Z E S Z Y T Y N A U K O W E P O L I T E C H N I K I P O Z N A Ń S K I E J
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CHONGQING TRADITIONAL VILLAGES CONSERVATION AND DEVELOPMENT BASED ON GIS METHOD

Chongqing, situated at the heart of China, exemplifies the harmonious blend of age-old customs and modern aspirations. Its rich historical tapestry encompasses the ebb and flow of dynasties, the evolution of cultural identities, and the architectural wonders of traditional villages nestled in its picturesque countryside. This project goes beyond the physical preservation of village structures; it delves into the intangible heritage – traditions, rituals, and cultural practices – that breathe life into these villages. By comprehensively understanding the historical significance, architectural legacy, environmental context, and social fabric of these settlements, the project aims to develop holistic GIS-based methods. These methods safeguard the history of Chongqing's traditional villages and pave the way for their adaptable growth, ensuring their survival the evolving landscape.

Keywords: Mountain city walkways, local construction, GIS based-methods, traditional village, contemporary architecture

1. INTRODUCTION

A robust methodological design constitutes the blueprint guiding empirical scientific inquiries towards their objectives. In the context of this study exploring the potential of GIS-based solutions for heritage conservation and culturally attuned development in traditional rural settlements in Chongqing, China, a thoughtfully conceptualized framework is important in directing evidence-based analysis, contextualized policy formulations and localized planning [Chen et al. 2021; Gao, Li 2022]. This chapter delineates a multi-phase, mixed-methods research methodology tailored

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to thoroughly investigate select villages across parameters encompassing architectural fabric, socioeconomic conditions, cultural dynamics, developmental needs, and environmental settings [Wang et al. 2019; Wu et al. 2020]. Qualitative techniques like archival research, field observations and focus group engagements help characterize heritage assets, community perspectives and ground realities framing the issues [Atalay 2012; Deacon 2004]. Meanwhile, quantitative questionnaire surveys, geospatial mapping and spatial analytics provide localized data on village morphology, utilities mapping, disaster risks and livelihood patterns guiding data-driven planning [Li, Xi 2018; Xu et al. 2023].

Synthesizing insights from literature emphasizing participatory methodologies, the framework also incorporates focus groups and collaborative mapping exercises enabling villagers themselves to articulate developmental priorities and preservation suggestions [Dai et al. 2022; Tang et al. 2019]. This multi-pronged methodical triangulation of secondary literature analysis, empirical fieldwork, geospatial visualization, statistical validation, and community participation is designed to inform the formulation of settlement-specific conservation schemes balancing heritage protection, ecological sustainability and cultural sensitivity with infrastructure upgrades and livelihood improvements [Historic England 2017; Wang et al. 2016]. In encapsulating the sequential processes from study area selection, data gathering, spatial diagnosis, participatory conversations to context-specific recommendations, this comprehensive methodological workflow provides the launch pad guiding the research towards its stated goals.

2. RESEARCHING FRAMWORK

2.1. Selection of study villages

The expanse of traditional rural settlements scattered across the Chongqing municipality offers a myriad tapestry of architectural forms, environmental contexts, cultural practices, and developmental challenges interconnected yet bearing distinguishing facets that necessitate careful consideration in research aiming for representational breadth [Chen et al. 2021; Shi et al. 2020]. This study adopts purposive sampling techniques entailing a customized set of criteria to identify 12 villages across Chongqing that encapsulate varied phenotypes along parameters of tangible and intangible heritage assets, existing infrastructure conditions, ecological settings, economic activities, demographic compositions, and administrative jurisdictions [Guo et al. 2017; Palys 2008] As Creswell and Creswell [2017] articulate, such qualitative filtering aligned with research goals yields more insightful cases for in-depth investigation compared to random selections. The choice of 12 villages permits adequately nuanced analysis across different preservation and developmental needs

while retaining scope for detailed assessment which extensive samples would preclude through resource constraints. The subsequent sections expand on the village selection strategy (Fig. 1).

