

Journal of World Architecture

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Anna University, India

BIO-BYWORD SCIENTIFIC PUBLISHING PTY LTD

(619 649 400)

Level 10

50 Clarence Street

SYDNEY NSW 2000

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Complimentary Copy



ISSN (ONLINE): 2208-3499

ISSN (PRINT): 2208-3480



Journal of World Architecture

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ISSN (Online): 2208-3499

ISSN (Print) : 2208-3480

Submission open for November - 2021

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Journal of World Architecture

Using Foucault's theory to analyze the relationship between people, organizations, space, power and boundary

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Abstract: This article will use Foucault's theory to critically consider the relationship between power, people, space and society at the boundary where different powers conflict with each other. Through the analysis of the project "Decolonizing Al Nada," this article will discuss how relations with those with power and social mentality are reframed at the border through the reconstruction of architecture and space.

Keywords: Foucault's theory; Power; Boundary; Reconstruction

Publication date: September 2021; **Online publication:** September 30, 2021

1. Introduction



Figure 1. Aerial view of Al Nada right before the Israeli colonies demolition of 2008

The project Destruction and Reconstruction is located in Al Nada, the northernmost part of Beit Hanoun, which is on the border of the conflict between the Palestinian and Israeli regimes (see **Figure 1**). Here, wars and armed conflicts have caused a large number of refugees to become homeless. This project is a

social housing project initiated by the government using a top-down approach to resettle Palestinian returnees. The main goal of this project is to reconstruct the residential spaces destroyed during the war, add some new housing units, and renew the infrastructure and public spaces in the city ^[1]. In the process of construction, the designers challenged the power structures of the borders and created a new sense of community for the inhabitants by using architectural and spatial interventions. The following article will use Foucault's theoretical framework to analyze this project in-depth in terms of the two themes of boundary and power and explore how architecture challenges power relations.

2. Considering Boundary by Using Foucault's Theory

In Foucault's theory, in order to explain more clearly the operation mode of power, he mentioned the term government. The meaning of the government here not only refers to the political structure or the governance of the nation but also indicates the possible ways of guiding the actions of individuals or organizations, while also suggesting that governance is the construction of the possible limits of the activities of people ^[2]. The area where two fields of action are adjacent to each other forms the boundary, and the boundary is not something that exists naturally; it is a highly architected place that is reproduced by people crossing it and the power that exists on both sides of the boundary can be clearly demonstrated when the subject crosses it ^[3]. For example, at the borders of two countries or regimes, the field of people's behavior and activities is monitored and limited by power. Only with the authorization or approval of the powers on both sides of the border can people cross the border; otherwise, they are considered to cross the border illegally and would be punished by powers.

In the Destruction and Reconstruction project, the Al Nada neighborhood is located at the border between the Israeli and Palestinian regimes, where the Palestinian-Israeli conflict is relatively intense, and where the entire area is not only under blockade, but also at risk of war at any moment. Here, power has become more obvious, and the Palestinian and Israeli regimes have tightened their regulations on the border and the subjects that are in the border area. After the war, the original inhabitants of Beit Hanon became displaced refugees. This area, which was previously Palestinian territory, has now become a border between the two regimes. The spatial manifestation of this change is that the separation wall has replaced some of the temporary dividing lines and created places such as security zones and checkpoints. This area of Beit Hanon has also experienced continuous destruction, expulsion, reconstruction and return during the ongoing war between the two regimes. At this border, Palestinian returnees are a marginalized group, distinct from ordinary citizens, who are simultaneously regulated and restricted by both Palestinian and Israeli authorities. In this project, the construction of the Al Nada community not only provides a shelter for Palestinian returnees but also serves as an expression of opposition to the Israeli colonization of the Palestine Gaza region. At this border, there is an inequality of power relations. In order to protect these returnees from the next attack, these reconstructed buildings need to be protective, but the construction of concrete-reinforced buildings in Gaza puts these refugees at greater risk, as these reinforced shelters become the preferred site for the next Israeli targeting, and the spaces reconstructed to protect these refugees may eventually become the reason for new attacks and destruction. In addition, any ideas for the reconstruction and renovation of refuge spaces must be communicated to the Israeli government, and the relevant materials used in the construction process need to be authorized and approved by the Israeli regime ^[1]. The Israeli government hopes to strengthen its power through this series of surveillance, management and control tools, while the Palestinian government hopes to oppose the Israeli government's colonization and destruction through this project.

3. Applying Foucault's Theory to Understand Power

Foucault's theory mentioned that power is subject less, a relationship, a system of interlocking networks

inherent in the institution itself. People are not the holders of power but are part of the network of power relations as the tools to operate it ^[3]. In the “Decolonizing Al Nada project,” for example, there is also a system of power in the Gaza region in which the Palestinian government, the Israeli government and the refugees are all part of this power relationship. This region has experienced war and strife, and the refugees are constantly moving, but the power relationship is always present, and in the process of destruction and reconstruction, the government wants to strengthen its power and position through colonization, supervision and control. In this power relationship, the refugees seem to be the objects of power implementation, in a marginalized and vulnerable position, but they are also constantly changing the power relationship in the system by constructing a sense of community and coalition.

Power and resistance are coexistent. According to Foucault, where there is power, there is always resistance. Resistance is a form of intransigence and opposition to the relations of control in existing power ^[4]. In border areas, inequalities of race, nationality, and gender produce oppression and also breed resistance ^[5]. In the “Decolonizing Al Nada project,” the Gaza region is at the border of the Palestinian and Israeli regimes. There are multiple resistances within this complex network of power. For example, the Israeli government’s war against Palestinian Gaza is a form of dissatisfaction and resistance to the existing power relations, and they want to acquire more land and power through war and colonization. In addition, the designers of the Al Nada complex also want to resist Israeli colonization by constructing a common space and sense of community in the process of reconstruction, both of which are not against a particular government, institution or group, but rather to reconstruct the power relations that exist in Gaza. Since the Israeli government considers any public space that can gather more than five people to be a potential threat, in this project the designer wants to transform private spaces into common spaces instead of public spaces, where people can communicate, organize activities and maintain a collective consciousness, and he wants to avoid over-designing these spaces and create a common space that can only exist with people’s participation (see **Figure 2**). This reconstruction breaks down old power relations and reconstructs new alliances. The refugees, who have experienced war, reconstruction and return together, interact and get to know each other in these spaces. These spaces enhance the emotional connection between refugees, bringing a new collective consciousness and reconstructing power relations, changing the old social structure.



Figure 2. Designing the common space

4. Conclusion

Borders are not only places where power can be demonstrated, but also where power is implemented. At

the borders, conflicts between regimes and religions are more evident and power relations are relatively more complex. In the project “Destruction and Reconstruction,” the Gaza region, as a border space, has experienced shifts in power through constant wars and colonization, and at the same time, it has also nurtured resistance. By examining Foucault’s theory and analyzing this project, the author recognized the inequality of power systems within the borders of regime and religion and the ability of architectural design to act as a means of intervention to challenge existing power relationships. This intervention can change the social structure and mentality of the inhabitants, creating a sense of community and empowering some marginalized groups. For urban and architectural designers, the process of practice cannot be limited to spatial design but needs to expand the scope of thinking to critically understand the relationship between space, people, power and social structures. In the design process, architects need to take a practical approach, place architecture in social situations and contexts, and think about the relationship between architectural space and existing social contexts from multiple perspectives

Disclosure statement

The author declares no conflict of interest.

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Research on the Mode Transformation and Innovation of Urban Planning Management

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Abstract: As an important part of today's social development, cities are also an important guarantee for the improvement of people's living standards. As an important model of urban spatial layout, urban planning and management plays an important role in the development of urban economy, politics and culture. Based on this, this paper takes "urban planning and management" as the research theme, analyzes the existing planning model, and starts from the aspects of content and form, improves the pertinence and directivity of the existing planning system, so as to provide valuable reference for experts in the field.

Keywords: Urban planning; Management mode; Innovative thinking

Publication date: September 2021; **Online publication:** September 30, 2021

1. Improve the urban construction planning and management system, promote the green development of cities

Urban planning is the basis of urban development. In the new era, relevant departments should further improve the urban construction planning management system and light the beacon for urban development. Secondly, government departments should also actively play their guiding role, change their functions, reduce unnecessary administrative intervention, and ensure that the planning and management system is in line with the general trend of market economy development. At the same time, we should do a good job of information feedback, further analyze the planning information in this way, and provide favorable suggestions for relevant decision-makers. In addition, decision makers and specific staff should constantly improve their comprehensive business ability, analysis ability and management level, and adopt the working distance mechanism of wide area consultation, professional decision-making team and finally leading decision-making level to promote the think tank development of urban planning.

