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Beyond Spatial Development: A Study on Rural Community Development in China Based on an Actor-Social Network Integration Approach

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Abstract

Rural community development in China has made progress under the rapid implementation of the rural revitalization strategy; however, it has also revealed challenges such as an overemphasis on spatial construction, severe homogenization, and low sustainability. Existing research on rural community development lacks sufficient localized experience, and there is a limited understanding of how the development process is generated, maintained, and evolved. This study examines Xiongfán Village in Dawu County, Hubei Province, using an innovative methodological integration of Actor-Network Theory (ANT) and Social Network Analysis (SNA). This mixed-methods approach qualitatively traces the formation of networks involving both human and non-human actors, while quantitatively mapping the collaborative structure among human actors. Qualitative analysis of actor networks identifies both human actors (such as government departments, enterprises, social organizations, and villagers) and non-human actors (such as natural and cultural landscapes) as key participants. Through processes like recruitment, mobilization, and dispute resolution, various actors have formed interest alliances centered around the core issue of “revitalizing and sustainably developing rural community resources.” Quantitative social network analysis reveals a “core-periphery” structure, with government departments and social organizations occupying central roles, while business institutions and community villagers are positioned at the periphery. This distribution contrasts with the overarching goal of community development, which seeks to enhance villagers’ intrinsic motivation. The study suggests that rural community development in this area can be improved by diversifying co-construction forms, restructuring core groups, and empowering peripheral actors. These measures will facilitate a shift from single-space development to enhanced community capacity-building, ultimately promoting sustainable rural development.



Academic Editor: Xuesong Kong

Received: 3 September 2025

Revised: 24 September 2025

Accepted: 25 September 2025

Published: 20 October 2025

Citation: Qian, Y.; Li, X.; Liu, J.; Lin, Y.

Beyond Spatial Development: A Study on Rural Community Development in China Based on an Actor-Social

Network Integration Approach. *Land*2025, 14, 2088. [https://doi.org/](https://doi.org/10.3390/land14102088)

10.3390/land14102088

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([https://creativecommons.org/](https://creativecommons.org/licenses/by/4.0/)[licenses/by/4.0/](https://creativecommons.org/licenses/by/4.0/)).**Keywords:** rural community development; social networks; actor networks; collaborative co-construction; rural areas

1. Introduction

In the late 20th century, several global initiatives sought to mitigate the urban-rural divide caused by globalization and urbanization. These included the European Union’s LEADER program [1], the Western “Community Revitalization” initiative [2], Japan’s “Town-Making Movement” launched in the late 1970s [3], South Korea’s “New Village Movement” [4], and Taiwan’s “Community Comprehensive Development” [5]. These efforts shared the aim of revitalizing local resources, reshaping living environments, and

fostering participatory community co-construction to enhance the resilience and sustainability of rural areas. The United Nations Sustainable Development Goals (SDGs) have further reinforced this global consensus on “building inclusive, safe, resilient, and sustainable cities and human settlements,” emphasizing the dual importance of environmental sustainability and social inclusion [6].

Within this broader international context, China’s community development has evolved towards participatory renovation of public spaces and the exploration of co-construction models primarily based on urban communities [7,8]. Domestic community development can be regarded as a new phase following earlier service- and construction-oriented models, underpinned by the “unit-neighborhood system” at the grassroots level [9]. Recent innovations such as urban community micro-renewal [7] and community garden renovation [8] have emerged as key strategies for promoting co-construction, resource-sharing, and community empowerment. Meanwhile, with China’s rural population standing at 464 million, rural areas continue to grapple with stagnation, population outflow, and hollowing out [10]. However, spurred by the rural revitalization strategy, they are gradually shifting from being solely agricultural production units to becoming platforms for collaborative construction involving diverse stakeholders [11].

Unlike traditional “top-down” planning approaches, rural community development integrates principles of community construction, governance, and development. By leveraging local resources and fostering innovative co-construction mechanisms, rural development promotes villagers’ empowerment and community self-reliance [12,13]. While traditional rural construction efforts focused primarily on improving physical environments, the essence of rural community development now lies in integrating social resources and maintaining the continuity of network resources [14]. Active participation of villagers is essential, as their involvement directly impacts the sustainability and success of development efforts [15]. Rural community development can foster shared values among community members, enabling them to adapt to societal changes through self-regulatory mechanisms and internal drivers, ultimately contributing to the formation of modern rural social structures [16].

Rural areas often lag behind urban regions in terms of income, infrastructure, and public services, while also facing complex challenges such as interest disputes, property rights conflicts, and differing visions for transformation [17,18]. Blindly replicating urban experiences in rural community development, particularly through top-down approaches, often prioritizes spatial construction over social processes. This reliance on existing models can lead to severe homogenization, structural dependency, and the eventual decline in the sustainability of rural community development [19,20]. At present, much of the research on rural community development in China remains focused on lessons drawn from historical experiences in Europe, the United States, Japan, South Korea, and Taiwan [5], with insufficient attention given to localized experiences. Thus, a systematic analysis of the generation, maintenance, and evolution of rural development processes is urgently needed.

Given the practical challenges in current rural community development practices, such as the overemphasis on spatial construction, severe homogenization, and difficulties in achieving sustainability, existing research often lacks localized experience. This study focuses on the rural community development of Xiongfeng Village in Dawu County, Hubei Province, using it as a case study to combine the broad, systematic process narrative strengths of Actor-Network Theory (ANT) with the structural measurement advantages of Social Network Analysis (SNA) [21]. The aim is to create a “narrative-quantitative” dual approach for this research. Both ANT and SNA are employed as analytical tools to bridge networks and communities, offering pathways to understand the relationships and networks within community research [22]. Through the application of ANT, this

study identifies the types of actors involved in rural community development and the network configurations they form. In doing so, it addresses the research gap concerning the application of actor networks in rural development contexts. Subsequently, SNA is used to explore the characteristics of co-construction relationships among human actors within the network. Specifically, this study seeks to answer the following questions: “Who are the actors involved in rural community development?”, “What kind of rural community development network do these actors collectively form?”, and “What are the characteristics of co-construction relationships among human actors in the network?” This approach aims to provide a localized perspective on rural community development.

2. Literature Review

2.1. Practices and Research on Rural Community Development

In 1871, the British scholar R.A. Mead [23] first conceptualized the countryside as a community in his work *The Village Community in the East and in the West*. In 1887, the German sociologist Ferdinand Tönnies [24] defined a community as a social order bound by a unified will, suggesting that rural areas represent intimate communities of social interest, composed of homogeneous populations sharing cultural commonalities. Wilkinson emphasized three key components of rural communities: a specific geographical environment, local society, and community domain, highlighting the interactive and dynamic nature of these communities [25]. Due to their distinct geographical features, social interactions, and collective norms, rural areas often serve as case studies for community research, which has contributed to the growing recognition of rural communities as a subject of study [26,27].

Research on community development typically focuses on areas such as the impact of social capital on communities [28–30], community empowerment [31,32], community participation [33,34], and the design of community spaces [7,8]. The combined effects of globalization, urbanization, and industrialization continue to reshape rural areas, altering the relationships between society and nature, humans and non-humans, rural and urban spaces, and local and global contexts [35]. Various scholars have investigated community development practices and research in rural settings. For instance, Kevin O’Toole [36] examined community operating groups in Australian townships, highlighting how these groups strategically utilized local capital and supply-demand dynamics to foster community self-governance and local autonomy. Kaisu Kumpulainen and others [37], through empirical research in Finnish rural areas, revealed the role of community-centered practices in reshaping rural spaces, emphasizing the importance of entrepreneurial culture, network connections, and institutional frameworks for rural development. Valentin Noble [3] used the “policy flow” framework to explore the evolution of the “one village, one product” strategy, arguing that the transnational “replication” of policies is not a linear transfer of technology but a complex process, with simple appropriation diminishing the original value of community identity. These studies underline the strong link between community development and local experience, emphasizing that development activities must be tailored to local cultures, social structures, and resources. By leveraging local capital, community-based practices, and policy innovation, rural communities can be revitalized, encouraging local development and the formation of distinct community identities.

In recent years, Chinese scholars have focused on integrating historical experiences and insights from other countries and regions into the study of community development, including the evolution of practical processes [38,39], intervention models [40,41], and comparative case analyses [42,43]. Jianhong Fan [44] summarized Japan’s community development process, highlighting the success of a hybrid governance model where the government actively empowers communities, mobilizes social forces, and promotes public participation, offering valuable insights for China. Keshih Chen [41] reviewed Taiwan’s

community development model, which evolved from artistic interventions to a broader focus on community industries, capital, and governance, presenting various strategies for Mainland China. Yan Liang et al. [45] compared community reconstruction processes in Mainland China and Taiwan, emphasizing the advantages of “people-centered” development in post-disaster recovery, cultural revitalization, and economic reconstruction. While these studies provide a theoretical foundation for rural community development, there is a lack of in-depth case studies that explore the generation, evolution, and maintenance of community development within the unique context of Mainland China, leaving room for further exploration.

2.2. Qualitative Research on Actor Networks in Rural Community Development

Actor-Network Theory (ANT), first proposed by Latour, Law, and Callon [46–48], has become a prominent qualitative research methodology in rural community studies [49]. It has been widely applied to explore the configurations, characteristics, and evolutionary mechanisms of rural communities in areas such as tourism [50,51], governance [52,53], transformation [54,55], industrial development [56]. For example, Peng Wang et al. [57] examined the role of urban return migrants, highlighting how migrant populations act as central actors in restructuring rural community networks. Tianyang Zhang et al. [55] how the government, village committees, enterprises, through processes of translation and reconstruction, transform traditional agricultural villages into multifunctional modern agricultural communities. Collectively, these studies demonstrate that ANT provides a valuable perspective for understanding local social relations and addressing complex contradictions in rural development [57,58].

