Enterprise retiree/farming	Junior high school	Native	Xiagu
HJ4	Male	82	Farming	Elementary school	Native	Xiagu
HJ5	Female	46	Business	Technical normal school	Nonnative	Xiagu
HJ6	Male	44	Teacher	Technical normal school	Native	Xiagu
HJ7	Female	56	Farming	Illiterate	Native	Xiagu
HJ8	Male	44	Farming/village cadre	Junior high school	Native	Xiagu
HJ9	Male	82	Farming	Elementary school	Native	Wuli
HJ10	Male	47	Farming	Elementary school	Native	Wuli
HJ11	Male	48	Farming	Junior high school	Native	Bashan
HJ12	Male	31	Migrant worker/farming	Junior high school	Native	Yindongwan
HJ13	Male	62	Farming/village cadres	Junior high school	Native	Yindongwan
HJ14	Male	63	Business	Junior high school	Native	Yindongwan
HJ15	Female	32	Part-time farming	Elementary school	Native	Yindongwan
HJ16	Male	54	Farming	Junior high school	Native	Yindongwan
HJ17	Male	43	Part-time farming	Junior high school	Native	Cha'eryan
HJ18	Male	39	Part-time Farming	Junior high school	Native	Cha'eryan
HJ19	Male	54	Farming/village cadre	Elementary school	Native	Cha'eryan
HJ20	Female	44	Farming/business	Elementary school	Nonnative	Cha'eryan
HJ21	Male	50	Farming	Junior high school	Native	Cha'eryan
HJ22	Male	33	Teacher	College	Nonnative	Cha'eryan
HJ23	Male	43	Farming/business	Elementary school	Native	Cha'eryan

Note: Samples are sorted chronologically according to the order in which the interviews were held.

interviewed as well. The interviewees generally had low levels of education, and they were mostly farmers or part-time farmers but also included teachers, village cadres, enterprise retirees, and migrant workers, making it possible to cover residents with different identities and income sources and levels. The characteristics of the sample are consistent with the situation of Huajiang residents; thus, the sample has good representativeness. The interviews lasted from 36 to 200 minutes, and were conducted at the interviewees' homes or in other places they found convenient.

An interview guide was used to structure the conversation, allowing the interviewees to frame the topics while allowing new and unexpected topics and ideas to emerge. The questions were largely open ended to ensure that the interviewees could express their ideas, experiences, and meanings freely. The interviewees were asked about their perceptions of the characteristics of their place of residence, personal observations and understandings of changes in the environment and landscapes past and present, perceived impacts on their families and place, interaction with the environment, various life experiences, thoughts and feelings about place over time,

whether they had ever thought about relocating and why, the importance of their place and what the place meant to them, and concerns about and prospects for the future of the place.

Subject analysis was used to evaluate the interviews. Each interview was hand-transcribed verbatim, and the transcript was then encoded. First, the core categories were identified according to the literature: place characteristics and their changes, daily activities and life experiences, place meanings, and sense of place. Then, each text was analyzed line by line and the text segments were organized into the identified subject categories. All text segments belonging to the same core category were edited, and the subcategories were created generically from the data. Each core category was divided into several subcategories. The whole process was highly iterative. Data were encoded by different authors to ensure consistency. The participating authors first coded independently; then, they analyzed the codes together, discussed the different codes, and finally agreed on the most appropriate codes, coding and recoding using a shared set of codes.

Results

Environmental degradation, residents' negative memory, and sense of place

Place characteristics—rocky desertification ecosystem: The karst environment in Huajiang is fragile, sensitive, and vulnerable and is easily destroyed by human activities. Chorography shows that after 1958, food shortages and extreme poverty led people to clear forests and grass for cultivation, demanding grain from the mountains. The continuous reclamation of steep slopes and firewood cutting, charcoal burning, and other activities have reduced the surface sediment retention and thus accelerated soil erosion. Particularly after the land reform of the early 1980s, arbitrary logging and cultivation caused serious environmental issues. Bare mountains were found everywhere. The fragility and vulnerability of the environment were prominent in the interviewees' narratives:

Since 1982, when the land was contracted out to households, people have worked hard to clear forests because they were afraid of hunger. Only ripe soil was assigned to households after contracting collective land to rural households; it took 2 years to rigorously reclaim these barren hills from the bottom to the top. If you planted corn in a place, loose mud would rush toward the river after heavy rain. Therefore, when the land was reclaimed and corn planted for 3 or 4 years, mud was washed away, and it became naked rock, which was similar to serious rocky desertification.