2. Apply Internet technologies to land use management and improve management effectiveness

Land use management is also the most important work of urban planning. In the context of the new era, natural space planning managers should make full use of modern scientific tools, combine professional and internet technology, and use comprehensive technical means to manage land space resources. On this basis, the natural resources and housing construction departments can also use small UAVs to establish urban land monitoring stations, build local ad hoc communication networks, and classify them according to the spatial attributes of urban land. Of course, relevant departments can also develop corresponding management information systems with the help of GIS technology. In addition, in order to further improve the efficiency of land use management, relevant departments should also create a transparent work management environment to regularly improve the management system, for example, from the following

two levels:

2.1. Improve project preparation

Project preparation is an indispensable part of urban planning, and it also provides an open and transparent environment for urban planning. In the process of system implementation, the management publicity system is usually selected to enable each department to clarify its own responsibilities and specific approval process, publicize laws and regulations, and hold accountable the departments that do not implement management responsibilities, so as to make practical planning through the above measures.

2.2. Building BIM information management

In the process of urban planning, the staff of relevant departments can also use BIM technology for ground facilities planning and design, and pay attention to the construction of database on this basis. At the same time, the GIS technology operation interface has rich functions, including menus, parameters, icons and other information. In this case, the relevant managers can also adjust the parameters according to the actual needs to build a stable information system. In the application process of this technology, we found that this technology also has a significant advantage: it can trace historical data. In this way, it can also facilitate planners to adjust all kinds of data in time and give full play to the function and social value of land ^[1].

3. Pay attention to the management of human settlements and improve the quality of life

3.1. Pay attention to spatial comprehensive function planning

3.1.1. Urban and rural land space intensification

As an important strategy for China's social development, the construction of ecological civilization is also an important guidance for the coordinated development of ecological environment and human society. In order to realize the "multi compliance and one" urban-rural space intensive development, the local government should change the traditional construction ideas, strengthen the urban space utilization rate, and explore a variety of space utilization modes according to the local population base and industrial characteristics, so as to provide a strong guarantee for the sustainable development of urban construction.

3.1.2. Spatial networking of urban and rural land

At present, in the process of adjusting the urban and rural spatial utilization mode, we should adhere to the policy of "people-oriented and sustainable development," actively explore a variety of spatial optimization modes, make dual connection and overall consideration, create a multi-level and multi gradient development pattern, realize the unified development of ecological civilization and urban construction, and ensure that people live and work in peace and contentment and the vigorous development of scientific and technological construction, form a benign urban spatial development framework.

3.1.3. Urban and rural land space functionalization

The essence of ecological civilization lies in the coordinated development of environment and society. Social environment and natural environment coexist and develop. Only by achieving the harmonious unity of nature and society can we build a sustainable urban ecological system. Urban construction should first plan the overall structure, make rational use of every inch of land, do not waste every resource, and use cities to drive rural areas to achieve integrated development.

3.2. Dynamic planning and management of transportation system

3.2.1. Pay attention to traffic network planning

As an important part of urban operation, traffic network has very important practical significance in improving the overall benefits of the city. Therefore, in the actual planning process, we should pay attention to the layout and division of traffic network, sort out the jurisdiction between roads and cities, optimize the

spatial layout, give full play to the function of road traffic system, and make it better serve urban development. In view of the differences in the overall economic level and development status of the city, we should follow the planning principle of “advance, moderation, science and coordination,” establish analysis and early warning models based on the reality of urban development, grid and radiate urban roads, improve road utilization, and lay the foundation for subsequent urban planning and construction.

3.2.2. Building a multi-mode urban transportation system

With the continuous development of social economy, the forms of public transport are becoming more and more diversified. The emergence of bus, subway and shared bicycle also marks the complexity and diversity of today’s road system. At present, China’s urban public transport network is often inflexible in the actual use process, the development of trunk lines is relatively perfect, the use frequency is high, and there are many uncertainties in the traffic conditions of auxiliary lines. In urban construction planning, road construction is the key planning content. We should focus on analyzing the local street road conditions and building a high-quality urban transportation system [2].

3.3. Carry out green space planning and management

Green space management is an important part of urban planning management. In the process of management, relevant personnel should strictly abide by the guidelines (“the requirements of three districts and four lines”), on this basis, establish the concept of green management, strengthen the protection of urban green resources, reflect the regional and contemporary characteristics of the city, and make green space the highlight of urban landscape. In addition, the hierarchical characteristics of greening should be highlighted in the planning process, and a variety of greening methods should be introduced, such as vertical greening, roof garden, etc. In terms of plant selection, take into account the practicability and aesthetics of plants, create a dynamic three-dimensional space, and make the urban three-dimensional landscape plumper.

4. Strengthen the overall planning and utilization of aboveground and underground space resources in key areas of urban and rural planning

In the process of urban spatial planning, relevant personnel should put the aboveground and underground space planning in the first place and pay attention to the overall planning of the two. In this way, the aboveground and underground space pattern can also be effectively coordinated to make it in a relatively stable state. For example, in the process of traffic line planning, the personnel of transportation, planning and housing construction departments should give priority to the urban-rural express network, and long-distance roads can be planned in the underground space. In the process of spatial planning, we should also coordinate the development of horizontal and vertical directions, such as introducing vertical greening, improving the micro environment inside the traffic, and unifying the aboveground and underground space. In addition, some cities take some main roads of the city as key areas in the process of spatial planning, and lay underground comprehensive pipelines on this basis. In this way, it can also save aboveground space, increase the utilization rate of underground space resources, and coordinate aboveground and underground space. To transfer all urban infrastructure to the underground, its construction should be comprehensively organized and incorporated into an advanced operation mode [3].

5. Pay attention to urban-rural integration planning and promote the development of urban-rural integration

5.1. Create a planning system covering urban and rural areas

Coordinated urban and rural development has always been the theme of urban development. Under the new era background, relevant departments can change the previous development concept, create a planning system covering urban and rural areas, take coordinated urban and rural development as the theme, and

improve relevant development planning on this basis. In the planning process, we should also focus on the analysis of regional economic development and land use, change the previous planning concept and innovate the management system. Relevant personnel should also take the coordination of human land relations as the focus of development to form a complete planning system. Secondly, in the process of urban and rural planning, we should also pay attention to the coordination of urban and rural resources, further standardize the land use system, make efficient and intensive use of land, and realize the rational distribution of land resources. Thirdly, in the planning process, we should dynamically adjust the planning scheme in combination with the changing characteristics of urban population to form a certain spatial industrial structure and land layout. Increase publicity on the key points of rural revitalization, pay attention to the planning, construction and operation management of characteristic villages, ancient residential villages and historical and cultural villages, give priority to the development of human settlements, and build a bridge for the common development of urban and rural areas. Do a good job in the development system of infrastructure sharing, strengthen mutual benefit and exchange among regions, and promote the common development of urban and rural areas (**Figure 1.**) ^[4].