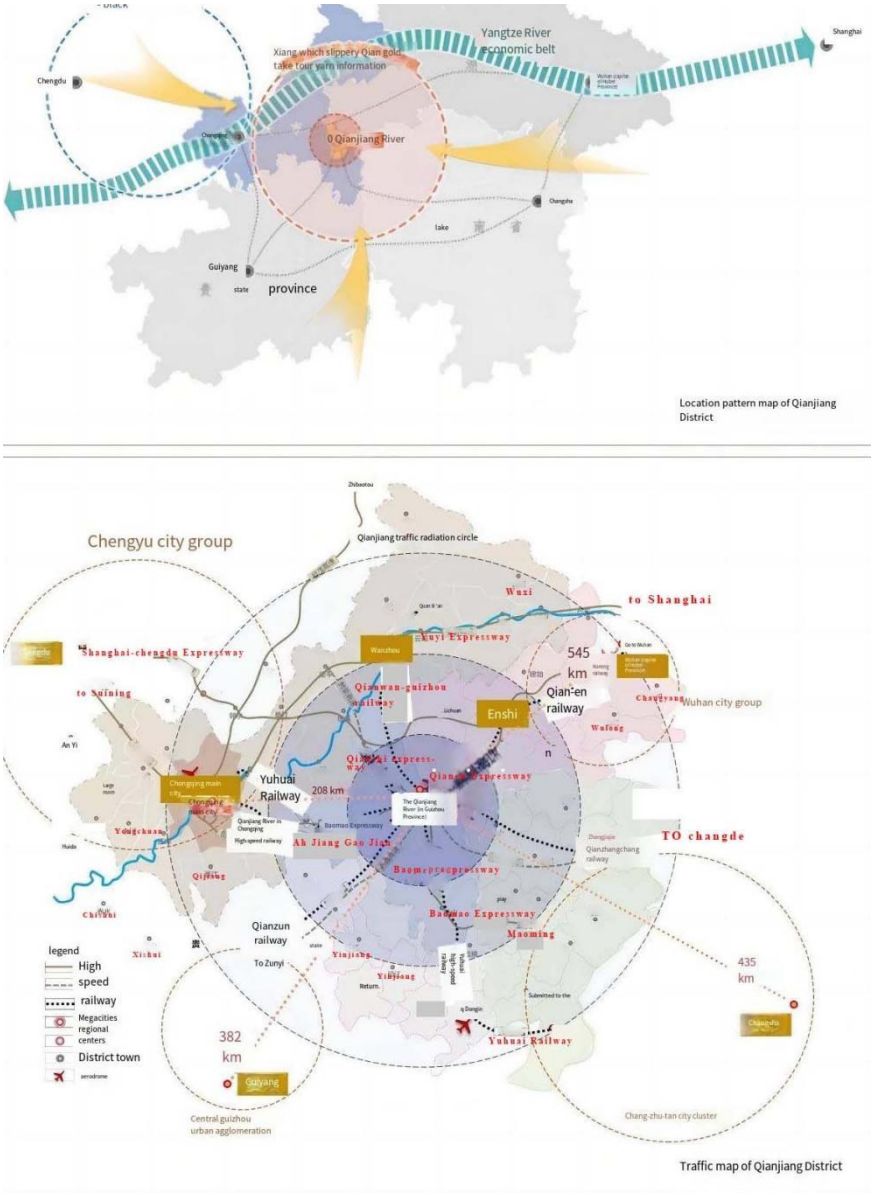

Fig. 1. Location Map of Qianjiang District [Chongqing map originated from www.sinomaps.com]

2.2. Architectural and Cultural Heritage

The architectural fabric and cultural traditions manifested diversely in Chongqing's villages, shaped by complex topographies and waves of inhabitants over millennia, call for identifying settlements showing particular historical design styles, architectural techniques, functional layouts, and localized cultural practices for holistic representation [Hu 2022; Wang et al. 2019]. Accordingly, village selections symbolize distinct categories such as Ancient Irrigated Rice Terraces preserving stone-based engineering of the Ba people from the Han dynasty, Fishing Settlements from the Ming and Qin era marked by boat dwellings and stilt houses, and Fortified Mountain Hamlets built using rammed earth construction during wartime periods [Chen et. al. 2021; Chongqing Municipal Government 2008]. Other categories reflect Villages with Distinct Craft Traditions, Religious Complexes and Regional Architectural Styles.

As conservation aims necessitate understanding existing infrastructure provisions, accessibility networks, disaster resilience and restoration needs which vary across space, chosen village sites capture such differential developmental contexts, with some being relatively self-sufficient while others deprived of basic amenities [Jiao et al. 2022; Shi et al. 2020]. For inclusivity, villages were filtered to incorporate remote mountain hamlets only recently connected by roads alongside easily accessible but culturally fading ancient market towns as well as rapidly modernizing agricultural villages and emergent tourist destinations [Chen et al. 2021; Chongqing Municipal Government 2008]. Figure 3.12 below shows the distribution map of traditional villages in Qianjiang region.