(HJ13)

Seriously affected by rocky desertification, the whole gorge ecosystem became increasingly fragile. "Little soil," "much stone," and "poor soil" were the terms most frequently used by locals to describe the environmental conditions, and they referred to their living place as a "stony corner." Some interviewees also described the drought effect and the climate and disaster effects of vegetation destruction under special geomorphic and hydrological structures:

In the 1990s, the mountains were flooded at this time of year because of the destruction of vegetation. Mudslides were scattered all over the mountains, and destructive natural disasters were very serious.

(HJ6)

In the past, the natural conditions of our place were harsh, hot, and arid.

(HJ9)

In the past, the problem of water shortages existed from the first lunar month to February, March, and April on the ancient calendar.

(HJ19)

Memories, life experience as a farmer, and negative sense of place: Local environmental characteristics were closely intertwined with local people's daily agrarian production and life practices and experiences. The rocky desertification environment interfered greatly with traditional agrarian production, and agricultural economic productivity was low. The local people were under strong survival pressure for a long time. In their memory, they

were underfed, were underclothed, and had little source of income in the past:

After 3 days, 5 days, or even a week of dry weather, all the corn turned yellow, and fire might even burn it up.

(HJ14)

As soon as February and March, there were many households that were poor in food and borrowed food everywhere.

(HJ7)

Environmental degradation exacerbated the deterioration of roads, water sources, and climate conditions (ie rugged roads). Coupled with poor water supply, transportation, housing, and energy and other facilities, this constrained access of local amenities and resources. The interviewees recalled their long-term experience of carrying water. Some "picked up the bucket [to fetch water] at 2 or 3 o'clock in the morning" (HJ7), and "the journey was probably nearly 10 km there and back, and it took half a day to pick up 2 buckets of water" (HJ19). Disputes and conflicts often arose over water.

The harsh physical environment even threatened the socioecological system. In the 1980s, villagers were known to outsiders as the "monkeys in the mountain valley," because they were dark and thin. Because "this place of residence won't do," with "dry mountains" and "poor family conditions of locals" (HJ19), girls from outside were reluctant to marry in. There were even some violent conflicts between families and locals.

A local ballad vividly depicts locals' past life experience: "You look at the river of Huajiang, water is running, but you can't drink it; you eat rice unless you are in a confinement period; the girls run out, and no girl marries in."

All these negative memories and embodied experiences in degraded environments point to a slowly spreading negative sense of place. In the early era of urban-rural separation in China, the local residents were largely unable to move out and had to stay despite poor harvests. Meanwhile, the special policy environment caused farmers to lack income-generating activities other than agriculture and thus exacerbated their economic poverty (Li 2008). Consequently, they formed a locked-in relationship with the place where they lived:

People who spent time making a basket or something else in the evenings or on days when you could not work uphill because of rain were said to be speculating. People had no money in their pockets because there was no chance to use their labor.

(HJ3)

Just live here, from birth to death! In the good years, it was easier to live, and in the bad years, it was harder. I just complained to the older generation about coming to this poor place, but the older generation had already settled down here, and there was nothing we could do to change this.

(HJ3)

Such negative functional dependence, accompanied by high-intensity use of the environment, exacerbated environmental degradation and led to the accumulation of negative experiences related to place. This made some interviewees feel helpless, disappointed, and resentful and

want to escape from the place they lived in, eroding their sense of attachment and emotional security to the place, which in turn affected how they saw themselves:

How to think of this place? There was nothing but pain and suffering, only endure bitterness like this because we were not allowed to move or go out. I said there was nothing but pain and suffering, only to go up the hill and plant corn to keep a minimum level of life.

(HJ4)

However, the interviewees who stayed still regarded their place of residence as home, showing some sense of attachment and identity. Some interviewees whose families had lived here for generations expressed emotional pain and conflict, saying they had wanted to leave here in the past but had been reluctant to “leave the ancestors behind” (HJ4). Some had returned after leaving to make a living elsewhere because “there were still the old, families, and children” (HJ3) and they felt that “the outside was not their roots” (HJ5). Despite the harsh environment, some, especially those with relatively good economic conditions living near the road, said they had no intention of moving away because it was where they came from. They even expressed identity with certain elements of the place, such as winter weather and production. For them, the place still had some emotional and symbolic meanings. Apparently, the locals had mixed feelings about the place.