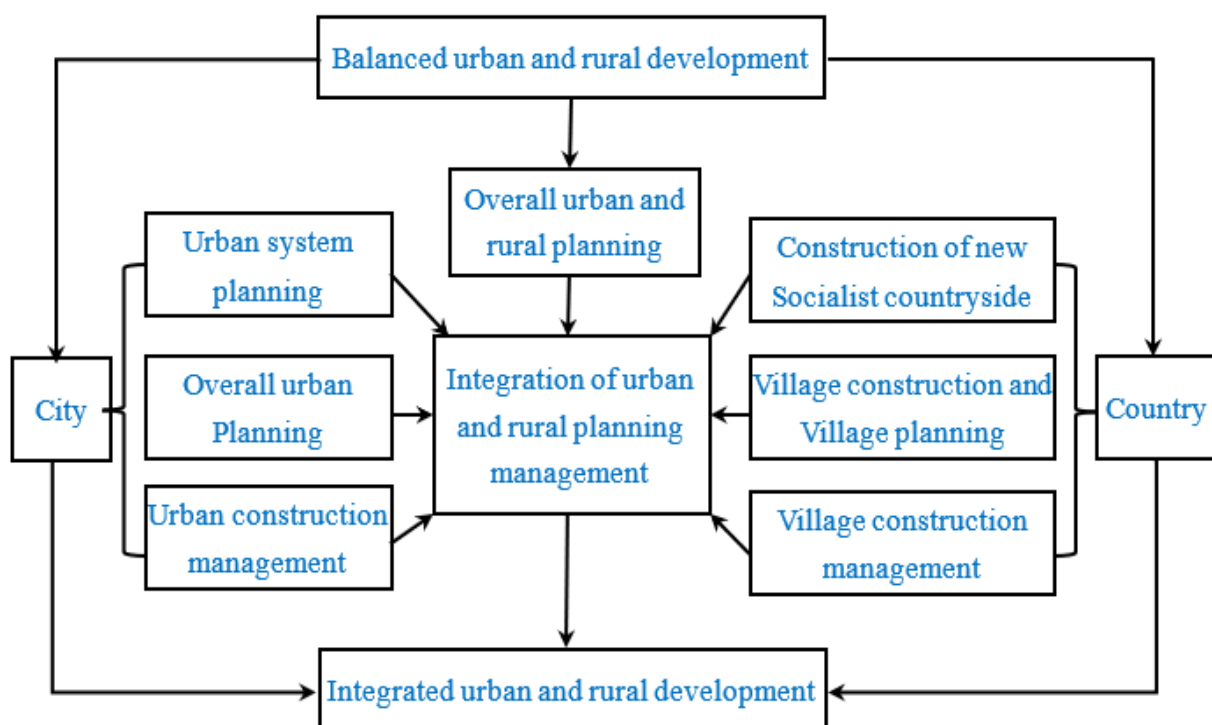


Figure 1. Urban-rural integration planning

5.2. Apply high and new technology for management

With the emergence of high and new technology, urban and rural planning and management has stepped into the expressway. Under the background of information age, relevant departments can carry out urban and rural planning and management with the help of high and new technology. For example, with the help of GIS and RS technology for spatial planning, these two technologies provide planners with visual space, which is conducive to assisting urban and rural planning management to make new progress. In addition, relevant personnel can also consult various data information with the help of these two technologies to reduce the error rate of decision-making. In addition, these two technologies also have the functions of statistics and monitoring, which can cooperate with other high and new technologies, such as remote sensing technology and geographic information technology, create a dynamic database, further improve the management efficiency and make the planning scheme more in line with the actual development

characteristics.

To sum up, urban planning management is an important measure to promote urban ecological environment construction and overall urban and rural development. In the context of the new era, relevant personnel should reform the previous planning ideas, promote the green development of cities by improving the urban construction planning and management system, and apply Internet technology for land management to improve the effectiveness of management; Pay attention to the management of human settlements and improve the quality of life; Pay attention to urban-rural integration planning and promote the development of urban-rural integration. Take multiple measures at the same time, adhere to the ecological space of giving priority to the development of human settlements, and promote the sustainable development of cities in China.

Disclosure statement

The author declares no conflict of interest.

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Design of Special-shaped Interchange between Expressway and Urban Road in Mountainous Cities

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Abstract: Driven by the rapid economic development, the development of transportation in China has begun to move towards mountainous areas. The climate environment, topography and landform of mountainous cities are different from those of plain areas. In mountainous cities, the area of opposite interchanges between expressways and urban roads is generally large, which has a certain contradiction with the topographic conditions of mountainous cities. Therefore, it is necessary to reasonably design the opposite interchanges between expressways and urban roads in mountainous cities. The author explores and analyzes the factors restricting the special-shaped interchange between expressway and urban road in mountainous cities and the main forms of special-shaped interchange, and puts forward a reasonable design scheme, hoping to make a smooth development of the special-shaped interchange in mountainous cities.

Keywords: Mountainous cities; Expressway; Urban Road; Special-shaped; Interchange

Publication date: September 2021; **Online publication:** September 30, 2021

1. Introduction

The special-shaped interchange between expressway and urban road is usually located around the urban area of mountainous cities, and the environmental conditions in mountainous areas are generally complex, which requires that the design work must be done in advance when building the special-shaped interchange between expressway and urban road in mountainous cities. In the process of specific design, the primary task is to analyze the main characteristics of special-shaped interchanges in mountainous urban expressways and urban roads. Secondly, before specific design, it is also necessary to accurately understand the main factors restricting the construction of special-shaped interchanges. At the same time, we also need to understand the main forms of special-shaped interchange, so as to better complete the design work.

2. Factors restricting special-shaped interchange between expressway and urban road in Mountainous Cities

In the design of special-shaped interchange between expressway and urban road in mountainous cities, there are many factors that restrict the implementation of the design scheme of special-shaped interchange.

2.1. Limit of height difference

One of the most obvious characteristics of mountainous cities is that the terrain fluctuates greatly and frequently, the breaking height is low, and there is a large height difference. In the selection of expressway line, the way of line expansion can be used to avoid restricting the implementation of special-shaped interactive interchange design scheme due to large height difference. In the specific design of special-shaped interchange between urban expressway and urban road in mountainous areas, if there is a large height difference between expressway, urban road main line and intersection line or continuous line, it is

necessary to use spiral line development and back line development, natural line development and other ways to meet the requirements of the longitudinal slope of the ramp in the special-shaped interchange.

2.2. Plane limit

It is easy to be restricted by the plane when designing the special-shaped interchange between the expressway and the urban road in mountain city. That is, it is easy to be limited by obstacles when choosing the main section of urban expressway and urban road in mountainous areas. At this time, you can choose to remove them directly or avoid the restrictions of obstacles through the setting of bridges and tunnels. It is precisely because the special-shaped interchange between expressway and urban road in mountainous cities is limited by the land, so the development needs of the city should be considered in the design.

3. Main forms of special-shaped interchange

3.1. A deformable interchange where ramps are separated from each other

The land area of ordinary interchange is generally large, and the terrain of mountainous cities is usually complex, so it is difficult to meet the land demand of ordinary interchange construction ^[1]. If the interchange ramps are separated, although the total floor area may increase from the overall point of view, the floor area will decrease from the local point of view. Therefore, when designing urban highways and urban roads in mountainous areas, the interchange ramp can be divided into two parts by using the open space between two smaller mountains, which can not only completely preserve the original landform of mountainous cities, but also reduce the damage to mountains.

3.2. A deformable interchange where main lines are separated from each other

The deformation interchange with the main line separated from each other is a special-shaped interchange form in which the left and right lines of urban expressway and urban road in mountainous areas are distributed on both sides of the coast or mountain bag, and intersect it with another main line through the adoption of separated subgrade.

4. Reasonable design scheme of special-shaped interchange between expressway and urban road in mountainous cities

4.1. Design of separation ramp special-shaped interchange for expressway and city road in mountain city

The main reason for the ramp separation of Expressway and urban road conventional interchanges in mountainous cities is that there are obstacles in the setting area of interchanges, which limits the setting of conventional interchanges. For example, there are obstacles when setting ramps in sections such as mountain mouth, raised Highlands, ponds and natural pits ^[2]. Although the layout of conventional overpasses can also be carried out technically, long-span bridges, large-scale filling and excavation or demolition are usually required at that time, which will cause damage to the surrounding environment. Obviously, this is inconsistent with the needs of urban development, which is not conducive to ecological environmental protection, but also to improving the economy of project construction. Therefore, when designing the special-shaped interchange between expressway and urban road in mountainous cities in these sections, we must take into account the needs of urban development, and the applicability of interchange can be improved by means of ramp separation.

When arranging expressway lines in mountainous areas, it is necessary to conduct comprehensive analysis and consideration from the perspectives of preventing massive excavation of mountains, reducing the emergence of bridge and tunnel structures, protecting the surrounding ecological environment, reducing the difficulty of expressway construction and improving expressway benefits. The line location of

Expressway in mountainous area is usually more suitable to be arranged at the foot of the hillside. For mountainous areas, the terrain connecting with the foot of the hillside is diverse, mainly including river banks, valleys, flat lands, etc., and there may be a prominent terrain at the connection, which is usually called “mountain mouth.” Mountain mouth is a terrain often faced by mountainous urban expressway in route selection. When designing special-shaped interchange at this terrain, comprehensive analysis should be carried out from the aspects of construction technology and project cost control. Usually, short tunnels can be used to ensure the rapidity and environmental protection of expressways.

4.2. Design of connect line development special-shaped interchange between urban expressway and urban road in mountainous area

For mountainous urban expressways and urban roads, the connecting line is the collection of turning off ramps of expressways and urban roads, which can overcome all the problems faced by turning ramps. If there are obstacles in the ramp, it can be bypassed or partially expanded. If there are no obstacles and restrictions on the ramp, the connecting line can be set in the right turn quadrant with relatively large traffic flow, as long as the length of the connecting line meets the setting of toll stations and the demand of main lines for deceleration through the ramp^[3]. However, the environment in mountainous areas is very complex. When designing special-shaped interchange, the requirements for the land scope in the plane and the height difference between roads are also strict. And high-speed difference and plane limitation usually exist together. At this time, when designing the special-shaped interchange bus for the expansion of urban expressway and urban road connecting lines in mountainous areas, upside down, spiral, turn back and natural expansion can be adopted, which can not only overcome the limitation of height difference, but also break through the plane limitation by means of line expansion and avoidance. Of course, for different wire spreading methods, they have their own advantages and disadvantages, and the applicable conditions are also different. Therefore, when selecting the line expansion mode, it can be selected from the perspectives of traffic capacity, driving speed, driver operation ability, project cost, construction difficulty, urban development demand and topographic conditions of urban expressways and urban roads in mountainous areas.