Despite these contributions, most applications of ANT have focused on specific aspects of rural change—such as tourism or governance—rather than on community development as a holistic and participatory process. In particular, little research has systematically applied ANT to examine how diverse actors collaborate to co-construct rural community spaces and institutions. Although Tan Chen et al. [59] suggested that community development can be conceptualized as an actor participation network—including stages such as demand articulation, interest linkage, strategy mobilization, and action integration—their research primarily addressed urban community development. This perspective, therefore, has not yet been extended to participatory rural community development. Rural communities differ significantly from urban ones in terms of resources, education, and participation levels [60]. In the Chinese context, where communities are typically organized around kinship and geographic ties, sustainable rural development requires the collaborative involvement of multiple actors to integrate resources, stimulate vitality, and foster long-term growth [13]. This study addresses that gap by adopting ANT to comprehensively explore the actors and co-construction processes involved in rural community development.

Moreover, existing research in ANT largely focuses on the exercise of power and its outcomes, addressing questions such as “What happens?” and “How do things unfold?” While ANT provides a broad framework for identifying relationships and connections among actors in rural communities, its qualitative approach often fails to explain why certain actors dominate the network [61], and it overlooks structural differences (e.g., capital, power, resources) and contextual factors (e.g., history, memory, trajectories) among actors [62].

2.3. Quantitative Analysis of Social Networks in Rural Community Development

The concept and methods of social network analysis (SNA) emerged in the early 20th century and, influenced by digital metrics, evolved into a mature theoretical framework by the end of the century [63]. SNA has since been widely applied in fields such as anthropol-

ogy, sociology, psychology, and management [64,65]. In contrast to actor networks, SNA in rural community research focuses on quantitatively representing the relational structures of human actors, emphasizing the visualization and analysis of power distribution and resource flows within communities.

Research using SNA explores social support mechanisms in rural community development and how social networks influence collective behavior choices [66]. This includes investigating how villagers make decisions in collective affairs such as land management [67], family entrepreneurship [68], and centralized relocation [69], and using SNA tools to model and analyze the networks formed by different actors in these collective processes [70,71]. Two key types of research have emerged. The first explores the organizational forms of various actors in rural community development. For instance, Xu Wang et al. [72] analyzed the social network structure of actors at different stages of rural development, emphasizing that rural development is a co-construction process involving multiple parties, such as the government, village committees, villagers, economic cooperatives, enterprises, and NGOs. Li Zhou [73] examined the transformation of a tourism-oriented rural community into an endogenous development model, analyzing the process in terms of network density, factionalism, and central power. Zhou found that the transformation was marked by government leadership and enterprise cohesion but also reflected profit-driven tendencies and a lack of democratic engagement among villagers.

The second category of research focuses on the overall influence of key individuals or groups within a community network. Kenichiro Onitsuka's [74] empirical studies of Japanese rural communities illustrated how leaders and key figures use traditional and emerging media to build cooperative networks, formulating a rural development model based on "government-led + community networks + communication technology". Ralph Richter's [75] case studies of rural social enterprises in Austria and Poland highlighted how these enterprises act as "embedded intermediaries" within social networks to stimulate community participation and drive rural development. Yaofeng Luo [71], in examining the roles of rural community leaders in collective affairs, emphasized that leadership within internal social networks significantly influences collective actions.

Both strands of research have utilized mathematical tools such as graph theory to quantify and analyze social network structures in rural community development, addressing a gap in exploring community development models. However, traditional SNA methods tend to focus on predefined relationship types, excelling at depicting existing structures but struggling to explain the emergence of new actor networks. Additionally, single-mode SNA tends to overlook non-human actors and simplifies the complexity of reality. While rural community development centers on "people," with an emphasis on fostering human change and harmonious relationships between people and the environment [76], this study integrates ANT's systemic perspective to identify as many types of actors and relationship configurations as possible before returning to the quantitative analysis of human actors' collaborative relationships.

In summary, existing studies have laid a solid foundation for understanding rural community development by drawing on international experiences, diverse theoretical frameworks, and the application of Actor-Network Theory (ANT). However, most of these studies have focused either on urban community development or on specific aspects of rural change, such as tourism, governance, or industrial transformation, rather than on participatory rural community development as a holistic process. Moreover, while ANT provides valuable insights into actor relations and processes, it often overlooks structural differences and lacks integration with quantitative approaches. Therefore, there remains a research gap in systematically applying ANT to rural community development, particularly in the Chinese context. This study seeks to fill that gap by combining ANT with Social

Network Analysis (SNA) to reveal the types of actors involved, their modes of participation, and the collaborative mechanisms that shape participatory rural community development.

3. Research Design

3.1. Research Area

This study situates rural community development within China's macro-regional framework. The eastern region benefits from strong policies and capital, the western region lags due to natural constraints, while the central region shows transitional characteristics and represents the national average level of rural revitalization [77].

Hubei Province, an important part of the central region, serves as the location for this study's focus area. Specifically, Xiongfán Village in Dawu County, located in the northern part of Xiaogan City and within the Wuhan Urban Agglomeration's influence zone, is approximately 2.1 km from the central town. This village exemplifies a traditional rural community in central China, covering 4 square kilometers and consisting of 474 households (Figure 1). Xiongfán Village was included in the fifth batch of China's Traditional Village List in June 2019 and is home to the only municipal-level cultural heritage site in the town, with rich historical, cultural, and spatial heritage value. The village shows a balanced gender ratio and a predominance of working-age residents, though elderly residents remain significant due to youth out-migration. Education levels are generally low, and household income is concentrated in the lower to middle ranges, reflecting reliance on agriculture and migrant labor. Most households are nuclear families, but extended family structures persist (Table 1). These features highlight both the limited internal resources for community development and the challenges of stimulating villagers' active participation, which are central issues addressed in this study.



Figure 1. The spatial relationship of Xiongfán Rural Community's geographical location: (a) The location of Dawu County in Hubei Province; (b) The location of Huangzhan Town in Dawu County; (c) The administrative area of Xiongfán Village.

Since December 2021, the village has pursued initiatives to stimulate local identity and community vitality through public space development, residential renovations, and participatory activities (Figure 2). These efforts have steadily advanced the unlocking of the community's potential. However, the village continues to face significant challenges, including severe "hollowing out," insufficient permanent residents, and a weak collective economy. In 2024, the village's collective income remained under CNY 100,000, well below the county average.

Table 1. Demographic and socioeconomic characteristics of villagers in Xiongfán Community.

Indicator	Category	Proportion (%)
Gender	Male	52
	Female	48
Age Structure	0–17	10
	18–40	32
	41–64	38
	65+	20
Education Level	Primary school and below	25
	Junior high school	40
	High school/Vocational school	20
	College and above	15
Household Structure	Single-person	12
	Nuclear family	58
	Three-generation household	30
Income Level (CNY/year)	<20 k	28
	20–50 k	50
	>50 k	22

**Figure 2.** Co-building rural community public spaces with villagers.

Despite long-term investments in community development by multiple stakeholders—including government, businesses, and social organizations—the impact on rural development has been limited. This study, therefore, selects Xiongfán Village as a representative case of a community with “rich resource endowments but slow development, ample external intervention but insufficient internal motivation.” The focus will be on examining the role of multi-stakeholder collaboration in rural community development.

3.2. Research Methods

This study adopted a mixed-methods approach combining qualitative and quantitative strategies, divided into four main phases.

3.2.1. Fieldwork and Participatory Observation

In the initial phase, researchers engaged deeply in the rural community development process in Xiongfán Village, Dawu County, from July 2022 to December 2023. Through in-depth interviews and participatory observations conducted over a span of one and a half years, the researchers explored the various actors involved in the community development process in Xiongfán Village and the forms of their participation. Primary data were collected using multiple methods, including documenting community development activities and capturing photographs of the village, conducting interviews with township officials, villagers, and relevant staff members, and participating in community meetings and other activities (Table A1). This phase aimed to identify key human actors with diverse identities, as well as non-human actors, such as natural and cultural elements, in line with actor-network theory [46,48]. To reveal cultural logic through a limited number of cases, interviews ranged from 30 min to 3 h, involving a total of 64 participants from various roles [78].

The in-depth interviews (Table 2) enabled the identification of five stages within the actor network—problem presentation, interest assignment, recruitment, mobilization, and dissent—and the processes through which actors achieve translation and network construction [79]. This process is essential for the functioning of actors and networks. A qualitative analysis was conducted to map and analyze the actor network for community development in Xiongfán Village.

Table 2. Key interview participants and objectives.

Interview Participants	Basic Information	Key Questions	Interview Objectives
Local Government Departments	Sample Size: 13 (9 male, 4 female)	The role and positioning of government at all levels in community development in Xiongfán Village; the collaboration process with foundations, universities, and businesses; challenges and coordination methods in policy implementation.	Explore the timing and strategies of government actions, and analyze how they integrate multiple resources to advance the development process.
Social Organizations (Universities/Foundation)	Sample size: 17 (11 male, 6 female)	How social organizations identify village needs; how they mobilize villagers to participate; and the discrepancies and resolution methods in their collaboration with government and businesses.	Understanding the coordination process of social organizations in projects, and analyzing their functional roles in community empowerment and resource integration.

Table 2. Cont.