Environmental conditions and economic activities intrinsically shape village morphologies and developmental pathways [Xu et al. 2023]. Thus, village sampling considered diversity in surrounding ecology, differentiated as riverine settlements, valley cultures, rice terrace agricultures and mountainous forest villages, along with economic bases spanning sustenance farming, niche cash cropping, animal rearing, fisheries, and emerging tourism centeredness [Chen et al. 2021; Tang et al. 2019]. The following is a map showing the plan of New Villages in Xiaonanhai Town, Qianjiang District (Fig. 2).

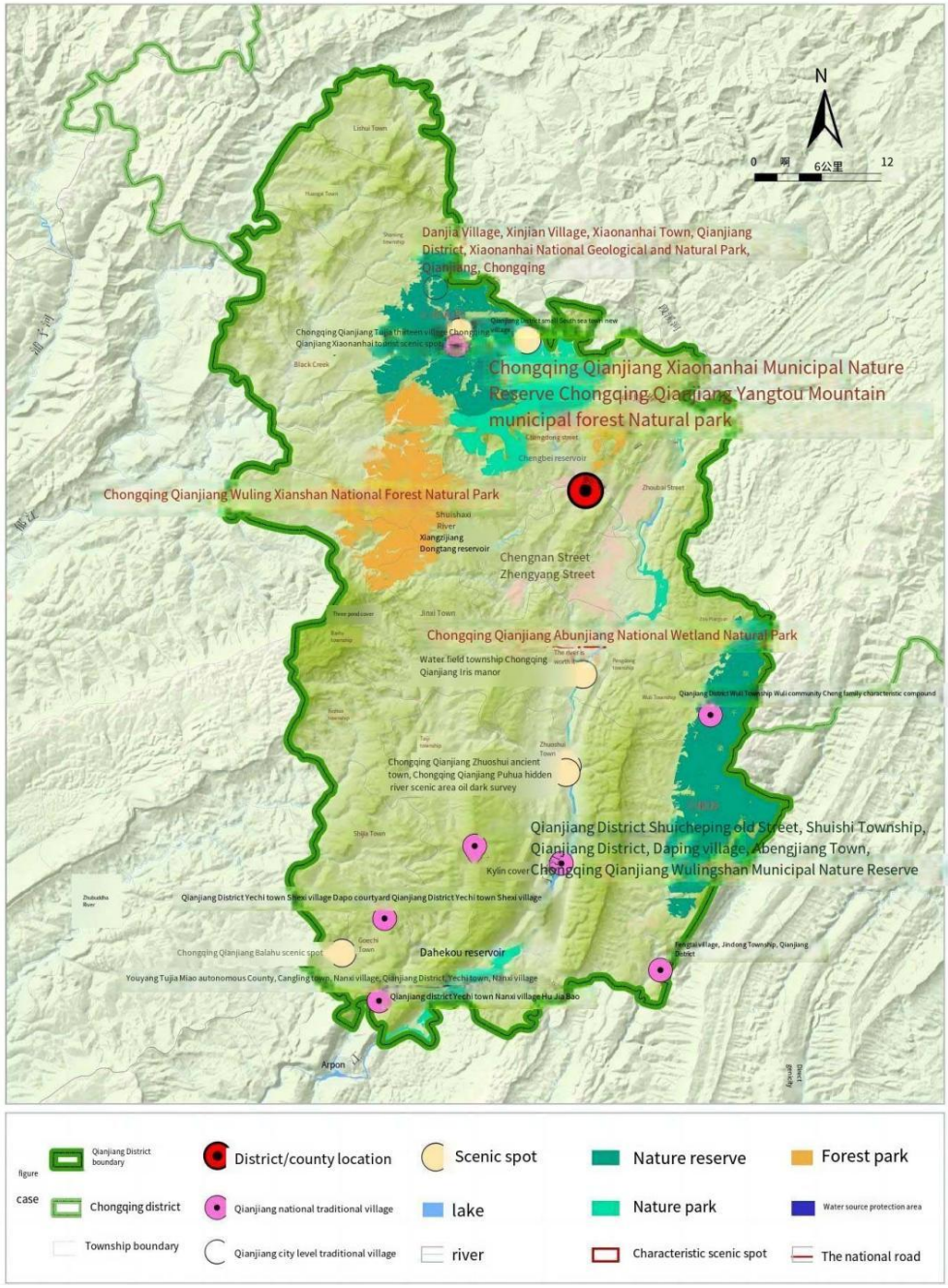

Fig. 2. Distribution map of cultural relics and natural parks and reserves at all levels in Qianjiang District [Chongqing map originated from www.sinomaps.com]