Rocky desertification governance, changing experience and meanings, and diverse and complex sense of place

Rocky desertification governance and local reconstruction: Since the 1990s, based on the advantages provided by local resources and the environment, the local government has issued policies to actively guide farmers in developing the characteristic economic orchard industry. As rocky desertification governance has become a national goal in the 21st century, the state has introduced many policies and projects and invested substantial funds. The local government coordinated, integrated, and implemented various ecological projects in the region while taking into account the construction of energy, water supply, transportation, and other facilities closely related to farmers’ production and life. By cooperating with scientific research institutions, the agricultural structure has been successfully adjusted on the premise of ecological restoration, forming a characteristic industry with Dingtan Chinese Prickly ash (*Zanthoxylum planispinum* var. *dintanensis*) planting at the core. While continuing to promote the development of the Chinese prickly ash industry, the local government has also actively introduced pitaya (*Hylocereus undatus*) and loquat (*Eriobotrya japonica*), as well as other follow-up industries, and has actively developed canyon tourism resources. After years of rocky desertification governance, great changes have taken place in the physical environment and landscape.

Almost all interviewees mentioned positive changes in their local areas, such as improved resource conditions, infrastructure, and ecological environment. Vegetation restoration has also affected people’s perceptions of the climate and disasters. The climate and bare-rock hills previously considered inhospitable have been increasingly seen as valuable:

Greatly changed now; there is water where water is needed, and there is land where land is needed. I think of our place as one with green mountains, birds singing, and the fragrance of flowers now.

(HJ14)

Aspects such as traffic, the Internet, and the environment have done quite well.

(HJ12)

You see, we’ve had almost no wind or rain in the last few years, so basically, the climate has changed.

(HJ5)

Changing experience, multiple meanings, and diverse and complex sense of place: Positive changes in the environment have created a positive experience of daily activities for many interviewees and an expansion of the functional meanings of place in range and degree. First, with changes in land and surrounding ecosystems, the local ability to provide food and livelihoods has increased significantly. The living standards of community residents have improved to varying degrees:

It feels so much better now because the policy is good and the country carries out planting of pitaya and prickly ash, which gives farmers a certain amount of income.

(HJ8)

Second, the physical environment and landscapes of the gorge provide a way of life based on nature. Some interviewees expressed their dependence on such a lifestyle, particularly showing an interest in the value of environmental health. Experiences such as freedom, relaxation, comfort, and safety have given them more personal happiness:

If I want to eat fish, I put a shrimp cage in the river when it gets dark. When I get up the next morning, there is a cage of shrimp. If I feel like I’ve stayed enough in my house, when the families come back, we will take a walk by the boat. I can eat and live safely, and the air here is good, so do I still need to go into town? You have to go to the countryside to enjoy the scenery; we have our own boat and thus can take a boat and go out for the day if we want.

(HJ5)

Improvements in services and facilities have enhanced local habitability and the ability of local areas to meet the needs of residents for quality of life. The increase in people’s positive life experience has promoted the choice of specific lifestyles provided by the place.

Even if their livelihoods were less dependent on production income, some still said they “would come back in the future” because now “the place is livable, the natural environment is better than the street and city,” and they “ultimately have to live on it [and] thus it cannot be thrown away” (HJ14), showing dependence on place that is clearly related to future livelihood and nonlivelihood activities.

The place has developed new meanings, which in turn influence people’s place identity:

More than 20 years ago, it was true that wherever we went, we were too embarrassed to talk about being from the village of Yindongwan because it was truly poor at that time. Now, when you say that you are from the village of Yindongwan, people all know the economic development here.

Indeed, earth-shaking changes have taken place, and we have even become the village with the highest per capita net income. Like, now, we all feel like we are walking tall when we talk about Yindongwan.

(HJ13)

Many interviewees chose to stay in or return to their hometown to live, even when alternatives were available, which promotes interpersonal communication in the acquaintance society. Affective attachment primarily based on social experiences, particularly of a family nature, has been greatly enhanced. The living place was described as the “hometown” (HJ21), “foothold” (HJ7), “old nest” (HJ11), and “after-birth land” (HJ9). Although recognizing some negative factors, some interviewees still expressed their love for the place:

Growing up in the place, [I] always feel attached to this place and am reluctant to leave this place, even if it is poor, remote, and mountainous.

(HJ3)

This old man also described such strong feelings toward the place that he wanted to “be buried here after death.”

There were also negative and ambivalent feelings toward the place. Although they perceived local development and positive changes, and had a high degree of economic dependence on their living place, some interviewees believed that these could not meet their expectations and requirements for life. They therefore expressed a functionally negative experience of the place. One interviewee commented that he still wanted his children to settle elsewhere so that they would have access to better educational facilities and services, although he had “feelings for this place at present because of the great hope for this place” and felt like he “belongs here” (HJ16).

Some interviewees had a positive livelihood dependence on place and a positive view of the modernization of the built environment and thus expressed the desire to take root. However, there were trade-offs. One 82-year-old interviewee said:

I can only say that it is my home right now, which is still unstable because the production area is too narrow now. There are hills and slates everywhere as soon as you go out. If the tourist area cannot be developed, where can you get something to eat since you can't grow anything?