4.3. Design of right turn ramp special-shaped interchange between urban expressway and urban road in mountainous area

If you want to realize the smooth operation of right turn special-shaped ramps of urban expressways and urban roads in mountainous areas, you need to cross up or down with the main line twice. On one hand, the smooth operation of the right turn ramp is realized through continuous 270 degree left turn by using the confluence or diversion with the semi directional left turn ramp^[4]. The route is usually located in the middle of the ring ramp and semi directional ramp, so the construction technology, operation capacity and operation speed are also between the ring ramp and semi directional ramp. Compared with the forms of directly connected right turn ramps, the detour length of right turn special-shaped ramps is significantly longer, various parameters and indicators are reduced, and the adaptability of ring ramps and turning traffic volume is basically the same, but it can complete merging with the main line in advance or diversion in a later step. On the other hand, use the ring ramp to merge or divert the right turn special-shaped ramp, and then complete the right turn through the crossing of the main line. Because this form of right turn ramp is realized by means of ring ramp, the driver needs to pass through a section of S-shaped Road, which requires high operation level of the driver, and the running speed will be limited. Therefore, this design method is only applicable to the case of obstacles on the right turn ramp.

5. Conclusion

To sum up, when optimizing the design of mountainous urban expressway and urban road special-shaped interchange, we must comprehensively consider and analyze various factors restricting the construction of special-shaped interchange, and understand the main forms of special-shaped interchange. Thus, to better optimize the ramp separation of mountainous urban expressway and urban road, the display of connecting line, right turn ramp special-shaped interchange design, so that it can provide more high-quality expressway and urban road traffic services for the masses.

Disclosure statement

The author declares no conflict of interest.

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Study on the Geohazard Distribution Laws and Hazard-Causing Mechanism in Menghai County of Yunnan Province

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Abstract: The study area is located at the southwest border of Yunnan Province and the southward extended part of Nushan Mountain, with complex and fragile geo-environmental conditions. Deep geological survey and mathematical analytical investigation on the geohazard distribution and hazard-causing mechanisms in this area were carried out in this study. The results revealed that: (1) The development of geohazards was affected differently by different slope shapes, slope structures and elevations; (2) Most of the geohazards were developed in medium shallow cut ridge-like medium-height mountainous geomorphological region and shallow cut steamed bun-like low and medium-height mountainous geomorphological region, and they were relatively concentrated on tectonic zones like fault zones; (3) The slopes formed by loose earth piling up on the surface of Indo-Chinese magmatic rock and Lancang Group metamorphic rock formations were most prone to slope instability and even landslide. The deep study on the geohazard distribution and hazard-causing mechanisms can provide geoscientific basis and reference for the prevention and mitigation work of geohazards under similar geo-environmental conditions.

Keywords: Menghai County; Geohazard; Distribution law; Hazard-causing mechanism

Publication date: September 2021; **Online publication:** September 30, 2021

1. Introduction

Located in Menghai County in the southwest of Yunnan Province, the study area adjoins Jinghong City in the east, Simao City in the northeast, and Lancang County in the northwest, and borders Burma in the southwest, with the border line of 146.6 km and total area of 5,511 km², and the traffic conditions are quite convenient in the area. Besides, the study area is featured by intense terrain cutting, diversified formation lithologies and complex geological structures. With the continuous expansion and accelerated development, the geo-environmental conditions in this study area have been considerably changed: Free faces are generated due to mining; the gangue stacking in gullies has aggravated the risks; the slope stability is degraded owing to the mountain excavation; the site leveling and supporting are ineffective; the waste slags produced by engineering construction are arbitrarily piled up; the gully bank reconstruction in reservoirs induces instable bank slopes; geohazards are induced by the ditch leakage, all of which directly harm the life and property safety of ethnic minorities at border and restrict the local economic development. There is almost no cognition or study regarding single hazard-bearing body and region in this study area at present. Hence, it is urgent and necessary to study the spatial distribution of geohazards in the study area and analyze the hazard-causing laws. In recent years, the author has participated in the detailed investigation work on

geohazards in this area at a scale proportion of 1:50,000. This professional investigation was implemented through point-line-surface combination. The “3S” new technology was actively utilized to guide the ground investigation work based on the remote sensing survey results. A total of 593 settlements, 31 mines and 29 schools in mountainous areas were investigated, the remote sensing interpretation covered 5,451 km², the 1:50,000 measurement (isometric projection) of geohazards was 826.65 km², and the engineering geological profile survey involved 10.23 km. By combining the geohazards taking place in this area in recent years as well as the related checking and inspection results, the spatial distribution of geohazards in the study area and hazard-causing laws were expounded and explored in detail from the aspects of topography and landform, geological structure, formation lithology, etc. The deep study on the distribution of geohazards in the study area and hazard-causing laws can provide geoscience basis and reference for the hazard prevention and mitigation work, such as local (adjacent counties included) geohazard control, relocation and site selection for the poverty alleviation in different places and site selection for engineering construction [1-3].

2. Geo-environmental Background of the Study Area

The study area, which is seated on the south segment of longitudinal valley of Hengduan Mountains, is a southward extended part of Nushan Mountains. It is high in the northwest and low in the southeast, high and steep at the perimeter and gentle in the middle, and mountain peaks, hills and flat dams are mutually staggered. In the area, the highest altitude is 2,429 m (mean peak of Huazhuliangzi), boasting the first high peak within the prefecture; the lowest point is located at the intersection between Nanju River and Nanlan River, with the altitude of 535 m and relative altitude difference of 1,894 m; the exposed strata in the study area, from new to old, are mainly Quaternary system, Cretaceous system, Jurassic system, Triassic system, Permian system, Carboniferous system and upper Proterozoic Lancang Group, and the dominant lithologies are hard-soft rock masses like sandstone, mudstone, tuff, andesite, granite, rhyolite and schist; the study area is situated at the south segment of Changning-Lancang fold belt, which is the southward extended part of Sanjiang fold system, the geotectonic structure here is an eugeosyncline fold belt that presents long-term polycyclic development, the third-order tectonic unit belongs to new Yingpan-Mengman median uplift, the main tectonic line approximately follows the south-north direction, which is basically identical with the direction of strata, being an arc that bulges eastward. The northwest press-twist faults play a dominant role in the study area, and the deep major fault of Lancang River has obvious abnormalities according to the aeromagnetic map and gravity survey. It is speculated that the fault depth reaches the Si-Mg layer, which is referred to the suture line between Indian Plate and Eurasian Plate. Moreover, affected by the obduction and uplift of Eurasian Plate, the structure line is mainly manifested by the intermittent upward motion and fault activity between crustal plates, frequent seismic activities, widely distributed geothermal hot springs, etc. Under the influence of regional tectonic activities, the rock structure is loose and broken in the study area, with low mechanical strength and obvious weathering differences (the thickness of completely weathered zone can reach 15 m). Spheroidal weathering takes place in the granite zone, and the unfavorable rock association and groundwater infiltration provide favorable conditions for the occurrence of geohazards [4].

3. Current Geohazard Status in the Study Area

Geohazards are developed at 159 places in the study area, including three geohazard types: landslide, collapse and debris flow [4]. Landslide occurs at 149 places, accounting for 93.7% of total number of geohazards, debris flow at 9 places (5.66%) and collapse at 1 place (0.63%).

According to the substance and structure, landslide is divided into three types: collapsing accumulation body landslide, diluvial-residual landslide and rock landslide, where small-scale shallow earth landslide,

the “chain effect” of this geohazard is apparent ^[5]. Landslide stability is divided into three levels: stable, relatively stable and unstable, and nowadays, most landslides are under unstable state. The debris flow developing in the study area is mainly small-scale debris flow. According to the drainage basin form, debris flow is divided into gully-type debris flow and slope surface-type debris flow, where the former plays a dominant role, characterized by “long gully, large catchment area, water flow throughout the year, distinct three zones and steep bank slope.” The latter is featured by “small scale, great vegetation destruction, strong surface erosion, distinct three zones, steep bank slope and no obvious circulation area.” There are five debris flows at the development stage and four ones at vigorous stage, and low-susceptibility debris flows are in the majority; one collapse geohazard point is developed in granite strata of the study area. To be specific, the differentially weathered block (rolling) stones go through instability and form dangerous rock masses because the completely weathered sandy soil beneath the stones are scoured by the water flow on the slope surface formed by rainfalls. The differentially weathered dangerous rock masses, which vary in lumpiness, are located on steep slope. As the slope is unstable, the dangerous rock masses are susceptible to instability and tumbling under the actions of rainfall, earthquake, blast vibration, weathering and unloading ^[6-7].

