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Research on the Construction of New Campuses for Relocated Universities in Xiong'an Based on the Urban-University Integration Concept— Taking the Xiong'an Campus of China University of Geosciences (Beijing) as an Example

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Abstract: As a crucial pivot for national strategic development, the university relocation project in Xiong'an New Area undertakes the mission of optimizing capital functions and promoting regional coordinated development. Taking the Xiong'an Campus of China University of Geosciences (Beijing) as a case study, this paper explores the collaborative pathways between universities and cities in terms of functional complementarity, resource sharing, and ecological symbiosis from the perspective of campus functional layout and spatial optimization. By integrating four core concepts—green ecology, intelligent technology, cultural inheritance, and traffic optimization—it proposes a design strategy of "breaking boundaries and multi-dimensional linkage," aiming to construct a new spatial paradigm of urban-university integration and provide theoretical support and practical references for the development of higher education and urbanization in Xiong'an New Area.

Keywords: Urban-university integration; Relocated universities; New campus

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1. Introduction

In the core task of relocating non-capital functions in Xiong'an New Area, university relocation is not only a spatial transfer but also an opportunity for functional reconstruction and value upgrading. The construction of the Xiong'an Campus of China University of Geosciences (Beijing) needs to break through the traditional closed campus layout and shift to an "urban-university symbiosis" model, achieving deep integration of educational resources and urban functions.

This paper takes "Functional Collaboration-Spatial Optimization-Technological Empowerment" as the logical main thread, and combines the master plan of Xiong'an New Area with the disciplinary characteristics of the uni-

versity to propose four design dimensions of urban-university integration: green ecology, smart technology, cultural inheritance, and transportation network, to construct an innovative space with both academic vitality and urban service functions.

2. Theory and practice of urban-university integration

2.1. Connotation of urban-university integration

The essence of urban-university integration is to transform universities from "isolated islands" into "catalysts" for urban development through functional complementarity and resource sharing. International cases show that open campuses (such as Cambridge Science Park and Stanford University with Silicon Valley) can significantly enhance regional innovation capabilities through industry-university-research linkage.

2.2. Planning orientation of Xiong'an new area

In the "one main and five auxiliary" spatial structure of Xiong'an New Area, the university relocation area needs to undertake the functions of scientific and technological innovation, cultural leadership, and ecological demonstration. As a professional university in the field of resources and environment, the campus planning of the Geosciences University's Xiong'an Campus needs to be closely integrated with the new area's strategic needs, such as geothermal energy development and ecological restoration [1, 2].

3. Core strategies for urban-university integration

3.1. Functional collaboration: three dimensions from closure to openness

3.1.1. Scientific research innovation and industrial docking

Lay out a "Geoscience Innovation Corridor" on the North side of the campus to form an "industry-university-research integration" chain with the Xiong'an Science and Technology Innovation Park, sharing laboratories, pilot bases, and incubators. Build university-enterprise joint research and development centers through underground space connection to promote the transformation of achievements in the fields of geological exploration and new energy technology.

3.1.2. Sharing of educational resources with the city

Open libraries, gymnasiums, and academic lecture halls to the urban public service system, and implement time-sharing and zoning management [3, 4]. Offer public geological science courses for citizens, and establish an "Urban Geological Museum" as a cultural exchange node between the university and the city.

3.1.3. Integration of living facilities and communities

Mix student apartments with surrounding residential areas, and configure facilities such as community commerce and shared kitchens to promote social integration between teachers, students, and citizens. Use campus green spaces to create a "Campus Vitality Belt," connecting urban parks and slow-moving systems to form a 24-hour open public space network.

3.2. Spatial optimization: boundary dissolution and composite utilization

3.2.1. Flexible boundary design

Replace walls with ecological green corridors and pedestrian streets, and blur the physical boundaries between the university and the city through landscape transition areas (such as wetland parks and sunken plazas). Adopt a "mo-

dular building cluster" to reserve flexible space for future functional expansion.

3.2.2. Three-dimensional space development

The underground space integrates transportation hubs, warehousing logistics, and energy pipelines, and the above-ground buildings adopt a superimposed structure to balance teaching, research, and commercial functions.

4. Four technical pathways for urban-university integration

4.1. Green ecology and sustainable development

(1) Ecological base construction: Utilize the university's disciplinary advantages to design a sponge campus system, and realize water resource recycling through rain gardens, permeable pavement, and artificial wetlands.