(HJ4)

Another claimed that the place was not important to her and she was not attached to it. She strongly expressed her desire to leave: “No feelings! I have lived here just because I cannot afford a house [in the city]” (HJ20). She thought city life was more convenient. However, reluctant to give up her old house, she had moved back from the resettlement area. Although her response was the opposite, the place seemed to still mean something to her. She wanted to leave but could not, which gave her an ambivalent feeling about the place.

Some interviewees acknowledged the disadvantage of their place of residence in terms of soil conditions and agricultural prospects but seemed to accept their livelihood dependence on it because the place “suited them” now. One interviewee also expressed no attachment to place, and his

expression of place identity seemed to be the result of a trade-off:

Belonging to this place. There is no room to pick and choose. No matter how bad it is, I can only be in this place to survive, with only this ability.

(HJ23)

Conclusions and discussion

The study revealed the dynamics and complexity of how locals' sense of place was affected by environmental changes. In Huajiang, the local physical environment and landscapes with specific attributes are part of the interaction between practice and structure, forming “time-space specific everyday practices” (Pred 1983: 51). They promote the generation and setting of boundaries for a range of place meanings and experiences (Stedman 2003). Environmental degradation accelerates the negative change in sense of place, producing feelings that are similar to some components of solastalgia (the distress that is produced by environmental change affecting people while they are directly connected to their home environment; see Albrecht et al 2007), whereas the rocky desertification governance promotes people's positive sense of place. The constraints of the physical environment and landscape materiality with regard to the range and degree of changes in experience and meanings allow current positive and negative or ambivalent feelings to coexist. The results enrich our understanding of the links between gradual environmental change and sense of place.

This study shows the profound response of place dependence during environmental change and its important role in the changes of local residents' sense of place. This finding partly supports previous studies that have emphasized the positive influence of place dependence on place identity (Moore and Graefe 1994; Vaske and Kobrin 2001). It also suggests that people's dependence on the place where they live and develop their livelihoods is not necessarily a positive goal realization; it may also be a negative functional choice in the absence of alternatives. Thus, although people develop emotional attachment because they are drawn to a place, they can also be anchored to a place by neutral or negative contextual factors (Beckley 2003). This negative place dependence has a negative impact on their place identity and attachment. Therefore, place dependence can be either a positive or a negative functional connection that may positively or negatively affect sense of place.

The study also indicates that people's emotional relationships to their place of residence exist in a larger social and political environment (Massey 1994; Manzo 2003). During the planned economy period, under the strict household registration management system, villagers were fixed on collective land as a means of labor production. At the same time, the state continually restricted or even abolished farmers' private plots, household sidelines, and rural markets, resulting in a lack of other sources of income for residents. The constraints of the institutional environment and livelihoods left people confined to the land and formed a locked-in relationship with their place of residence. This led to a vicious circle of environmental

degradation—interference with place use—negative space experience and meaning, which promoted the slow spread of a negative sense of place and complicated people–place bonds. Perhaps we can call this kind of sense of place formed by being fixed or constrained in a place a locked-in sense of place. The local reconstruction that promoted the changes in sense of place in the second phase occurred in the context of China’s socioeconomic transformation, with the unlocking of the place and the top-down implementation of environmental policies. The 2 phases present seemingly extreme changes in sense of place, which may stem from the sharp contrast between their experience of using place in different phases. Deep memories of long-term hardships and struggles with the environment further promoted the current positive evaluation of local changes for residents.

The research suggests that rocky desertification governance has promoted local ecological restoration and development. This is reflected in the physical space, namely, the changes of local physical environment and landscape. As the environment changes, people’s sense of place becomes dynamic and complex. These findings may have implications related to future management or governance. For example, dynamically capturing the changes and characteristics of residents’ sense of place will help decision-makers better predict, understand, and effectively develop appropriate governance responses in the future. By actively reconstructing place meanings through changes, decision-makers and managers may promote the sharing of meanings of different groups and some degree of consensus and cooperation, which can be taken into account in the design of environmental policies in other mountain regions with similar environments. However, when values within a group show dynamic, diverse, and complex characteristics, attitudes toward policies and planning within a group may be different or even controversial. In such circumstances, initiating dialogue and consultation, and ultimately achieving an agenda acceptable to all parties, may face additional challenges. Clearly, a diversified approach is needed. Moreover, according to Massey (1994), different individuals and groups attribute diverse meanings to place, and this study does not present stratified research on different groups; thus, further work on this topic is necessary.

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