Interview Participants	Basic Information	Key Questions	Interview Objectives
Enterprise Institutions	Sample size: 6 (4 male, 2 female)	Motivations for corporate participation in rural revitalization; collaboration processes and challenges with government and village committees; balancing profit expectations with public welfare objectives.	Analyzing the motivations and constraints of corporate participation from a market perspective, and exploring their actual influence and sustainability in spatial development.
Community Villagers	Sample size: 24 (12 male, 12 female)	Villagers' perceptions and attitudes toward community development; participation methods and perceived benefits; trust levels toward the government, businesses, and social organizations.	Clarify the current participation process of villagers in community development and explore the internal driving forces and collective action capabilities within the community.
Tourists/External Observers	Sample size: 4 (2 male, 2 female)	Perceptions of spatial changes and community atmosphere in Xiongfán Village; willingness to continue participating or recommend others to participate in community development activities.	Obtain external perspectives on the effectiveness of community development efforts, and analyze external recognition of community development and potential sustainable support.

3.2.2. Snowball Sampling and Human Actor Coding

In the second phase, the researchers employed a “snowball sampling” technique for interviews from April to September 2024. Initial participants were asked to identify additional eligible participants, who in turn suggested others, continuing until no new participants emerged (Appendix A.2) [80]. This iterative process confirmed the complete list of participants [81]. Most respondents identified between 1 and 5 co-participants, resulting in a network that reflects the subset of social relationships that participants prioritized (Table A2). Based on this, the study statistically analyzed the closed list of participants, ultimately identifying 58 human actors involved in Xiongfán Village’s community development. These participants were categorized into four groups based on their roles: government departments (G), enterprises (E), social organizations (S), and community villagers (V). Each interview subject was numbered and organized according to the format “participation attribute + participation role + number.” (Table 3).

Table 3. Composition and proportion of human actors in the community development of Xiongfán rural area.

Participation Attributes and Coding	Proportion (%)	Participation Role and Code	Number of Nodes
Government Departments (G)	24.13	County-Level Government (Gc)	3
		Township Government (Gt)	5
		Township Department Personnel (Gd)	1
		Village Committee Member (Gv)	5
Enterprise Institutions (E)	10.34	Design and Construction Company (Ec)	1
		Water Utility (Ew)	1
		Integrated Media Center (Em)	2
		County Culture, Tourism, and Investment (Et)	2

Table 3. Cont.

Participation Attributes and Coding	Proportion	Participation Role and Code	Number of Nodes
Social Organizations (S)	29.33	Foundation Investment Personnel (Si)	1
		Foundation On-Site Staff (Sw)	2
		In-House Expert Team (St)	3
		In-House Team Student (Ss)	8
		External Expert Team (Se)	1
		External Team student (So)	2
Community Villagers (V)	36.20	Specialized Technical Villager (Vt)	8
		Active Villager (Va)	6
		Ordinary Villager (Vo)	3
		Villager from Neighboring Village (Vn)	4

3.2.3. Social Network Construction

In the third phase, the study conceptualized human actors in community development as “nodes” in a network, with “lines” representing their joint participation in the development process (joint participation was marked as “yes,” otherwise as “no”). This allowed for the construction of a co-construction network for rural community development in Xiongfán Village. The aim was to quantify the relational structure of joint participation among the various human actors using social network analysis, thereby uncovering the characteristics and implications of these relational structures [63].

The study adapted Clarkhart’s Local Aggregation Structure (LAS) as a proxy for real-world networks, creating a two-dimensional $RN \times N$ network structure [82]. The LAS framework aggregates individual networks to form the “actual” network structure [83], which is suitable for behavior-oriented relationship studies [84]. Joint participation relationships in rural community development were defined using a symmetrized R' dataset. In this dataset, if either individual i or individual j acknowledges the occurrence of a participation relationship, it is considered a joint participation relationship. The relationship is defined as follows:

$$R'_{ij} = \begin{cases} 1, & \text{if } R_{ij} = 1 \text{ or } R_{ji} = 1; \\ 0, & \text{otherwise} \end{cases} \quad (1)$$

3.2.4. Social Network Analysis

In the fourth phase, based on social network construction methods, network building and “whole-part-individual level” analysis of the action subjects in community development were conducted using Ucinet (6.0), with network visualization achieved through RStudio (2024.12.0). The selection of relationship analysis indicators was inspired by several scholars [85]. Social network analysis focused on three key indicators: core-periphery structure, Lambda sets, and degree centrality.

In social network research, the “core-periphery” structure is crucial for identifying differences in the overall node status within a network. This structure divides the network into a core region (with high connection density) and a peripheral region (with sparse connections). The analysis of the “core-periphery” structure aims to identify variations in the centrality of nodes by dichotomizing the network. This is achieved by maximizing the connection density between core nodes and minimizing it between peripheral nodes, as described by the following function [86]:

$$\rho = \text{Corr}\left(\{a_{ij}\}_{i < j}, \{d_{ij}\}_{i < j}\right) \quad (2)$$

$$d_{ij} = \begin{cases} 1, & \text{if } c_i = 1 \text{ or } c_j = 1, \\ 0, & \text{if } c_i = 0 \text{ or } c_j = 0, \end{cases} \quad (3)$$

Here, $A = [a_{ij}]$ denotes the adjacency matrix of the observed network. $D = [d_{ij}]$ is the ideal core–periphery matrix, where nodes assigned to the core ($c_i = 1$) are expected to connect with all other nodes, while peripheral nodes ($c_i = 0$) have no ties among themselves. The coefficient ρ represents the correlation between the upper-triangle elements of A and D , measuring the extent to which the observed network conforms to an idealized core–periphery structure. A higher value of ρ indicates a stronger core–periphery pattern.

The Lambda set (λ set) is based on edge connectivity and is used to identify highly cohesive subgroups within a network, thereby analyzing the hierarchical structure of the network. A λ set is a group of nodes where the edge connectivity between any two nodes within the group is at least λ , and the edge connectivity between any node within the group and any node outside the group is less than λ . For two nodes i and j in an undirected graph, the edge connectivity $\lambda(i, j)$ between them is defined as: $\lambda(i, j)$ = the minimum number of edges that need to be removed to disconnect nodes i and j (i.e., no longer connected) [87].

Individual characteristics analysis of social networks is based on the importance of nodes in the network, and degree centrality is generally used as a key indicator. Centrality in informal structures can affect cognitive accuracy and power [88]. Degree centrality is the number of nodes directly connected to a node in a network, which measures the power centrality of an individual through its connectivity. The calculation formula is:

$$C'_D(i) = \frac{C_D(i)}{N - 1} \quad (4)$$

where $C'_D(i)$ is the absolute degree centrality of node i (the number of directly connected nodes), N is the total number of nodes in the network, and $N - 1$ is the maximum possible number of connections.

4. Results

4.1. Composition of Multi-Actor Actors in Xiongfán Village and the Emergence of Core Issues

The actor network in Xiongfán Village includes both human and non-human actors, who play central roles in community development and form the foundation of the network structure (Table 4). Human actors in the community development of Xiongfán Village consist of government agencies at various levels, the village committee, villagers, cultural tourism investment companies, design and construction firms, charitable organizations, and university groups. Non-human actors include landscape and spatial resources, historical and cultural assets, production and living resources, and social support resources.

Table 4. Composition of actors in the community development of Xiongfán Village.

Type	Category	Actor Composition
Human Actors	Governments	County People's Government, Town People's Government, Village Committee
	Enterprise Institutions	Cultural Tourism Investment Company, Design and Construction Company, Water Resources Group, Integrated Media Center
	Social Organizations	Charitable Foundations, University Groups
	Community Residents	Local Residents, Residents of Neighboring Villages
Non-human Actors	Landscape Space Resources	Public Spaces, Public Transportation, Historic Buildings
	Historical and Cultural Resources	Clan Culture, Local Sage Culture, "Red Culture"
	Production and Living Resources	Farmland, Waterways, Houses, Land
	Social Support Resources	Policies, Funding

Prior to the translation process, different actors faced distinct challenges based on their specific interests (Table 5). Among human actors: Governments, at all levels, act as decision-makers in rural development with the aim of enhancing regional development. However, they lack effective strategies and channels for rural community development and often rely on administrative measures to intervene. Village committees, as grassroots management organizations, suffer from a lack of credibility, excessive reliance on external resources, and issues such as “multiple concerns, significant needs, and a wide range of matters.” Enterprises participate in community development mainly to secure short-term, high returns, and reduce investment costs, but the local community has not demonstrated long-term, profitable potential. Villagers primarily rely on traditional agriculture and migrant work, resulting in low and unstable incomes, as well as significant talent outflow. Faced with collective matters, villagers tend to prioritize short-term gains, often conflicting with the long-term and collective interests of the community.

Table 5. Excerpts from interviews on the main issues of human actors in community development in Xiongfán Village (selected excerpts).

Human Actor ID	Human Actor Participation Attributes	Core Issues/Dissent Expressions	Issues Addressed
Gc1	County-Level Government	“We hope to revitalize and utilize the village’s resources, but there is no economic guarantee, companies are unwilling to make long-term investments, and villagers are not cooperating. At this point, we can only implement the policy first.”	Concerns about companies prioritizing short-term returns and villagers’ low efficiency in cooperation
Gv1	Village Committee	“We are willing to cooperate to effectively utilize the village’s resources, but we fear that if we do a poor job, we will be blamed.”	Weak organizational capacity and insufficient credibility of the village committee
Gv4	Village Committee	“Property rights are unclear, accounts are unclear, and villagers do not trust us.”	Low transparency in village affairs, resulting in a lack of trust among villagers
Ec1	Enterprise Institution	“We want to do a good job with the design, but there are too many opinions from the villagers, and they are not expressed clearly.”	Communication barriers between enterprises and villagers
Ew1	Enterprise Entity	“We want to invest and integrate natural resources, but we’re concerned about post-investment management.”	Blurred boundaries of corporate responsibility and unclear exit mechanisms
Et1	Corporate Institution	“We want to move quickly to revitalize village community resources, but government approval processes are slow.”	Conflict between corporate efficiency and government processes
St1	University Expert	“The project’s objective is to revitalize rural resources and achieve sustainable development. We recommend proceeding according to the plan and advancing in an orderly manner, but the government always wants to see results quickly.”	Mismatch in pace between universities and the government

Table 5. Cont.