(2) Low-carbon technology integration: Promote ground-source heat pumps, building-integrated photovoltaic (BIPV) systems, and zero-carbon building technologies, reducing campus carbon emission intensity by 40% compared with traditional models.

4.2. Construction of intelligent and smart campus

(1) Digital twin platform: Build a campus management hub based on BIM+GIS technology to monitor energy consumption, security, and traffic flow in real time.

(2) AI-empowered services: Deploy intelligent guided robots, unmanned delivery systems, and virtual simulation laboratories to improve operational efficiency and user experience.

4.3. Cultural inheritance and innovation

(1) Expression of regional culture: Extract elements of the Baiyangdian water network and integrate the image of "layered geology" into building facades and landscape design.

(2) Activation of school history genes: Restore iconic scenes of the Beijing campus through AR technology to establish an emotional connection between the old and new campuses.

4.4. Optimization of transportation and public spaces

(1) Slow-moving priority network: Construct a transportation system dominated by "cycling and walking," and realize pedestrian-vehicle separation through aerial corridors and underground passages.

(2) Seamless public transport connection: Set up subway transfer stations in the core campus area, and customize "Urban-University Direct Buses" during peak hours to shorten the commute time to within 15 minutes.

5. Innovative value of urban-university integration

The contents in **Table 1** fully demonstrate that Xiong'an New Area reconstructs the relationship between universities and cities through multi-scale integration strategies, seeing the big from the small and covering all aspects. First, spatial restructuring involves replacing the traditional closed-campus model with a strategy of "large openness and small enclosure," combining overall openness with clustered, enclosed management to facilitate the flow and sharing of resources. Second, institutional innovation aims to ensure that talent is both willing to relocate and able to establish long-term roots. This is supported by urban–rural integration policies between Beijing and Xiong'an—such as the "three no less than" principle and shared public service provision lists. Third, ecological

empowerment is achieved by transforming green infrastructure—such as botanical gardens and rainwater collection systems—into multifunctional spaces for teaching and public use, thereby reinforcing the principles of sustainable development.

This model not only solves the problem of industrial-urban fragmentation in university relocation but also takes functional mixing, resource sharing, and scene symbiosis as the core, providing a Chinese paradigm of "industry-education-city-person" integration for global new town development.

Table 1. Six key points for the construction of new campuses for relocated universities in Xiong'an

Key points	Specific measures	Integration value
Planning and layout integration	Adopt the "group growth, circular integration" model: the teaching core area is inside, public services are in the middle, and scientific research and incubation facilities are arranged along the periphery.	Break the boundaries of closed campuses and achieve functional gradient penetration.
Sharing of functional facilities	Cultural and sports venues (such as the activity center of University of Science and Technology Beijing), experimental resources, and auditoriums are open to citizens; community commerce is embedded in student living areas to form a "15-minute living circle" [5].	Improve the utilization rate of public resources and activate urban vitality.
Interconnection of ecological landscapes	Beijing Forestry University creates a "boundless botanical garden," and the campus water system green belt is connected with the urban ecological corridor [6].	Co-cultivate ecological resources and shape green open spaces.
Interconnection of transportation networks	Campus roads are open to the public in sections and time slots to connect with urban road networks; supporting housing in the university town is within walking distance of the campus to reduce commuting pressure.	Construct an efficient and low-carbon urban-university transportation system.
Urban-rural integration of service guarantee	Provide "one-stop" school transfer services for relocated personnel; welfare benefits for Beijing registered personnel shall be "three no less than" the Beijing level (entrepreneurship, housing, treatment).	Eliminate barriers to talent flow and strengthen a sense of belonging.
Integration of industry, education, research, and city	University germplasm resource banks (such as those of Beijing Forestry University) and scientific innovation platforms are docked with Xiong'an's industries; the vocational education park implements a comprehensive demonstration zone of "teaching-research-living-commerce."	Drive innovative economy and empower regional development.

6. Conclusion

The construction of the Xiong'an Campus of China University of Geosciences (Beijing) marks the transformation of universities from "functional relocation" to "value reconstruction." Through the top-level design of urban-university integration, multi-dimensional win-win results in education, industry, and life can be achieved. In the future, it is necessary to further explore the governance mechanisms and interest distribution models of urban-university co-construction, and promote Xiong'an New Area to become a global model of urban-university integrated development.

Disclosure statement

The author declares no conflict of interest.

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