4. Geohazards Distribution and Hazard-Causing Laws in the Study Area

The study area is quite developed with geohazards, with totally 159 points exposed to geohazards and hidden dangers. The geohazards are distributed in six towns, five villages and a farm. Mengsong Village and Xiding Village include the most geohazard points, with 38 and 34 geohazard points, respectively, followed by Daluo Town, Blang Mountain Blang Nationality Village and Glang & Hani Nationality Village, with 19, 17 and 16 geohazard points, respectively. The number of geohazard points distributed in other villages and towns is small (<10). The geohazards present overall nonuniform spatial distribution and local concentrated distribution.

Landslide is a prevailing geohazard in the study area, followed by debris flow. With the enhancement of human engineering activities in recent years, the geohazards show an ever-increasing trend. The geohazards mostly take place in multiple processes, during which one geohazard can trigger the occurrence and development of another or several disasters, thus forming a geohazard chain. In the study area, the number of geohazards presents a growth trend owing to the socioeconomic development, increasing human engineering activities and frequent disastrous weather in recent years. Rainfall is an important factor inducing the geohazards, and thus geohazards occurred frequently at May to October in each year in the study area, and the annual occurrence and development of geohazards is of evident seasonality ^[8-10].

4.1. Topographic conditions and geohazards

4.1.1. Geomorphic units and geohazards

Different geomorphic units represent different altitudes and cutting depths as well as different geological agent and groundwater runoff conditions like weathering, denudation and erosion, which are the direct manifestations of tectonic and lithological differences and objectively decide the significant differences of slope engineering geological characteristics ^[8]. Located at the south of Yunnan Province and southward extended part of Nushan Mountains, the study area is cut by rivers like Lancang River, Nanlan River, Liusha River, Nanguo River and Mengwang River, and most gullies are developed in “V” shape. It is high in the northwest and low in the southeast, high and steep at the perimeter and gentle in the middle, and mountain peaks, hills and flat dams are mutually staggered. The mountainous areas account for 93.45% and dam areas account for 6.55%. According to the genetic type, the landform in the whole area can be divided into tectonic erosion, tectonic denudation and depositional landform. Through analytically studying the 159 geohazards, 71 geohazards are located within medium shallow cut ridge-like medium-height mountainous

geomorphological region and 43 ones occur in shallow cut steamed bun-like low and medium-height mountainous geomorphological region, while others are sporadically distributed in other geomorphological regions (**Figure 1.** and **Figure 2.**), and the geohazard development density is the maximum in the medium shallow cut ridge-like medium-height mountainous geomorphological region. Hence, the topographic and landform features provide advantageous spatial conditions for the generation of geohazards and decide the necessity of geohazard development.

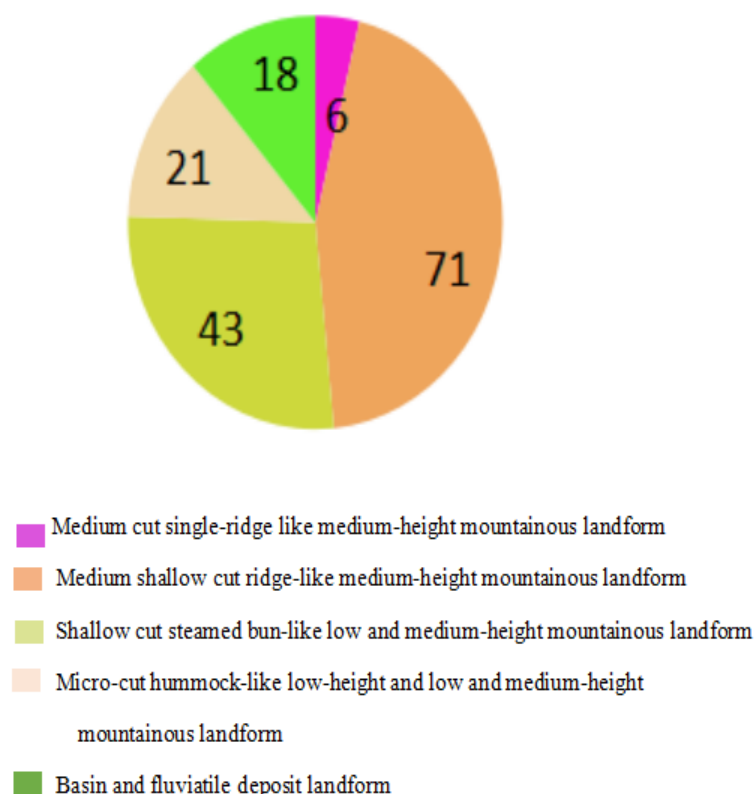


Figure 1. Numbers of geohazards developed in different geomorphological regions

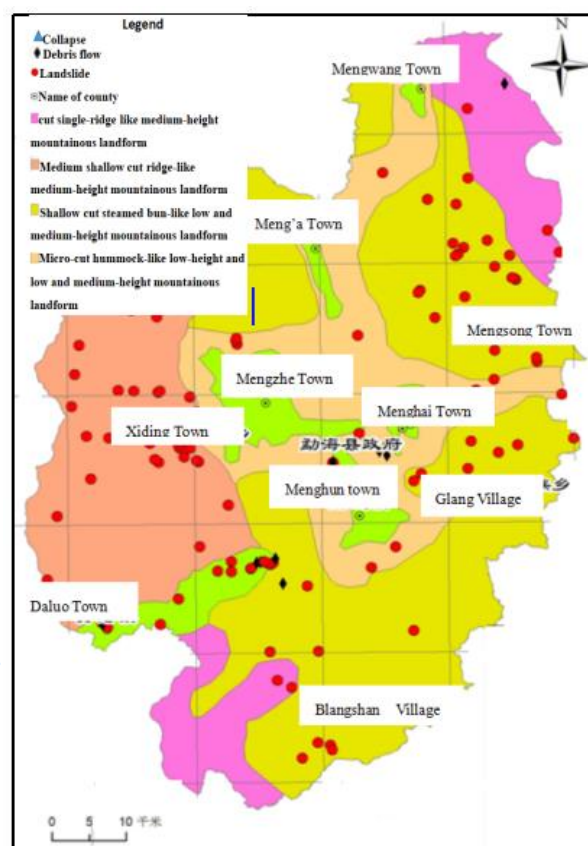


Figure 2. Geohazard development and distribution map of different geomorphological regions in the study area

4.1.2. Topographic slope and geohazards

Most of the 149 landslides analyzed in this study take place within the topographic slope of 20-40°, where there are totally 124 landslide points, accounting for 83.22% of total number of landslides (as shown in **Figure 3.**). Among the nine debris flows, there is only one slope surface-type debris flow, while the other eight ones belong to gully-type debris flows, which are all developed within the average longitudinal slope of 100-300‰ of main gully. Hence, the topographic slope has a great bearing on the generation of landslide and collapse, and the landslide distribution in the study area is obviously controlled by the topographic slope.

4.1.3. Slope forms and geohazards

In the study area, the slope forms are divided into concave slope, straight slope, convex slope and step slope according to the different micro-landforms formed at adaptive crust uplift speed and undercut speed of hydrological network. Among the 149 landslides developed in the study area, 66 ones are generated in concave slopes, accounting for 44.30%; 44 ones in straight slopes (29.53%); 33 ones in convex slopes (22.15%); six ones in step slopes (4.03%) (as shown in **Figure 4.**). Besides, it is worth mentioning that

following the generation of landslide, concave slopes will mostly be formed on some slope forms, which will form new unstable slopes and generate new landslides under the effects of water flow and loading.

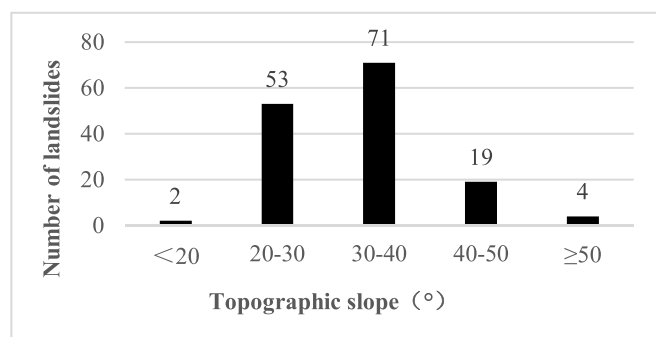


Figure 3: Statistical Graph of Landslide Development at Different Slopes

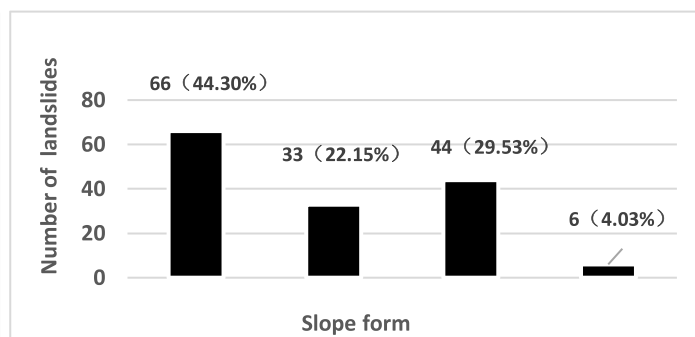


Figure 4: Statistical Graph of Landslide Development with Different Slope Forms

4.1.4. Slope structures

According to the original slope structure type, the slopes in the study area are divided into four types: dip slope, oblique crossing slope, reverse slope and specially structured slope. Among the 149 landslides, 23 ones are developed in dip slopes, accounting for 15.44%; 25 ones in oblique crossing slopes (16.78%); 15 ones in reverse slopes (10.07%); 86 ones in specially structured slopes (57.72%).