Human Actor ID	Human Actor Participation Attributes	Core Issues/Dissent Expressions	Issues Addressed
Sw1	Social Organization	“Only by focusing on the common goal of revitalizing resources can we bring the government, businesses, and villagers to the same table. Otherwise, villagers will always say, ‘You’re just here to take photos,’ and they won’t trust us.”	Challenges for external organizations to integrate, identity barriers
Ss1	University Student	“We wanted to resolve conflicts through participatory design, but villagers said, ‘You don’t understand.’”	Conflict between professional knowledge and local experience
Va6	University Youth	“We want to keep people here, but there’s no income, no policies, and if the village’s resources can’t be developed, we don’t know what we can do here either.”	Lack of internal motivation among villagers, insufficient policy support
Vo6	Ordinary Villager	“Even if there are issues, we don’t report them to higher authorities anymore—they can’t be resolved.”	Villagers are disappointed in the village committee’s governance capabilities
Vt1	Specialized Villager	“I’m willing to participate, but I’m afraid there’s no pay. I can join for a short time, but whether I continue afterward isn’t up to me.”	Villagers’ willingness to participate is constrained by compensation and guarantees
Vo1	Ordinary Villager	“I’m afraid my house will be demolished, and even if I turn it into a homestay, no one will come, and I’ll have worked for nothing.”	Villagers’ concerns about participating in spatial renovation and its outcomes

Among non-human actors, Xiongfán Village boasts rich natural and cultural resources with significant potential for cultural tourism. However, resource utilization remains low, and challenges persist in village construction, maintenance, and effective use of production factors. Confronted by the “resources—trust—legitimacy” bottleneck, local actors realized that no single entity could resolve the issues of “dormant resources, trust deficits, and governance vacuums.” As a result, actors sought to translate their fragmented demands into a shared agenda of “revitalizing and sustainably developing rural community resources” through interaction. This agenda became a mandatory point of passage, allowing actors to renegotiate roles and benefit distribution, establishing “revitalizing and sustainably developing rural community resources” as the core agenda for this phase (Figure 3).

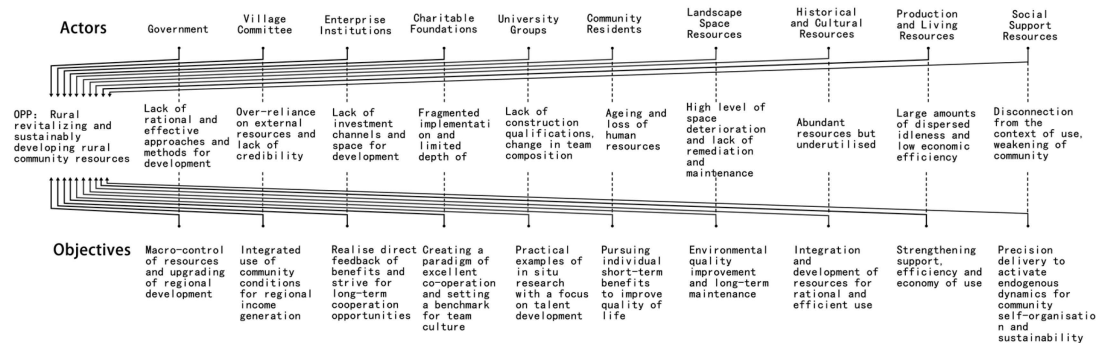


Figure 3. Mandatory passing point for rural community development in Xiongfán.

4.2. The Process of Stakeholder Translation and the Construction of a Collaborative Co-Construction Model

4.2.1. Recruitment

In 2019, the Charitable Foundation collaborated with university groups to form a rural revitalization team. Together, they launched a rural community development project in Xiongfán Village aimed at “revitalizing rural communities and promoting sustainable development.” The university groups further partnered with government departments at various levels, who utilized administrative and market-based methods to recruit enterprises and capital for the project. The county government used the capital donated by the Charitable Foundation as a foundation, leveraging policies such as “Harmonious Rural Development” and “Joint Creation” and capitalizing on Xiongfán Village’s rich landscape and cultural resources to recruit cultural tourism investment companies, media centers, and other enterprises to undertake tasks such as capital advances, cultural tourism development, heritage protection, and project promotion. The cultural tourism group subsequently recruited water conservancy groups and design and construction companies through market channels to carry out rural community construction and environmental improvement work.

4.2.2. Mobilization

The implementation of policies requires intermediary actors to transform abstract policy concepts into practical, context-specific strategies [89]. As external groups with cultural and public welfare attributes, university groups engage in a manner distinct from the direct control of government or the profit-driven motives of enterprises. They attract social resources, conduct in-depth rural research, and provide professional technical guidance. Community participation arises as an adaptive response to changes in social governance and local residents’ perceptions [90]. During the creation process, the village committee and university groups worked together to mobilize community villagers through joint construction symposiums, community participation activities, and rural construction talent training, all aimed at increasing enthusiasm for joint construction. Enterprises and institutions were also mobilized to establish long-term development goals, assess rural development plans, protect cultural heritage, and implement agricultural product upgrading strategies. They also clarified policies and implementation plans to villagers and village committees, ensuring balanced communication and addressing imbalances in capabilities and information exchange among stakeholders.

In addition to human actors, non-human actors significantly shaped the mobilization process. National and county-level policies, together with foundation-based funding, acted as critical enablers that lowered the transaction costs of collaboration and motivated stakeholders to engage. Similarly, the presence of historic buildings and clan-based cultural heritage provided symbolic anchors that facilitated trust-building among villagers and external organizations, turning cultural assets into mediators of cooperation. These non-human elements transformed abstract policy goals into tangible entry points for action, thereby reinforcing the stability of the collaborative network.

4.2.3. Objections

Rational choice theory suggests that actors aim to maximize personal interests, yet each actor controls certain resources needed by others [91]. Village officials, as key actors in rural transformation, are influenced by the financial resources they possess and the incentive structures they operate within [92]. Xiongfán Village faces challenges such as low collective income and the village committee’s insufficient capacity, which limits its ability to meet market-based bidding or cooperate effectively. In practice, issues arise from the

promotion of higher-level policies, managing conflicts among villagers, and negotiating schemes with enterprises. The asymmetry of cooperation information and capabilities has hindered effective collective action.

To address these challenges, university groups have initiated spatial renovation projects as pilot interventions, establishing a long-term presence to strengthen trust between the village committee and residents. This intervention has enhanced the village committee's capacity for construction and operations. The county and town governments, together with enterprises, provided economic and institutional support through policies, financial subsidies, and technical training, which enhanced credibility. As a result, the village committee and certain community members actively promoted and mobilized others to engage in development work.

The heterogeneous actors in Xiongfán Village organized and participated in spatial renovation, river landscape improvement, talent base construction, and community activity formation, all centered around the common goal of “revitalizing and sustainably developing rural community resources.” The village committee worked with university groups to allocate roles and interests, attracting more actors into the network, resolving conflicts, and forming a stable, mutually embedded alliance and network with aligned interests. This created an initial collaborative co-construction model involving diverse actors (Figure 4).

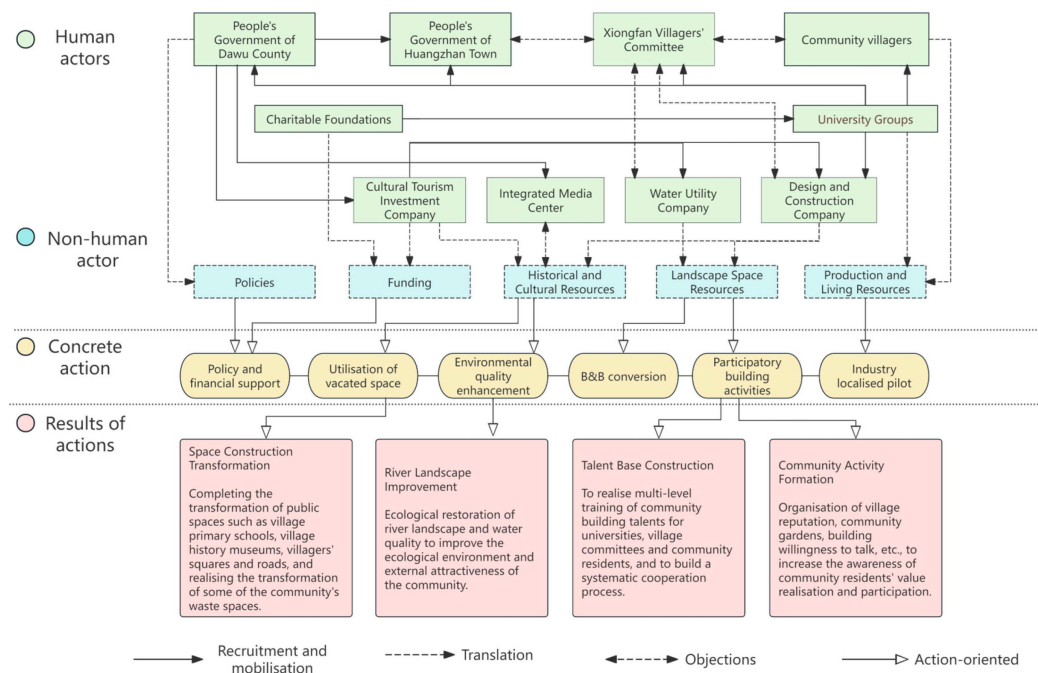


Figure 4. Collaborative co-construction model of rural community development in Xiongfán.