2.3. Demographic Compositions

As heritage sustainability links closely with the numbers and interests of younger community members undertaking preservation, sample sites account for villages with aging declining populations versus growing family sizes and return migrant influx [Hu 2022; Li, Xi 2018]. The figure below is provided to show the planning map of Dapping Village (Fig. 3).

Fig. 3. Planning map of Daping Village, Apengjiang Town, Qianjiang District, Chongqing City [Chongqing map originated from www.sinomaps.com]

Since policy directives for village planning and financing infrastructure projects operate within bureaucratic jurisdictions, ensuring representativeness the selected villages encompass city, county and provincial administrative areas across Chongqing based on their heritage value, developmental contexts, and geographic spread [Xu et al. 2023; Chongqing Municipal Government 2008]. Cognizant of calls emphasizing selection rigor in qualitative research, the villages identified as investigative samples for this project were intentionally filtered based on a priori criteria mapping significance to research goals seeking multi-dimensional insights into preservation and developmental pathways for traditional rural settlements in Chongqing municipality.

The study adopts a mixed-methods approach to synthesize data from literature reviews, field surveys, geospatial mapping, archival records, focus group discussions and questionnaire surveys with local participants. Informed by the research objectives of thoroughly investigating current heritage preservation and infrastruc-

ture conditions for devising tailored development pathways for select traditional villages in Chongqing, a robust methodological design necessitates an evidence-based foundation utilizing diverse data gathering techniques [Creswell, Creswell 2017]. This study adopts a mixed-methods approach, harnessing the depth of qualitative strategies and breadth of quantitative tools to yield multi-dimensional village-specific insights through methodological triangulation [Fetters et al. 2013]. Aligned with recommendations from Batistella et al. [2019], the fieldwork encompasses five complementary techniques elaborated below:

An extensive review of scholarly literature on three levels – global heritage conservation paradigms, China-specific preservation frameworks, and Chongqing village developmental contexts – helps survey architectural preservation principles, cultural sensitivity considerations, environmental sustainability models, infrastructure evaluation mechanisms and participatory planning systems to synthesize a conceptual framework guiding field investigation and analysis in the studied villages [Onwuegbuzie, Frels 2016]. Secondary academic and policy sources help characterize regional heritage conservation approaches and development challenges.

3. GIS-BASED ANALYSIS

3.1. Comprehensive Field Surveys and Geospatial Mapping

Direct sustained observations through extensive field surveys facilitate first-hand experiences of the intangible heritage practices, cultural fabric and communal ethos alongside visible architectural relics, current infrastructure provisions ranging from road systems, sanitation facilities to civic structures, and the surrounding ecosystem [Historic England 2017; Wang et al. 2019]. Meanwhile, geospatial data gathering through GPS mapping, drone imaging and satellite data extraction aids in digitally visualizing the village spatial morphologies, structural clustering patterns and topographic terrains [Wu et al. 2020; Xu et al. 2023].

Historical records offer insights into villages' origin stories, architectural evolution, and cultural practices. Consulting historical archival documents, including past maps, paintings, and chronicles, helps trace village origin stories, architectural lineage over time, community compositions, cultural practices, past development works, and critical events aiding temporal analysis of continuities and changes in heritage assets and developmental contexts [Deacon 2004; Wang et al. 2019].

Discussions with community members aid participatory problem and needs assessment. Structured conversational focus group sessions with community members spanning ages, genders and occupations facilitate participatory problem appraisal and needs assessment capturing localized perspectives on issues faced, develop-

ment priorities, preservation desires and ideas for balancing heritage and modernity [Kamberelis, Dimitriadis 2013; Li, Xi 2018].