4.2. Distribution elevation and geohazards

By analyzing the elevations of 149 landslides and one collapse in the study area, it is discovered that 12 geohazards are developed below the elevation of 800 m, accounting for 8.00% of total number of geohazards; 12 within the elevation of 800-1,000 m (8.00%); 17 ones within the elevation of 1,000-1,200 m (11.33%); 27 ones within the elevation of 1,200-1,400 mm (18.00%); 38 ones within the elevation of 1,400-1,600 m (25.53%); 42 ones within the elevation of 1,600-1,800 m (28.00%); two ones above the elevation of 1,800 m (1.33%). The area with relatively concentrated development of geohazards in the study area has the elevation of 1,200-1,800 m, at which the geohazards are developed most.

4.3. Geological structure and geohazards

The study area is situated at the south segment of Changning-Lancang fold belt, which is the southward extended part of Sanjiang fold system, and the main tectonic line nearly follows the south-north direction, which is basically consistent with the direction of strata. Under the tectonic influence, the bedrocks in the area experience folding and breakage. Moreover, given the local unique climatic conditions, the surface rocks are intensely affected by the physical weathering, so the rock and earth masses are of poor engineering properties, and the geohazards are mostly developed in a straight and banding-like distribution, which basically keeps consistent direction with the tectonic line. In the study area, the formation of tectonic zones like Lange Fault, Paliang-Longdao Fault, Manzhan Fault, Jieliang Fault and Manmeidui Fault is accompanied by the development of a large number of secondary faults, thus forming various rock mass structural surfaces with different scales. Besides, characteristic landforms like anticlinal mountains and synclinal valleys, which are greatly different, are formed, and the axial part and hinge zone of folds are especially the areas with the most concentrated tectonic stress, which contribute a lot to the geohazard development. Based on the analysis results through the spatial superposition of geohazard points and geological structures within the buffer zone range of 500 m, the geological structures are correlated with geohazards to some extent. In general, the areas with complex geological structures have poorer

environmental disturbance resistance and poorer stability, leading to a higher occurrence probability of geohazards. According to the analytical investigation, a total of 30 geohazards and hidden dangers are located at or nearby faults, accounting for 18.87% of total number. The geohazards present a relatively concentrated distribution on tectonic zones like Mange Fault, Paliang-Longdao Fault, Manzhan Fault, Jieliang Fault and Manmeidui Fault.

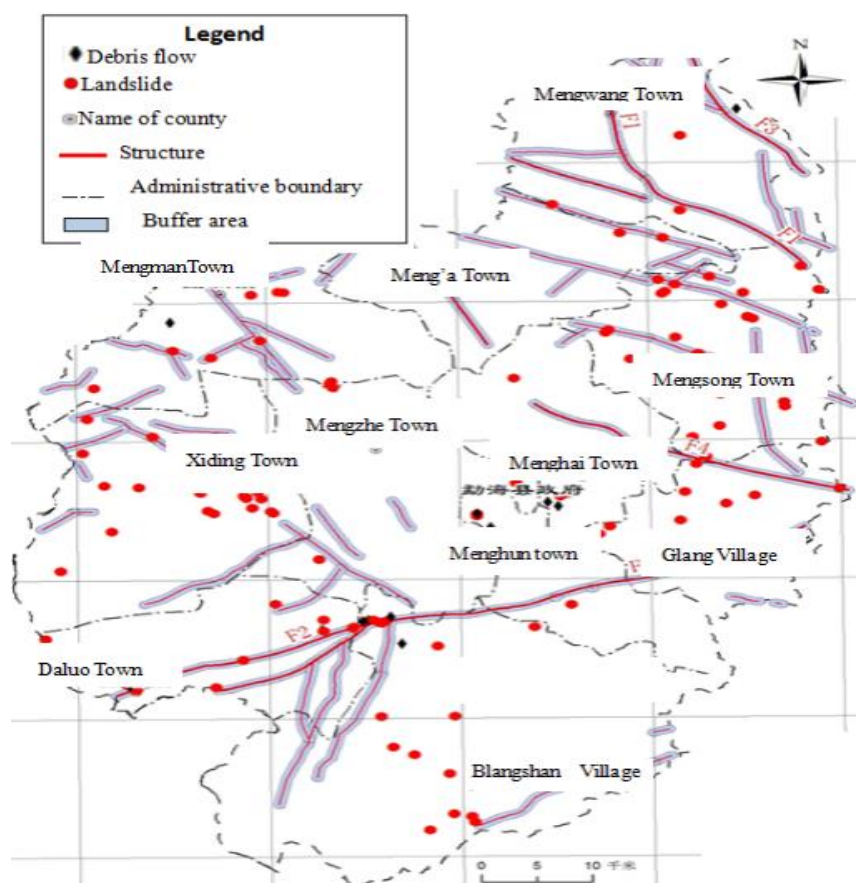


Figure 5. Distribution Map of Rock and Soil Mass Types and Geohazards

4.4. Rock and soil mass structure types and geohazards

Different lithologies are mutually associated in the study area, constituting stratiform soft-relatively hard rock formations, where soft rocks can be easily weathered in the rock formations to form weak structural planes. The rock masses are featured by joint development, broken structure and easy weathering, and the adverse rock association and groundwater infiltration provide advantageous conditions for the occurrence of geohazards like landslide and collapse. Influenced by the differential weathering, the outcropping rocks are broken into pieces after weathering, which provides the material source for debris flow^[8]. By analyzing the landslide development status in the area, it can be obtained that loose soil mass is the slope that is most beneficial for generating landslides, and it is especially susceptible to slope instability when the dip angle of contact surface between loose soil mass and underlying bedrocks is smaller than the topographic slope and greater than 25° under the intense undercutting action of gullies. With landslide taken for example, most landslides in the study area take place in magmatic rock formations and surface cover layer of metamorphic rock strata in Lancang Group, where they are mostly developed in magmatic rock formations at 55 places, accounting for 36.91% of total number of landslides, followed by those occurring in

metamorphic rock formations in Lancang Group (55, 36.91%). Only 14 landslides happen in the surface cover layer of other strata, accounting for 9.40% of total number of landslides. Hence, the rock and soil masses in the study area constitute the material basis for the generation of geohazards, and their types, properties and characteristics exert important effects on the geohazard development, as shown in **Figure 5**.

4.5. Human engineering activities and geohazards

According to the analytical investigation, a total of 82 landslides are directly caused by human engineering activities, accounting for 55.03% of total number of landslides. These landslides, which are relatively concentrated, are mainly distributed around houses and engineering construction areas like along highways, mines and rivers, mainly in the following forms: (1) Village and town construction, slope cutting and excavation can generate high and steep slopes and trigger geohazards like landslide and collapse. Ancient landslides experience deformation and revival to different extents because houses are built on their accumulation bodies. (2) Mining activities result in the silting river valleys and even debris flow, which generates a great impact on the downstream ecological environment and threatens highways, fields and private houses. (3) Highway construction, mountain excavation and stone prying and loose rock masses destruct the slope stability and provide rich loose solid matters for debris flows. (4) The cultivation on steep slopes and unreasonable predatory land exploitation and utilization lead to the geo-environmental deterioration and ecological changes and trigger all kinds of geohazards. The aforementioned human activities that are inharmonious with the ecological environment have changed or affected the surface runoff characteristics, accompanied by the phenomena of “mountain peeling” (rapid and disastrous slope surface erosion) + “rill cutting” (rill erosion) + “river wandering” (riverbed silts up and rises, and the lateral erosion effect of river is strengthened) + “bridge and culvert silting” (flood water carrying branches and grass block the bridge and culvert) + “flooding”, all of which will finally give rise to geohazards like landslide and debris flow.