4.3. Collaborative Structure and Characteristics of Human Actors: Integrating Qualitative and Quantitative Findings

To quantify the collaborative relationships among human actors identified and described qualitatively in Sections 4.1 and 4.2, a 58×58 human actor co-construction network matrix was constructed (Figure 5). In this matrix, nodes represent actors, node colors indicate participation attributes (as defined in Table 3), and node size reflects degree centrality, with larger nodes representing greater influence in the network. Lines represent the collaborative roles of actors, as identified through social network analysis, revealing the network's structural characteristics. This quantitative mapping provides a basis for optimizing the network structure and enhancing collective participation, directly complementing the qualitative process narrative.

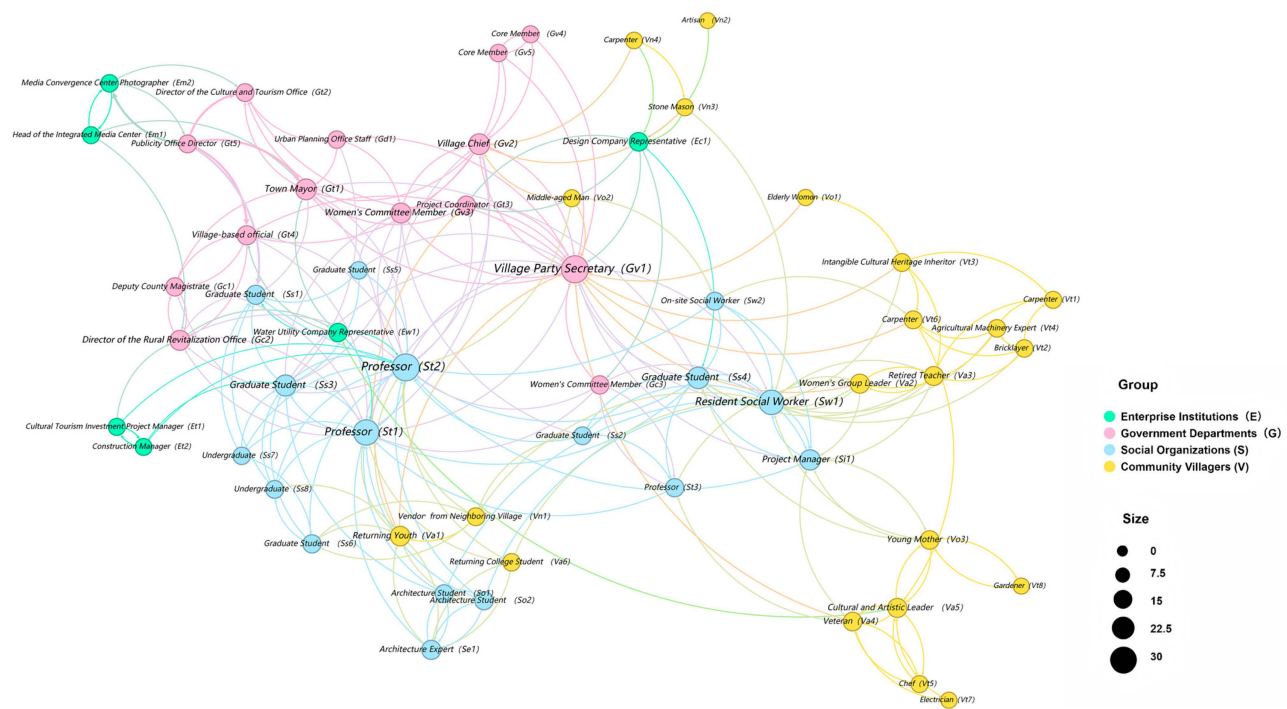


Figure 5. Human actor co-construction network in the rural community of Xiongfán.

4.3.1. Core-Periphery Structure: The “Dual Core” Monopoly of Government and Social Organizations

The qualitative analysis revealed the formation of an interest alliance centered around the core issue of resource revitalization, involving government and social organizations as key facilitators. This quantitative core-periphery analysis directly validates and measures this qualitative observation.

In social network research, nodes in a network can be divided into core region nodes and peripheral region nodes based on local density [86]. The core-periphery division of the overall network exhibits high concentration (Table 6).

Table 6. Core-periphery structure of the Xiongfán Village Community development network.

Division Area	Network Nodes
Core Region Nodes	Gc2 Gt1 Gt2 Gv1 Gv2 Gv3 Si1 Ss1 Ss3 Ss4 St1 St2 Sw1
Peripheral Area Nodes	Ec1 Em1 Em2 Et1 Et2 Ew1 Gc1 Gc3 Gd1 Gt3 Gt4 Gt5 Gv4 Gv5 Se1 So1 So2 Ss2 Ss5 Ss6 Ss7 Ss8 St3 Sw2 Va1 Va2 Va3 Va4 Va5 Va6 Vn1 Vn2 Vn3 Vn4 Vo1 Vo2 Vo3 Vt1 Vt2 Vt3 Vt4 Vt5 Vt6 Vt7 Vt8

Among the 58 nodes, only 12 were classified as core nodes, all of which belonged to government departments (G) and social organizations (S); the remaining 46 nodes—including business institutions (E) and the vast majority of community villagers (V)—were pushed to the periphery. This structure quantitatively confirms the qualitative finding that agenda-setting, resource allocation, and key decision-making in community development are primarily controlled by the “government-social organization” alliance, as formed through the translation process. While villagers and enterprises are given co-construction roles at the narrative level, their ties within the network are weak or disconnected, reflecting a “strong core-weak periphery” structure, which aligns with the challenges in mobilization and dissent described qualitatively.

4.3.2. Lambda Set: Co-Construction Diffuses Hierarchically from “Core-Intermediary-Periphery”

The Lambda set reveals the hierarchical structure of the network, with each fork point representing the number of subsets within the network (Figure S1). This analysis identifies 14 hierarchical subsets, where a higher Lambda value indicates stronger internal connections between nodes, with relationships between subsets becoming progressively weaker from left to right. The hierarchical paths demonstrate a clear gradient decline in resources and information from the core to the periphery.

The first seven subsets consist solely of core government departments (Gv1) and social organizations (St2, St1), showing the highest internal edge connectivity and most stable cooperation, corresponding to their central role in the translation process (recruitment and mobilization). In subsets 8 and 9, water utilities (Ew) and active/skilled villagers (Va/Vt) are introduced, indicating that enterprises and technical villagers are integrated into the network through intermediaries (such as government or university teams), as observed qualitatively during the mobilization phase. In subsequent subsets, ordinary villagers (Vo) and neighboring villagers (Vn) emerge, but edge connectivity diminishes rapidly. This quantifies the qualitative finding of loose villager participation, often limited to short-term engagements like paid labor, lacking strong geographical or kinship ties within the broader collaborative network.

4.3.3. Degree Centrality: Power Discontinuity Between “Hubs and Peripheries”

The ranking of degree centrality clarifies the influence of actors within the network (Table 7). The village committee secretary (Gv1) ranks first with a centrality score of 27, followed by university professors (St2, St1) and foundation-based social workers (Sw1). These actors, identified qualitatively as key intermediaries and translators, serve as quantitative “bridges” within the network, linking government, capital, and knowledge resources externally while mobilizing villagers and technical craftsmen internally. As the primary leader of the village committee, Gv1 plays a critical role in communicating with external groups and encouraging villagers to participate. Social organization members (St2, St1, Sw1) facilitate communication and resource integration between the government and the village collective. The degree centrality of villager nodes shows a sharp decline, with only a few “active villagers” (Va1–Va3) having centrality scores between 7 and 9. The remaining 24 ordinary villagers (Vo), specialized villagers (Vt), and neighboring villagers (Vn) have lower centrality scores, forming a peripheral cluster with sparse connections. This quantitatively validates the qualitative evidence of weak social capital, limited collective action capacity within the community (Vo6, Vt1), and the limited interaction between villagers and enterprises. It highlights the risk of network fragmentation once the “government-social organization” hubs withdraw, underscoring the challenge of community empowerment and the cultivation of endogenous motivation, a key concern raised in the qualitative dissent phase.

Table 7. Intermediate centrality ranking of the Xiongfán Village Community (top 20).