Sample questionnaire surveys administered to local household's aid collection of representative quantitative data on population profiles, infrastructure adequacies like access to utilities, transportation barriers, vulnerabilities, disaster risks, livelihood patterns, and developmental aspirations to statistically contextualize issues being investigated [Bradburn et al. 2004; Shi et al. 2020]. This tailored mixed-methods data collection strategy synthesizing literary insights, empirical observations, archival records, community engagements and sample surveys helps assemble multi-faceted datasets illuminating the developmental contexts and nuanced preservation needs within each studied village from academic, administrative, environmental, socio-cultural and community emic perspectives. Close-ended resident surveys help quantify living conditions and developmental aspirations.

3.2. GIS-based Strategies

The figure below shows a framework of centralized and continuous protection and utilization model of traditional villages (Fig. 4).

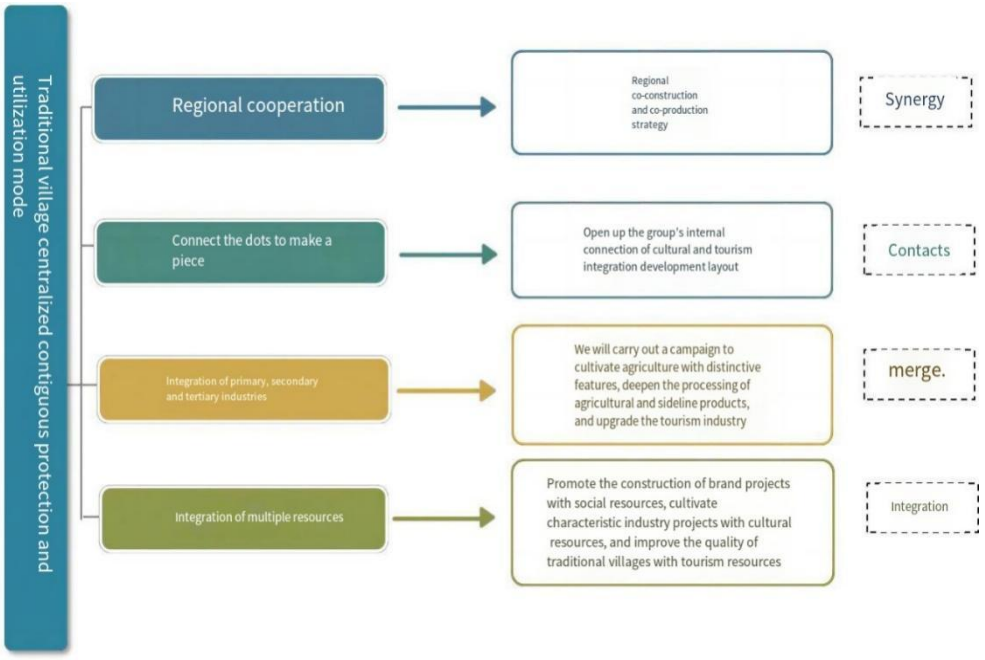

Fig. 4. Framework of centralized and contiguous protection and utilization model of traditional villages [The authors' research]

As gleaned from the literature review, Geographic Information Systems (GIS) offer robust analytic capabilities pivotal for evidence-based heritage conservation and development planning [Historic England 2017; Vecco 2010]. Integrating the myriad qualitative and quantitative datasets gathered through the techniques elaborated in section 3.2 into a GIS platform enables creating an intelligible and visually incisive spatial database on the studied villages [Wu et al. 2020]. This allows leveraging GIS overlay analysis, data interpolation and spatial modelling functions to derive actionable insights tailored to inform preservation and growth pathways for specific settlements [Wang et al. 2019; Xu et al. 2023].

The empirical qualitative observations and archival records will be synthesized within GIS to create an ArcGIS geodatabase containing vector and raster layers capturing village morphology, architectural fabric, cultural assets distribution, infrastructure conditions, developmental contexts, and topographic settings [Batistella et al. 2019; Chongqing Municipal Government 2008]. Customized attribute tables appended to geospatial features depict associated qualitative descriptors, while raster overlays characterize the ecological habitat. Vectorizing paper maps and GPS coordinates from field surveys facilitates generating layered digital village land use maps coding structures, public amenities, access networks, forested/agricultural/fallow lands [Wu et al. 2020]. Meanwhile, questionnaire survey results will be geospatially linked to household locations within villages as geotagged quantitative data on population, utilities access, vulnerabilities, and developmental priorities [Shi et al. 2020].