5. Conclusions

- (1) There are mainly three geohazard types in the study area: landslide, debris flow and collapse, which are under the nonuniform spatial distribution and local concentrated distribution. The temporal distribution has the law of concentration, intensification, periodicity and continuous occurrence. The slope forms include straight slope, convex slope and 20-40° slope, and the slope structures include specially structured slope and oblique crossing slope, while the geohazards are developed most in the landforms with the elevation of 1,200-1,800 m; the geohazard development density is the maximum in the medium shallow cut ridge-like medium-height mountainous geomorphological region.
- (2) By analyzing the 500 m range of the buffer area, it is found that the areas with complex geological structures are featured by poor environmental disturbance resistance and poor stability, which increases the occurrence probability of geohazards. The geohazards are mainly concentrated on tectonic zones like Mange Fault, Paliang-Longdao Fault, Manzhan Fault, Jieliang Fault and Manmeidui Fault.
- (3) The surface slopes in Indo-Chinese magmatic rock and Lancang Group metamorphic rock formations in the study area tend mostly to generate the slope stability, and even go through landslides when the dip angle of contact surface between loose soil mass and underlying bedrocks is smaller than the topographic slope and greater than 25° under the intense undercutting action of gullies. In the study area, the geohazards induced by human engineering activities grow year by year. Human activities, which have become an important geological agent, are the most dynamic factor inducing the geohazards.

Acknowledgements

The study results of this paper have been achieved through the joint hard work of all members in the project

team. The members participating in the field investigation project also include Lu H, Cao Y, Cao J, Wang Y Y, Huang X Z, Zhang W Y and Zhang G E, all of whom have provided reliable and detailed first-hand field information for writing this paper, and to whom we would like to extend our sincere gratitude! We would also like to thank the reviewers for scrutinizing the whole paper and giving the valuable opinions on the revision.

Disclosure statement

The author declares no conflict of interest.

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Analysis on Intellectual Property Management of Construction Enterprises

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Abstract: As the main force of construction enterprises, construction enterprises shoulder the important task of national pillar industries. However, at present, construction enterprises are still labor-intensive enterprises, with low profitability, low overall scientific and technological level, insufficient innovation ability and weak application and protection of intellectual property rights. Based on the current situation of construction enterprises, combined with the author's enterprise, this paper considers the problems existing in the intellectual property management of construction enterprises, and puts forward some countermeasures for the intellectual property management.

Keywords: Construction enterprise; Intellectual property management; Current situation and countermeasures

Publication date: September 2021; **Online publication:** September 30, 2021

1. Introduction

Intellectual property rights are the exclusive rights legally enjoyed by people with respect to the product of their intellectual labor, which is usually the exclusive or sole right granted by the state to the creator for his intellectual achievements in a certain period of time, and is the property right enjoyed by the right holder for the achievements created by his intellectual labor. Generally, it is only valid in a limited period of time. Intellectual property rights generally include copyright (copyright), patent right, trademark right, right of discovery, right of invention and other scientific and technological achievements. Intellectual property management refers to a systematic project including a series of management behaviors such as intellectual property strategy formulation, system design, process monitoring, application and implementation, personnel training, innovation and integration. From the perspective of enterprise management, the generation, implementation and protection of enterprise intellectual property are inseparable from the effective management of intellectual property.

2. Importance of intellectual property management of construction enterprises

With regard to intellectual property management, China attached great importance to and established the State Intellectual Property Office to specialize in national intellectual property management. In recent decades, it has been proposed to improve the intellectual property protection system since the 16th CPC National Congress, to implement the intellectual property strategy again at the 17th CPC National Congress, and to implement the innovation driven development strategy at the 18th CPC National Congress. It shows that the state attaches great importance to intellectual property rights; The GB/T 29490-2013 Enterprise Intellectual Property Management Code, which came into effect on March 1, 2013, is the first national standard for enterprise intellectual property management in China. It is a normative document guiding enterprises to plan, implement, inspect and improve the intellectual property management system, and has opened a new voyage for enterprise intellectual property management in China.

As a pillar industry in China, construction industry plays an important role in economic construction.

Construction enterprises with many employees and a high proportion of completed construction output value are a new force in the economic tide. Although China's construction industry has bid farewell to the era of simple labor, the technical level has been greatly improved, the degree of mechanization has been improved, "high, large, fine, new" buildings emerge in an endless stream, especially great progress has been made in technological innovation in recent years, construction enterprises are still characterized by labor-intensive enterprises, high output value and low benefit, which is a typical manifestation of low technological content in the industry. Relevant national statistics show that the average output value profit margin of domestic construction enterprises has been within 4%, the profit margin of listed construction enterprises in the annual report is about 2.4%, and the real profit margin of construction enterprises from construction is mostly about 1%. Today, technological innovation is particularly important when the country encourages and advocates technological innovation, vigorously develops green buildings, intelligent buildings, Internet + and economic globalization. Intellectual property management, which is closely related to technological innovation, brings opportunities and challenges to enterprises. Compared with other enterprises, such opportunities and challenges may be more obvious and severe. The opportunity lies in the relatively high single value of building products and the wide research and development field at the technical level. The economic benefits brought by technological progress and innovation should be considerable. The challenge is that the quality of personnel in construction enterprises is uneven, there are few high-quality talents, and there is a big gap in technology research and design ability compared with IT and other technology leading industries. Facing domestic and foreign competitors, construction enterprises with intellectual property strategy, strong technological innovation ability and core technology advantages will have comparative advantages, so as to obtain the overall competitive advantage. Such as the construction of Shanghai Nanpu Bridge, the Shanghai authorities pay invited Japanese experts to come to guide the construction with high salary, but due to the Japanese side of its unique steel structure bridge engineering installation technology intellectual property protection is not rigorous enough, a company, the project general contractor in Shanghai, "steal art" success. Only 40 days later, the Japanese experts hired by high salaries had to go home; And the company in Shanghai, which is constantly innovating, has gained a foothold in the bridge market at home and abroad with its "housekeeping skills" learned by stealing art. It has successively obtained the construction contract right of Shanghai Yangpu, Xupu, Lupu, Donghai, Wuhu Yangtze River Bridge, etc. Bridge construction has also become the core advantage of its enterprises and the most dazzling economic growth point. It can be seen from this case that as a construction enterprise, we want to occupy the market, improve its competitiveness, maintain sustainable development and obtain the maximum profit space, but if we do not protect our core technologies (patents, achievements, construction methods, etc.) and form our own technology core cluster, we will be the same as the Japanese company at that time, our core technological advantages will gradually lose, and many of our original construction markets will be replaced by others, not to mention the realization of building "metallurgical construction national team".

3. Current working situation of intellectual property management of construction enterprises

According to incomplete statistics, from 2001 to 2016, more than 850000 domestic construction patents were authorized, 2542 national construction methods were publicly released, and about 3000 civil construction papers were included in major foreign search tools, showing an increasing trend year by year. However, the proportion of domestic patent applications in the same period only increased from 2.4% in 2001 to 3.2% in 2016, it is seriously inconsistent with the contribution and status of the construction industry in the gross national product. Through these figures, we can see that the current intellectual property protection in the construction industry lags behind, which is incompatible with the rapid development of the industry. From 2001 to 2016, the author's enterprise has made great achievements in

technological innovation and intellectual property management. It has been recognized as a technological innovation enterprise for many times. There are 2088 domestic construction patents, only 1 in 2003, 4 in 2005, 251 in 2010 and 440 in 2016. Although it is increasing year by year, accounts for 0.01% to 0.35% of domestic construction patents, and have publicly release 12 national construction methods, due to the limited quantity and quality of high-quality patents, the enterprise has not been able to form a core technology group, so it has not cultivated core technology advantages. Generally speaking, most construction enterprises have the following problems in the actual operation of intellectual property management:

3.1. the intellectual property protection mechanism and system of the construction industry are imperfect

At present, the construction industry lacks perfect protection mechanism and system, and the internal core technical secrets and patents of the enterprise are difficult to be effectively protected: First, the employees change jobs frequently, and the core technologies and trade secrets that the employees master or know well in the original enterprise will serve the new enterprise. Second, in the bidding process, the construction party often gives the unsuccessful scheme to the bid winner free of charge to “optimize the implementation scheme,” and etc. These violations of laws and regulations on intellectual property protection have seriously disturbed the construction market, stifled the enthusiasm of enterprises to cultivate core technology advantages, and increased the difficulty of construction enterprises to implement intellectual property protection. However, such acts or practices have not been punished or effectively stopped.