Rank	Network Node	Network Centrality	Node Identity Description
1	Gv1	27	Village Committee Secretary, Primary Responsible Person for the Village
2	St2	26	University Expert Team Professor
3	St1	20	University Expert Team Professor
4	Sw1	18	Foundation-based Social Worker
5	Gt1	13	Township Government Mayor

Table 7. *Cont.*

Rank	Network Node	Network Centrality	Node Identity Description
6	Ss1	13	Graduate Student Stationed in Village by University
7	Ss3	13	Graduate Student Stationed in Village by University
8	Ss4	13	Graduate Student Stationed in Village by University
9	Gv2	11	Village Committee Chairman
10	Gt2	9	Director of the Culture and Tourism Office of the Town Government
11	Gv3	9	Village Committee Women's Affairs Commissioner
12	Si1	9	Foundation Project Manager
13	Va1	9	Returning Youth, Active Villager
14	Gc2	8	Director of the Rural Revitalization Office of the County Government
15	Gt4	8	Township Government Village-Stationed Cadre
16	Ec1	7	Design Company Manager
17	Ew1	7	Water Services Group Representative
18	Va2	7	Women's Group Leader, Active Villager
19	Va3	7	Retired Teacher, Active Villager
20	Va5	7	Cultural and Artistic Backbone, Active Villager

5. Discussion

5.1. Comparison with Existing Research

Compared with previous studies, our findings both confirm and extend existing knowledge. For example, research in Japan and South Korea emphasized the role of government empowerment and hybrid governance models [4,74], while studies in Taiwan highlighted community-based industries and participatory mechanisms [5]. Our results similarly reveal the central role of government and social organizations; however, unlike these cases, the dominance of external actors in Xiongfán has created a “strong core–weak periphery” structure, limiting villagers’ autonomy. European and Australian studies have stressed the importance of local capital and community entrepreneurship [36], yet in Xiongfán, kinship-based social structures and limited economic resources reduced the capacity for endogenous development. These contrasts suggest that while international experiences provide useful frameworks, localized social and geographical factors—such as migration, cultural identity, and land ownership—play decisive roles in shaping rural community development in China.

This study highlights critical divergences from prior international findings. Unlike the decentralized, self-governance models observed in Australian townships or the entrepreneurial culture-driven development in Finnish rural areas [36,37], the case of Xiongfán reveals a strong, external actor-dependent “core-periphery” structure where government and social organizations dominate, resulting in weaker endogenous motivation. This aligns with critiques of policy transfer, such as Noble’s [3] analysis of the OVOP/OTOP model, where external agendas can overshadow local identity and needs—a risk clearly evident in the Chinese context.

5.2. Practical Guidance and Recommendations

The combined use of network analysis techniques reveals that the current process of rural community development in Xiongfán Village remains heavily focused on spatial construction projects, indicating that the village is still in an early developmental stage and largely dependent on external intervention. To refine the overarching goal of “activating and utilizing rural community resources for sustainable development,” it is crucial to avoid allowing external forces to dominate internal resources. Such dominance could exacerbate internal inequalities and lead to the re-establishment of an authoritarian structure once

external support dissipates. The following practical recommendations stem from the findings of this study:

5.2.1. Identifying Core Groups and Activating Diverse Collaboration Forms

Successful rural community development necessitates the identification of key individuals and groups that occupy central roles in the process. It is essential to develop differentiated cooperation strategies for various groups, ensuring clear and transparent information about the identities and functions of core actors. This will enhance communication and cooperation efficiency among stakeholders. Furthermore, efforts should focus on fostering deeper relationships among villagers, rather than merely expanding the number of participants. To avoid a situation where “one person holds multiple roles,” efforts should be made to ensure that distinct actors can perform specific roles within collaborative efforts.

5.2.2. Emphasizing Power Devolution and Empowering Marginalized Groups

The analysis of actor characteristics highlights the driving roles of social organizations and enterprises in fostering cooperation, as well as the pivotal facilitative role of the government. Future efforts should aim to decentralize power, allowing villagers to establish more direct connections with external entities. In parallel, it is essential to promote democratic decision-making and self-governance within communities, thereby fostering inclusivity. This approach will contribute to the development of a harmonious, efficient, and vibrant rural community environment.

5.2.3. Shifting Focus from “Spatial Construction” to the “Subject Process”

The empirical findings reveal that Xiongfán Village’s network structure exhibits a “strong core—weak periphery” pattern, primarily driven by a project-based logic that prioritizes spatial outputs as the main performance metric. To avoid the cycle of “external forces withdrawing—community reverting,” it is imperative to shift the development approach from one that is “spatial construction-oriented” to one that emphasizes the “subject process.” This entails introducing “subjectivity indicators” into decision-making processes, including metrics such as the level of villagers’ and community self-organizations’ participation, negotiation frequency, and capacity-building efforts. These elements should become necessary conditions for project approval and evaluation. Furthermore, it is critical to replace one-time construction efforts with task delegation and accompaniment-based empowerment. This will ensure that spatial renewal is aligned with the generation of governance knowledge and public rules, ultimately fostering the sustained reproduction of endogenous dynamics.

5.2.4. The Impact and Integration Strategies of Non-Human Actors

Beyond human actors, non-human actors—such as policies, funding, cultural heritage, natural landscapes, and infrastructure—play a crucial role in shaping the trajectory of rural community development. These elements are not merely passive resources but active mediators that influence actor interactions, trust-building, and resource mobilization.

For instance, national and county-level policies, together with foundation-based funding, acted as critical enablers that lowered the transaction costs of collaboration and motivated stakeholders to engage. Similarly, the presence of historic buildings and clan-based cultural heritage provided symbolic anchors that facilitated trust-building among villagers and external organizations, turning cultural assets into mediators of cooperation. Natural landscapes, such as waterways and farmland, not only serve as material bases for tourism and agriculture but also embody ecological and aesthetic values that attract external investments and visitor engagement.

However, the current development model tends to treat these non-human actors as static resources rather than dynamic participants in the network. To enhance their positive impact, it is necessary to: Institutionalize the role of non-human actors in development planning, ensuring that policies, funds, and cultural assets are integrated into long-term governance frameworks; Strengthen the symbolic and material linkages between non-human and human actors, for example, by using cultural heritage as a platform for community identity formation and collective memory; Monitor and evaluate the sustainability of non-human resource use, avoiding over-exploitation or commodification that may undermine local authenticity and ecological balance.

By recognizing and leveraging the agency of non-human actors, rural communities can foster more resilient and context-sensitive development pathways that align with both local values and broader sustainability goals.

5.2.5. National and International Contributions

At the national level, the findings offer actionable insights for China's rural revitalization strategy. By shifting the focus from spatial outputs to participatory governance processes, the study highlights a governance pathway that enhances villagers' agency and ensures the long-term sustainability of rural communities. At the international level, the study contributes to the Sustainable Development Goals by providing a transferable model of how rural communities can integrate human and non-human actors to mobilize resources and foster inclusive governance. These insights are relevant not only to China but also to other developing countries facing similar challenges of external dependence and weak endogenous motivation.

5.3. Future Prospects

While this study has achieved significant results both in terms of research methods and practical applications, it also has limitations and opens up new avenues for future research. This study is primarily based on a case study with a limited sample size, which may restrict the generalizability of its findings. Future research could expand the sample scope, incorporating rural communities from different regions and types for comparative analysis. Such studies would further validate the collaborative co-construction mechanisms and optimization strategies proposed here, and assess their generalizability and effectiveness across diverse contexts.

Additionally, future research could enhance the methodology by incorporating more quantitative tools and models, such as structural equation modeling and multi-agent modeling, to provide a more comprehensive and objective analysis of the complex relationships and collaborative mechanisms in rural community development. While this paper primarily focuses on uncovering the collaborative mechanisms among actors, there is limited exploration of the long-term effects and sustainable development of community projects. Future studies could focus on long-term tracking of rural community development projects, evaluating their effectiveness and sustainability across economic, social, and environmental dimensions, while also exploring how continuous collaborative co-construction mechanisms can contribute to the long-term development of rural communities.

6. Conclusions

In response to the challenges faced in rural community development, such as an overemphasis on spatial construction, severe homogenization, low sustainability, and the lack of localized research, this study examines the rural community development project in Xiongfán, Dawu County. By employing actor-network theory, it identifies the various actors involved, their participation methods, and the differences between them. The study aims

to summarize the collaborative co-construction model of rural community development. Furthermore, by utilizing the quantitative tools of social network analysis, it uncovers the “core-periphery” structure and identifies the “key nodes” within this collaborative model. The goal is to fill the gap in localized research experience in mainland China’s rural development and provide transferable tools and intervention strategies for rural areas facing challenges such as “excessive external influence and insufficient internal driving forces.” The main findings of this study are as follows:

6.1. Collaborative Co-Construction Model Involving Multiple Actors

The collaborative co-construction model of rural community development involves both human actors—such as government departments, enterprises, social organizations, and community villagers—and non-human actors, including natural and cultural landscapes. Together, these actors form a comprehensive network, transcending the limitations of traditional research that focuses on a single actor or subject.

6.2. Translation Process of the Actor Network and Interest Coordination

The study outlines the translation process within the actor network, including recruitment, mobilization, and dispute resolution. Various actors reached a consensus around the core issue of “revitalizing and sustainably developing rural community resources,” leading to the creation of a collaborative co-construction model. This provides new theoretical insights and practical support for the long-term development of rural communities.

6.3. Core-Periphery Structure and Power Imbalances: A Quantitative Analysis

Social network analysis quantitatively reveals that government departments and social organizations occupy central positions in the network, demonstrating high network centrality and substantial influence. In contrast, villagers and enterprises remain on the periphery, highlighting the power imbalances inherent in the current rural development model.

6.4. Internal Connectivity and Collective Action Challenges Under a Space-Focused Development Approach

The quantitative results validate the actor-network theory’s assumptions about the process of community development. They show that, under the current model, key actors primarily interact with village committee members, active villagers, and external groups. Villagers from neighboring areas and technical specialists are often mobilized to lead development efforts. However, the focus on spatial construction has weakened internal coordination and participation, making it difficult to foster collective action. This underscores the need for enhanced community empowerment.

In conclusion, while the collaborative model has created significant advancements in rural development, strengthening internal participation and addressing the power imbalances are crucial for achieving long-term sustainability in rural communities.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/land14102088/s1>. Figure S1. Community Development Network Lambda Set of Xiongfán Village.