This GIS database integrates multimodal data into an organized repository for spatial analysis. Network analysis will determine infrastructure distribution adequacy based on zone-wise households and road/utilities accessibility [Wang, Zhang 2019]. Overlay analysis of land use, ecological habitats and public facilities can reveal environmental quality and sustainability. Proximity analysis will help identify disaster risks and mitigation priorities based on terrain gradients and water bodies [Chen et al. 2021]. Interpolation of survey quantifications can characterize zone-wise developmental contexts and needs. The visualization and diagnostic capabilities of GIS facilitate parsing complex multifaceted village information into coherent spatial patterns, trends, and relationships to inform context-specific planning [Xu et al. 2023]. This phase applies GIS as a pivotal analytic tool to transform raw heterogeneous village data into structured actionable database layers, leveraging geospatial modelling to characterize settlement morphologies, diagnose problem zones, identify community needs and map conservation priorities with geographic specificity critical for site-appropriate interventions.

Synthesizing the comprehensive mixed-methods data collection and systematic GIS-based analysis elucidated in the preceding sections will enable formulating an innovative Conservation and Development Framework tailored to each investigated traditional village in Chongqing. This culminates the methodological design by translating gathered evidence into context-specific policies balancing heritage preservation, environmental sustainability and cultural sensitivity with infrastructure

upgrades and livelihood improvements needed in these settlements [Gao, Li, 2022; Shi et al. 2020].

The Framework comprises Settlement Conservation Schemes rooted in the architectural legacy, cultural practices, communal ethos, and ecological habitats characterizing each village to sustain their heritage essence [Chen et al. 2021]. Conservation priorities identified through field observations, archival records and community engagements will shape strategies like restoring dilapidated vernacular structures based on traditional construction techniques, revitalizing fading oral traditions and folk arts through cultural centres and retaining contiguous agricultural lands and watersheds surrounding settlements [Su et al. 2019]. Particularly, the scheme will focus on participatory initiatives designed in conjunction with villagers to foster a sense of ownership over safeguarding heritage based on their priorities, such as intergenerational mentoring programs for passing down specialized craft skills and sustainable tourism cooperatives for boosting local incomes in ways preserving communal heritage and ecology [Chu et al. 2022; Schnell 2013].

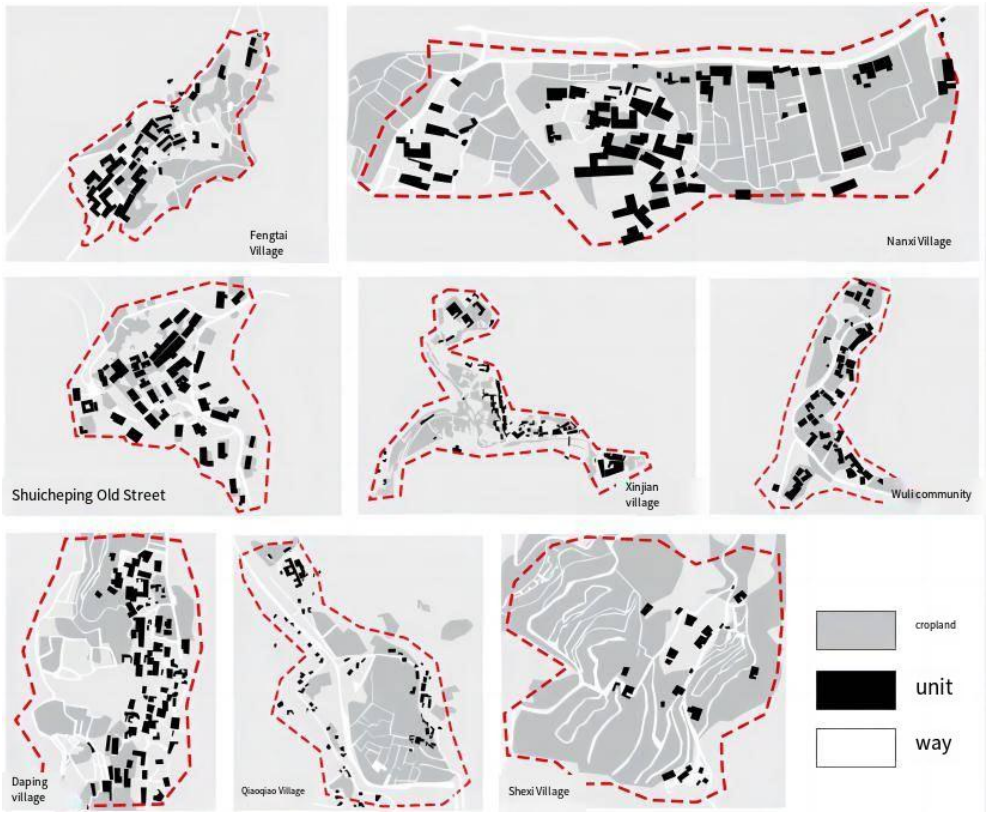

Fig. 5. Traditional village spatial texture map [Chongqing map originated from www.sinomaps.com]