3.2. Intellectual property rights for construction enterprises

Construction enterprises have little idea of intellectual property rights, pay insufficient attention to intellectual property rights, and have not fully realized the importance of intellectual property rights, especially patent technology, to the development of enterprises. Some people even think that innovation management is a department that spends money and does not make money. To tell the truth, on the surface, construction enterprises to protect intellectual property rights, from innovation, research and development, declaration, reward, maintenance to rights protection and so on will incur costs and expenses; At the same time, due to the low technical content in the actual construction, the application of new technology involves a wide range (owners, designers, supervisors, etc.), the promotion is difficult and the confidentiality is poor. Most construction enterprises generally adopt the practice of “take-in” and think that “take-in” is more practical and economical. However, with the progress and development of society, the improvement of domestic intellectual property legal system, and the improvement of intellectual property awareness at home and abroad, as well as from the perspective of many domestic intellectual property rights protection events (such as the case of “high-altitude spray dust suppression system” of Wuhan Cuiyu company), this “taking doctrine” view and practice is outdated and has legal risks. Therefore, construction enterprises are required to carry out independent innovation, reserve certain technical resources, and effectively protect the achievements of independent innovation. Then, construction enterprises can develop continuously and healthily.

3.3. Patent infringement disputes are increasing

In recent years, new inventions, new processes and new technologies developed and applied in the construction industry emerge one after another, and intellectual property lawsuits also occur from time to time. Problems, such as “piracy” of architectural design, counterfeiting of construction products, misappropriation of technical schemes in the bidding process, infringement of construction software, etc., are often due to the use of suspected patent infringing products and technologies by construction enterprises

in construction, and there is no agreement on relevant intellectual property terms in the contract; Moreover, the entry threshold of the construction industry is low. Some enterprises survive by copying and counterfeiting other people's technologies or products, especially patented technologies. Therefore, intellectual property infringement disputes occur frequently.

4. Counter measures of intellectual property management of construction enterprises

4.1. Establish a sound intellectual property management system

Construction enterprises should aim at the characteristics of low technical content of the industry, difficult confidentiality of construction workplaces, large number of contacts and high mobility. First of all, the enterprise should have a special management organization and formulate management measures for technology research and development, achievements, patents, construction methods, etc. according to its own characteristics, especially for special property rights protection in the process of bidding and contract signing. Secondly, the personnel mobility of construction enterprises is large. In order to ensure the confidentiality of technical achievements, it is necessary to improve the confidentiality management of personnel related to technological innovation, and promote the signing of confidentiality agreements and peer competition restrictions between enterprises and relevant personnel. Third, we should establish a sound examination and approval system for the release of technical papers and network information, so as to ensure that the core technical achievements of the enterprise are effectively protected before they are made public and prevent leaks from happening. Fourth, we should establish and implement an intellectual property evaluation system, fully evaluate the intellectual property owned by enterprises, classify management and focus on protection, reduce the maintenance cost of intellectual property, and create greater value for enterprises. Fifth, establish a reward and punishment system in combination with the characteristics of the enterprise. In order to improve the enthusiasm of enterprise employees for innovation and the awareness of intellectual property protection, reward and punishment measures should be implemented in place in time. In short, only a perfect management system can better improve the protection of intellectual property rights and the innovation vitality of enterprises.

4.2. Equipped with a professional innovation team

The excavation and innovation of enterprise core technology need to be completed by a professional team. Only by continuous innovation can the enterprise be in an invincible position. Research and innovate the enterprise's core technology, so as to form its own core technology group. For example, although the company of the author has more than 2,000 patented technologies, the patent distribution is relatively scattered, and our core technology group has not been formed. At present, the technological innovation is only to rely on construction site technicians part-time to complete. But the construction management tasks of site personnel is heavy, the energy used in technology innovation is not enough, related professionals is scattered, collective innovation environment is insufficient, so they innovate only because they have to in order to fulfill the innovation task assigned by their superiors, which lead to innovative technology content is also difficult to have a big breakthrough and beyond, with the lack of the core competitiveness of high-quality patents. Therefore, in order to make great breakthroughs and surpass in technological innovation, form core technology group and cultivate core competitive advantages, it is necessary to equip professional innovation teams, such as specialized structural innovation team, electrical innovation team and pipe corridor innovation team, so as to increase investment in technological innovation. With the patent management system, capability improvement platform and external resource platform as the support and intellectual property strategy as the leading role, a comprehensive enterprise intellectual property management system with technological innovation, intellectual property risk control and intellectual property operation as the core shall be formed. Through the professional innovation team in-depth

construction of the first line to guide the promotion and application of innovative technology achievements, give full play to the greater value of technological innovation.

4.3. Improve the intellectual property competitiveness of enterprises and cultivate their core technology advantages

To improve the intellectual property competitiveness of enterprises, we should have our own intellectual property achievements. The number of patents, patent clusters and patent technology content of an enterprise are the main embodiment of the intellectual property competitiveness of enterprises. To improve the number and technical content of patent applications, construction enterprises can start from the following aspects: First, according to the patent source channel, we can explore patents from the aspects of pioneering invention, combined invention ($1 + 1 > 2$), selective invention, conversion invention, new use invention of known products, etc. Second, in the process of patent mining, we form our own patented technology by putting forward our goals, such as what needs to be met, what functions to be added, what performance to be improved, optimizing the structure or miniaturization, more convenient and humanized operation, reducing costs, etc. Third, we can also add new features on the basis of traditional schemes, replace some existing features with new features, or adopt a new technical scheme or combine several schemes into a new scheme, or form our own patent technology for application. Fourth, starting from the task of an overall project, first find out the components of the task, find out the innovation points of each technical element by analyzing the technical elements of each component, and finally summarize the technical scheme according to the innovation points to form your own patent. Fifth, according to the technical elements of the whole project and the construction environment, find out the technical factors that break through the environment, so as to put forward the innovation points. Finally, summarize the technical scheme according to the innovation points and apply for patents. Sixth, improve the shortcomings of previous patents, divide the working environment of the same construction object, find out other innovation points, and finally summarize the technical scheme according to the innovation points, so as to apply for patents. Seventh, boldly envisage the application of technologies that cannot be realized in our construction field in other fields, so as to achieve substantive results and apply for patents (such as applying the car door design technology to our manhole cover).

4.4. Strengthen the promotion and application of new technologies in enterprises

Only when the technological innovation achievements and core technologies of enterprises are applied to construction practice can they form technical advantages and maximize the transformation of achievements, which is an effective means to improve the competitiveness of enterprises. At present, the intellectual property of our enterprise mainly stays in the reserve, and there is little application and promotion, mainly because the construction technicians do not know enough about the intellectual property achievements of our enterprise. To comprehensively promote the application and industrialization of technical achievements, first, in the bidding process, we should vigorously promote the application of our proprietary technology, core patents, construction methods and achievements on the premise of effective protection, so as to improve our bid winning rate. Second, during the construction process, we should strengthen the application of our patents and construction methods, and adopt various ways to promote and study the company's patented technology, scientific and technological achievements, construction methods and other specific contents face-to-face. Third, establish the company's technological innovation network platform, divide all the company's technological achievements and technologies into disciplines, and establish a general retrieval account, so as to promote the use of technological achievements and avoid repeated research and design. Fourth, the technical innovation professional team goes deep into the construction front-line training and guidance, organizes relevant personnel, selects the technical innovation achievements related to the

specific construction content for training, and guides the promotion of the project. Fifth, establish an indicator assessment system for the promotion and application of technological innovation achievements. Each construction project must use and promote several technological achievements. In the process of promotion, the enterprise technological innovation management department monitors the process, forms text and picture summaries on the project, and reports the completion of the indicators. New technology promotion must be realized by mandatory means.

5. Summary

In short, construction enterprises need to cultivate core competitiveness in order to maintain healthy and stable development. Core competitiveness comes from core technology advantages, which rely on intellectual property management. Therefore, construction enterprises should establish and improve the intellectual property management system, establish technical innovation teams of relevant disciplines, increase the application of technical innovation and technical achievements, establish a technical innovation platform, strengthen the publicity of technical innovation, popularize technical innovation knowledge, and improve the awareness and level of technical innovation, so as to reserve rich technical resources and technical achievements. At the same time, do a good job in safeguarding intellectual property rights to strive for the maximum profit space and broad construction market for enterprises.

Disclosure statement

The author declares no conflict of interest.

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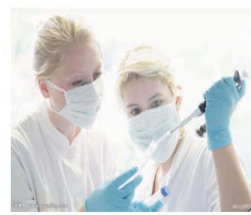
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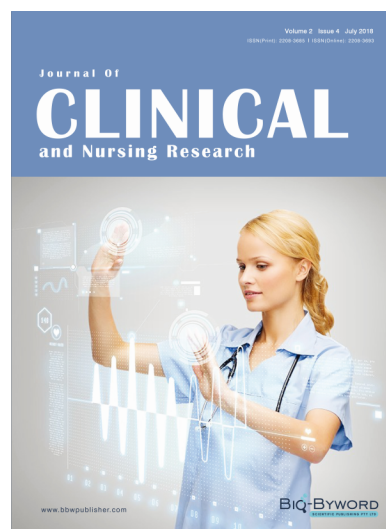
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