Author Contributions: Conceptualization, Y.Q., X.L. and J.L.; Methodology, Y.Q., X.L. and J.L.; Formal analysis, Y.Q., X.L. and J.L.; Resources and data curation, Y.Q. and Y.L.; Writing—original draft, Y.Q.; Writing—review & editing, Y.Q., X.L., J. L. and Y.L. All authors have read and agreed to the published version of the manuscript. The original contributions presented in this study are included in the article; for further inquiries, please contact the corresponding author.

Funding: We are grateful to CHAN CHEUNG MUN CHUNG CHARITABLE FUND LIMITED (IR91/9906) for the financial support provided for this research.

Data Availability Statement: The original contributions presented in this study are included in the article; for further inquiries, please contact the corresponding author.

Acknowledgments: This research is a phased achievement of the rural practice in Hubei Province by the Rural Revitalization Fund Project Group of China Agricultural University. We are grateful for the donation and support from the CHAN CHEUNG MUN CHUNG CHARITABLE FUND LIMITED and the support from the People's Government of Dawu County for this research work. This study acknowledges the support of team graduate student Song Ge.

Conflicts of Interest: The authors declare that this study received funding from CHAN CHEUNG MUN CHUNG CHARITABLE FUND LIMITED. The funder was not involved in the study design, collection, analysis, interpretation of data, the writing of this article or the decision to submit it for publication.

Appendix A

Appendix A.1

Table A1. Interview records on actor network construction in Xiongfán Village (n = 64).

No.	Actor Type	Interviewee Identity	Summary of Interview Content	Conflict/Disagreement
Gc1	County Government	Deputy County Magistrate	"We aim to revitalize and utilize the village's resources, but without economic guarantees, companies are reluctant to make long-term investments, and villagers are uncooperative. In this situation, we can only focus on implementing the policies first."	Concerns about businesses pursuing short-term returns and villagers' low efficiency in cooperation
Gc2	County Government	Director of the Rural Revitalization Office	"This project is coordinated by the county government. We are concerned that it might turn into a 'showcase project,' so we still need villagers to truly participate."	Concerns that the project may become "formalism"
Gt1	Township Government	Town Mayor	"We aim to attract businesses with the support of the higher-level government for sustainable development, but villagers are concerned that their land may be expropriated during the process."	Unclear land ownership rights, and villagers resisting the implementation of government policies
Gt2	Township Government	Director of the Culture and Tourism Office	"The town aims to develop a cultural IP, but both the town and village lack operational talent."	Township government talent shortage
Gt3	Township Government	Project Coordinator	"We want to hire a design company, but the villagers say they can't understand the blueprints."	Communication barriers with villagers and businesses
Gt4	Township Government	Village-Based Official	"Like the villagers, we are also concerned that 'once you finish the project, you'll leave, and we'll be left to deal with the aftermath.'"	Township government concerns about project sustainability
Gt5	Township Government	Publicity Office Director	"Our publicity and filming still rely on resources from the county government; we don't have effective methods at the township level."	The township government's publicity methods are limited

Table A1. Cont.

No.	Actor Type	Interviewee Identity	Summary of Interview Content	Conflict/Disagreement
Gv1	Village Committee	Village Party Secretary	"We are willing to cooperate to make effective use of the village's resources, but we're worried we might not do it well and get blamed."	The village committee has weak organizational capacity and insufficient public trust.
Gv2	Village Committee	Village Chief	"We want to retain people; only with people can the village achieve sustainable development, but most young people are unwilling to return."	Severe population outflow within the village
Gv3	Village Committee	Women's Committee Member	"We want to organize activities, but we have no money or venue, so we can only do what we're told from above."	The village lacks resources and relies on external resources.
Gv4	Village Committee	Core Member	"Property rights are unclear, accounts are unclear, and villagers do not trust the committee."	Property rights and financial transparency issues
Gv5	Village Committee	Core Member	"We mobilized the elderly, but they said it was 'useless.'"	Limited mobilization capacity of the village committee
Gd1	Township Department Staff	Urban Planning Office Staff	"We want to unify the village's appearance and revitalize it, but the villagers say it 'doesn't look like my home.'"	Conflict between aesthetic control and residents' preferences
Ec1	Enterprise Institutions	Design Company Representative	"We want to do a good job with the design, but the villagers have too many opinions and they're not very clear."	Conflict between design standards and villagers' aesthetic preferences
Ew1	Enterprise Institutions	Water Utility Company Representative	"We want to invest and integrate natural resources, but we're concerned about post-construction management."	Blurred boundaries of corporate responsibility and unclear exit mechanisms
Em1	Enterprise Institutions	Head of the Integrated Media Center	"Our publicity efforts are heavily influenced by environmental factors. We can't restore cultural heritage sites or old buildings, making it difficult for us to source content, and we're unsure what to promote."	Lack of highlights in publicity implementation
Em2	Enterprise Institutions	Media Convergence Center Photographer	"Villagers refuse to cooperate with filming, saying, 'You come, film, and leave.' This leaves us with no tangible resources to share."	Disconnect between corporate publicity and actual benefits for villagers
Et1	Enterprise Institutions	Cultural Tourism Investment Project Manager	"We want to move quickly to revitalize the village community resources, but the government approval process is slow."	Conflict between corporate efficiency and government procedures
Et2	Enterprise Institutions	Construction Manager	"Unclear property rights, slow payment settlements, and delays in commencing construction."	Lack of trust between the village committee and villagers

Table A1. Cont.

No.	Actor Type	Interviewee Identity	Summary of Interview Content	Conflict/Disagreement
Si1	Foundation	Project Manager	"We aim to undertake long-term projects, but government transitions may impact our plans."	Concerns about the continuity of government policies
Sw1	Foundation	Resident Social Worker	"Only by focusing on the common issue of resource revitalization can we bring the government, businesses, and villagers to the same table. Otherwise, the villagers will always say, 'You're just here to take photos,' and they won't trust us."	Challenges in embedding external organizations, identity barriers
Sw2	Foundation	On-site Social Worker	"We also cannot guarantee that we will stay in one place long-term; no one knows what will happen to this place once we leave."	The forms of participation by social organizations exhibit significant fluidity
St1	University Expert Team	Professor	"The project's objective is to revitalize rural resources and achieve sustainable development. We recommend proceeding according to the plan and in an orderly manner, but the government always wants to see results quickly."	Mismatch in pace between universities and the government
St2	University Expert Team	Professor	"The solutions proposed by companies should be discussed jointly with the government and villagers."	Concerns about the implementation of results
St3	University Expert Team	Professor	"Construction qualifications and implementation should be the responsibility of the local government and the company. We will be responsible for coordinating and advancing the work."	Universities lack construction qualifications
Ss1	University Students Stationed in Villages	Graduate Student	"The villagers said, 'We don't understand what you're saying.'"	Language and cognitive differences
Ss2	University Students Stationed in Villages	Graduate Student	"We wanted to resolve conflicts through participatory design, but the villagers said, 'You don't understand.'"	Conflict between professional expertise and local experience
Ss3	University Students Stationed in Villages	Graduate Student	"During our research, villagers often feared being 'exploited.'"	Villagers have concerns about the use of information
Ss4	University Students Stationed in Villages	Graduate Student	"We wanted to conduct in-depth interviews to understand the village's needs, but villagers were initially reluctant to speak."	Villagers have privacy concerns
Ss5	University Students Stationed in Villages	Graduate Student	"We need to re-plan the roads, but the villagers say they don't use that route on a regular basis."	Conflict with villagers' established path habits
Ss6	University Students Stationed in Villages	Graduate Student	"The planting plan I devised was deemed 'shade-blocking' by the villagers."	Conflict with villagers over the functional use of space

Table A1. Cont.

No.	Actor Type	Interviewee Identity	Summary of Interview Content	Conflict/Disagreement
Ss7	Summer Volunteers	Undergraduate	"We plan to film a documentary, but the villagers say it 'won't look good on camera.'"	Villagers have concerns about their image
Ss8	Summer Volunteers	Undergraduate	"We want to help the village in some way, but we don't know what we can do."	Role ambiguity
Se1	External Experts	Architecture Expert	"The 'dilapidated houses' mentioned by the villagers are precisely the neglected resources that can be utilized."	Conflicts with villagers over safety and protection
So1	Students from Other Universities	Architecture Student	"Our renovation plan cannot truly gain the villagers' approval; every household has their own interests."	Sensitivity regarding villagers' property rights
So2	Students from Other Universities	Architecture Student	"We want to preserve the rural style, but the villagers believe that imitating urban architecture is better."	Conflict of interests with villagers
Vt1	Skilled Villagers	Carpenter	"I am willing to participate, but I'm worried about not getting paid. I can join for a short time, but whether I continue afterward is not up to me."	Village residents' willingness to participate is constrained by compensation and guarantees
Vt2	Skilled Villagers	Bricklayer	"I can do it, but I'm worried that if something goes wrong, no one will take responsibility."	Unclear maintenance responsibilities and lack of trust and security guarantees
Vt3	Skilled Villagers	Intangible Cultural Heritage Inheritor	"Only we can still do it. Young people aren't interested in learning, so the craft will definitely be lost."	Concerns about the discontinuation of traditional skills
Vt4	Specialized Village Residents	Agricultural Machinery Expert	"I want to teach, but no one is willing to learn."	Low learning motivation among village members
Vt5	Specialized Technical Villagers	Chef	"Opening a farmhouse restaurant sounds good, but I'm worried there won't be any customers."	Market uncertainty, lack of financial support and policy guarantees for villagers
Vt6	Skilled Villagers	Carpenter	"I'm worried there won't be orders for the furniture I make, and there's no support for starting a business."	Unstable demand and lack of financial support
Vt7	Skilled Villagers	Electrician	"I want to help, but I'm afraid of accidents."	Concerns about safety responsibilities
Vt8	Specialized Villager	Gardener	"Beautifying the village is fine, but I'm not comfortable handling public areas—I need the village's approval first."	Difficulty in protecting public property
Va1	Active Villagers	Returning Youth	"I'm willing to organize some activities, but I don't have the funds."	Lack of activity funding

Table A1. Cont.