Complementing conservation efforts, the Framework comprises customized Village Development Plans formulated through GIS-based analysis of the settlements' infrastructure adequacy, service access levels, disaster vulnerability, environmental quality, and developmental needs articulated by inhabitants [Jiao et al. 2022]. Guided by spatial diagnostics, the plans will utilize geodesign techniques to propose context-sensitive interventions such as realigning road networks to improve connectivity while avoiding cultural structure encroachment, designing drainage channels to mitigate flood risks identified through hydrological modelling, locating solar infrastructure on unsuitable agriculture tracts to sustainably improve electricity access, and community-proposed amenities like village cooperatives and accessible healthcare centres [Liu et al. 2022; Wang, Zhang 2019]. By balancing cultural preservation with environmentally responsible and community-centred growth pathways, the Conservation and Development Framework shaped by the methodological trajectory of this study aims to provide policymakers and planners with integrated village-specific roadmaps that can sustain the essence of traditional rural settlements in Chongqing while adapting them to meet contemporary habitation needs and aspirations (Fig. 5).

4. CONCLUSION

An efficacious research methodology constitutes the blueprint guiding the empirical investigation towards its objectives. In the context of this study focused on leveraging GIS-based solutions for heritage conservation and culturally attuned development in traditional rural settlements in Chongqing, China, a multi-pronged methodological design was formulated. The framework commenced with identifying sample villages representing the architectural diversity, cultural practices and developmental challenges faced by settlements in the region using purposive sampling techniques. This was followed by a mixed-methods data collection strategy encompassing literary insights, extensive field observations, archival records, focus group engagements with communities and questionnaire surveys to assemble multi-dimensional data on village forms, heritage assets, infrastructure conditions and needs.

The study then leveraged GIS technology to integrate the qualitative and quantitative datasets into a spatial database and visualize settlement morphologies, model disaster risks, diagnose infrastructural gaps and reveal developmental priorities through overlay analysis, proximity analysis and interpolation mapping. Finally, the methodology coalesced into devising settlement-specific conservation schemes focused on participatory heritage preservation and context-sensitive development plans balancing modern amenities with cultural sensitivity through geodesign techniques. This comprehensive methodological provides the launch pad guiding the

study towards its goals of illuminating pathways for sustaining the cultural vibrancy, ecological harmony, and communal essence of traditional villages in Chongqing municipality while adapting them for contemporary habitation needs through strategic planning. GIS technology had integrated the qualitative and quantitative datasets into a spatial database and visualize settlement morphologies, model disaster risks, diagnose infrastructural gaps and reveal developmental priorities through overlay analysis, proximity analysis and interpolation mapping.

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BADANIA NAD KONSERWACJĄ I ROZWOJEM TRADYCYJNYCH WIOSEK W OPARCIU O METODĘ GIS W CHONGQING

Streszczenie

Chongqing, położony w samym sercu Chin, stanowi przykład harmonijnego połączenia odwiecznych zwyczajów i nowoczesnych aspiracji. Jego bogata historia obejmuje różne dynastie, ewolucję tożsamości kulturowych i cuda architektury tradycyjnych wiosek położonych w malowniczej okolicy. Projekt ten wykracza poza fizyczną ochronę struktur wiejskich. Zagłębia się w niematerialne dziedzictwo – tradycje, rytuały i praktyki kulturowe – które tchną życie w te wioski. Dzięki kompleksowemu zrozumieniu znaczenia historycznego, dziedzictwa architektonicznego, kontekstu środowiskowego i tkanki społecznej tych osiedli projekt ma na celu opracowanie holistycznych metod opartych na GIS. Metody te chronią historię tradycyjnych wiosek Chongqing i torują drogę do ich adaptacyjnego rozwoju, zapewniając im przetrwanie w zmieniającym się krajobrazie.

Słowa kluczowe: górskie chodniki miejskie, budownictwo lokalne, metody oparte na GIS, tradycyjna wieś, współczesna architektura