No.	Actor Type	Interviewee Identity	Summary of Interview Content	Conflict/Disagreement
Va2	Active Villagers	Women's Group Leader	"We also want to learn e-commerce and sell products online, but no one is teaching us."	Lack of skills
Va3	Active Villagers	Retired Teacher	"We could use our free time to teach the children, but we need a suitable space."	Lack of educational space
Va4	Active Villagers	Veteran	"We could organize patrols, but no one supports the idea."	Public governance is lacking
Va5	Active Villagers	Cultural and Artistic Leader	"We could also organize our own evening performances, but no one would come, and we can't get it organized."	Lack of appeal, organizational difficulties
Va6	Active Villagers	Returning College Student	"We want to keep people here, but there's no income, no policies, and if we can't develop the village's resources, we don't know what we can do here."	Lack of internal motivation among villagers, insufficient policy support
Vo1	Ordinary Villagers	Elderly Woman	"I'm afraid my house will be demolished. If I renovate it into a guesthouse, no one will come, and I'll have wasted all my effort."	Villagers' concerns about participating in spatial renovations and the outcomes
Vo2	Ordinary Villagers	Middle-aged Man	"I'm afraid traveling will be too noisy."	Concerns about disruptions to daily life
Vo3	Ordinary Villagers	Young Mother	"I'm worried that the children won't have anywhere to play."	Lack of public spaces
Vo4	Ordinary Villagers	Young Mother	"When there are many people, I go to take a look, and it's quite good, but I wouldn't actively organize anything."	Low level of participation
Vo5	Ordinary Villagers	Migrant Worker Returning Home	"Everyone is busy with their own affairs, and there are no opportunities for cooperation."	The village lacks platforms and opportunities for cooperation and interaction
Vo6	Ordinary Villagers	Migrant Worker Returning Home	"Even if there are issues, we don't report them to higher authorities because they can't be resolved."	Villagers are disappointed in the village committee's governance capabilities
Vn1	Villagers from Neighboring Villages	Vendor from Neighboring Village	"I want to set up a stall, but I'm afraid they won't let me in."	Unclear access mechanism
Vn2	Villagers from Neighboring Villages	Artisan	"I can bring my items to display, but if no one buys them, it's pointless."	Lack of market confidence
Vn3	Villagers from Neighboring Villages	Stone Mason	"I just go to do some odd jobs, and then I come back."	Short-term cooperation, low level of involvement
Vn4	Villagers from Neighboring Villages	Carpenter	"I'm just doing short-term work with them; I haven't considered anything long-term."	Short-term collaboration, low level of involvement
To1	Tourists	Self-driving Tour	"I want to come and take photos, but I'm afraid the villagers will be offended."	Conflict with cultural respect towards outsiders

Table A1. Cont.

No.	Actor Type	Interviewee Identity	Summary of Interview Content	Conflict/Disagreement
To2	Tourists	Self-driving Tour	"I also want to experience the rural landscape, but I'm worried it might be inconvenient."	Insufficient reception capacity
To3	Tourists	Tour Group	"There are no other places to play or stay nearby, so it's all done in half a day."	Insufficient supporting facilities
To4	Tourists	Tour Group	"The buildings are nice, but there's no one to explain anything."	Inadequate reception services

Appendix A.2

Xiongfán Village Community Development Collaborative Co-construction Nomination Questionnaire

Questionnaire Number: Interview Date:

Interview Location: Interview Participants:

Hello, we are conducting a survey on rural community development. Your responses will help improve, promote, and publicize the local rural development process. The questionnaire and related materials are for research reference only and will not be disclosed. We welcome your contributions to local rural development and your suggestions for the construction of "harmonious and beautiful villages" and the promotion of "joint creation."

Gender: ☐ Male ☐ FemaleAge: ☐ 0–17 ☐ 18–40 ☐ 41–64 ☐ 65 and aboveEducation Level: ☐ No formal education ☐ Elementary and junior high school ☐ High school and vocational school ☐ College and university ☐ Graduate schoolOccupation: ☐ State-owned enterprise ☐ Private enterprise ☐ Self-employed☐ Government ☐ Village Committee ☐ Student ☐ Retired ☐ Other

1. Have you participated in rural community development initiatives?

☐ Yes ☐ No

2. If yes, in what capacity did you participate? (Multiple selections allowed)

☐ Construction organizer (involved in spatial planning, design, selection, supervision, etc.)☐ Construction participant (involved in construction work, project implementation, etc.)☐ Activity organizer (involved in event planning, organization, etc.)☐ Event Participant (actively participating in village evenings, film screenings, and other related activities)☐ Promoter (involved in media promotion, event marketing, etc.)☐ Other: _____

3. What projects and tasks did you primarily undertake during the construction process? (Multiple selections allowed)

☐ Overall planning ☐ Financial support ☐ Space construction ☐ Event organization☐ Other: _____

4. Who did you collaborate with in this community development process? What is your relationship with them?

Serial His/Her Name What is your relationship with him/her?

A. Colleague B. Friend C. Neighbor D. Relative E. Teacher/Student F. Other How often have you collaborated with him/her in the past six months?

A. 1–2 times every six months B. Once a month C. Twice or more per month D. 1–2 times per week E. Once a day

Appendix A.3

Table A2. Nomination results of collaborative community development in Xiongfán Village.

Nomination Actors		Nominated Actors				
Gv4	Gv1	Gv2	Gv5			
Gv5	Gv1	Gv2	Gv4	Gv3		
Gv2	St1	St2	Gv1	Gt4	Gt1	
Gv1	St1	Gt1	Sw1	Gv3	Gv2	
Gv3	Gv1	Gt2	Gv2	Ss3		
Vo1	Vt3	Gv1				
Ss3	St1	St2	Ss1	Gv1	Gv3	
St2	St1	Gv1	Gv2	Gv3	Gc2	
Gt1	Gt2	St2	St1	Ss4	Ss1	
Ss1	St1	St2	Gv1	Ss3	Gt2	
Vt1	Sw1	Gv1	Vt3	Vt6	Va3	
Gt2	Ss1	Ss3	Gv1	Gv3	Gd1	
Gd1	Gt1	Gt2	Gv1	Gv3	Ss3	
Vo2	Gv1	St2	Gv2	Sw2		
Vt2	Sw1	Vt1	Vt4	Va3	Vt6	
Vt3	Gv1	Sw1	Vt1	Vt6	Va3	
Va1	Gv1	St2	St1	Se1	Gt3	
Sw1	Ss4	Gv1	Si1	Va2	Va3	
Ss4	Sw1	Si1	St1	St2	Gv1	
St1	Gc1	St2	Ss3	Gv1	Gc2	
Gt3	Gt1	Gv1	Ec1	Gt2	St2	
Si1	Sw1	Gv1	Ss4	Vo3	St2	
Ss5	Ss3	Ss1	Gv3	Gv1	St2	
Gt4	Gc1	Gc2	Gv1	St1	St2	
Gc2	St2	St1	Ss1	Ew1	Gc1	
Ew1	Gt1	Gt4	St1	St2	Ss1	
Gc1	Gc2	Gt4	Gt1	St1		
Va2	Ss4	Si1	Sw1	Va3	Gv1	
Vo3	Sw1	Ss4	Si1	Va5	Vt8	
Gc3	St1	St2	St3	Gv1	Sw1	
Va3	Sw1	Si1	Vt1	Ss4	Va2	
Vt4	Sw1	Va2	Vt1	Vt6		
St3	St1	Va2	Ss4	Gc3		
Ec1	Gt3	Gv1	Gc3	Ss4		
Va5	Va4	Vo3	Ew1	Vt5		
Va4	Va5	Gv1	St3	Si1	Vt5	
Vt5	Va5	Va4				
Vt6	Va5	Gv1				
Vt7	Va5	Va4				
Vt8	Va5	Vo3				
Va6	St1	St2	Se1	Sw1		
Se1	St1	So2	So1	Va6	Va1	
So1	Se1	St1	So2	Ss3	Sw1	
So2	Se1	Sw1	St2	St1	Va1	
Em1	Gc2	Em2	Gt1			
Em2	Em1	Gt2	Gt5			

Table A2. Cont.

Nomination Actors		Nominated Actors				
Et1	Gc2	Et2	St2			
Et2	Et1	St2	Ss3			
Gt5	Gt1	Gt2	Gt4	Em2	Ss1	
Sw2	Sw1	Si1	Ss1	Ss4	Vt6	
Ss6	St2	Ss3	Va1	Ss8	Vn1	
Ss7	St2	St1	Ss1	Ss3	Ss6	
Ss8	St1	Ss3	Ss1	St2	Va1	
Ss2	St2	Sw1	Ss4	Gv3	St3	
Vn1	Ss2	Va1	St2	Sw1	Ss6	
Vn2	Ec1					
Vn3	Ec1	Sw1	Gv2			
Vn4	Ec1	Vn3	Gv2			

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