

**World Natural Heritage Sites**  
**State Party: China**

**State of Conservation Report**  
**of South China Karst**  
**World Natural Heritage**

**The Ministry of Housing and Urban-Rural**  
**Development, PRC**  
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## 1 Abstract

South China Karst World Natural Heritage is composed of 7 sectors, which sites were inscribed respectively into the World Heritage List in 2007 and 2014 in two phases. In 2015, under the guidance of Ministry of Housing and Urban-Rural Development of the PRC, the overall Conservation and Management of 7 properties were compiled comprehensively and it was handed to World Heritage Center by State Party in February, 2016. In the aspect of overall management, administrative protection management system of nation, Province, heritage-property of three-level were established. World Natural Heritage Protection and Management Coordinated Commission and advisory committee of South China Karst were founded. Many great achievements were made, for example: Planning and Programming, supervision and inspection, technological forum, Capacity-Building and so on. They are very effective to overall planning and administration. So far, all the sites involved in South China Karst have been protected under the special provincial or municipal laws and regulations on protection. So far, all properties have their specific provincial and municipal laws of protection. According to the relevant decisions of World Heritage Committee, many measures were taken by State Party. The strictest legal management and planning of properties as well as management system of constructional program were carried out. tourist capacity of scenic spot were controlled. Environmental capacity and instantaneous overload capacity system were established and improved. Verification and Monitoring by remote-sensing satellite were carried out. Property's outstanding value carriers as well as monitoring system of environment and human activities were established gradually. According to the legislation and planning, the natural reserve of upstream area of the sites was established, and the water quality here was monitored, supervised and treated jointly. More attentions were paid to water environment protection and water pollution treatment. For Wulong Karst, some key section of upstream area in buffer zone along Furong River was also under protection. Currently, the water quality in 7 sites is very nice, which could be classified at least as Type III. The branches have the water quality better than Type II. For addressing agricultural influences and promoting sustainable development of community, different local governments for different sites proposed the policy of "promoting tourism to compensate agriculture". The policy for sharing tourism bonus of community was also proposed, which may encourage local community to take part

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in direct administration of the sites. The business serves well for the community. Moreover, the water pollution, rubbish pollution, agricultural chemicals pollution, and poaching have been alleviated dramatically through governmental subsidy, popularization and education, as well as guidance and support. The State Party has paid high attention to the relationship between protection of the sites and the development of the towns involved. For the development of urban area, the sites and the tourism attraction spots, the landuse property and the land use scope as well as the construction projects administration were considered in coordination. It is defined that the protection of the sites and the tourism attraction spots should be considered primarily. It is stipulated that the plan for urban development should be in accordance with the plan for tourism attraction spots and the sites. For protecting the culture and custom of indigenous peoples, the Shilin (Forest Stone) Karst, Libo Karst, Shibing Karst, and Huanjiang Karst have paid more attention to the protection from local governments to ethnic cultural arts and carriers. Through enterprises, tourists, and local residents' participation, it has established a platform for displaying ethnic culture and its carriers. More channels for contacting and communication among the three parties have been strengthened, which has enhanced the confidence of indigenous peoples, promoted the protection of ethnic culture, and brought about economic benefits to ethnic culture.

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## **2 Response to the Resolution of World Heritage Committee**

### **2.1 Overall Plan and Coordinating Administration of World Heritage Sites**

#### **2.1.1 Progress for the Compilation of Protection and Administration Plan**

South China Karst was inscribed into the World Heritage List in 2007, 2014 respectively in two phases. During the declaration, every site compiled its own protection plan. According to the resolution made by the 38th World Heritage Committee Congress, under the guidance of MOHURD, the protection plan for the 7 sites was re-compiled in 2015, which was sent to World Heritage Committee in February of 2016. The plan focused on 3 points as follows: 1. highlight the protection measures and requirements for outstanding common values and their integration, with more emphasis on unified management and reasonable plan for serial sites 2. sufficient involvement of legal plan of related tourism attraction spots and natural reserve, which may help the administration of world heritage sites coordinate with national regulations for natural reserve; 3. explain the related points proposed by the resolution of 38th World Heritage Committee Congress, such as the monitoring of tourism, water pollution, agriculture and urban development and the countermeasures. This plan conforms to the requirements for world heritage protection, representing the basic willing and requests from administration organizations of the sites and the interest related parties.

#### **2.1.2 Comprehensive administration and arrangements**

##### **2.1.2.1 3-level administration and protection system**

For national level, the MOHURD is in charge of protection, supervision and instruction of world heritage sites. Moreover, it is also in charge of the planning, administration, protection and supervision of national tourism attraction spots involved by world heritage sites. MOHURD has also set up the Protection and Research Center for World Natural Heritage Sites, assisting the protection and management of the heritage sites. Besides, the Ministry of Environmental Protection, the State Forestry Administration, the Ministry of Land and Resources etc are also responsible to the administration of natural reserves and national geoparks involved by South China Karst.

Provincial level means the Department of Housing and Urban-Rural Development (Bureau of Forestry) in different provinces (autonomous regions, municipalities) is in charge of protection and administration of world natural heritage. Therefore, the Department of Housing and Urban-Rural Development in Guizhou is responsible for the administration of Libo Karst and Shibing Karst, which is implemented by Administration Office of World Heritage Sites Declaration and Administration Section of Tourism Attraction Spots; the Department of Housing and Urban-Rural Development in Guangxi is responsible for the administration of Guilin Karst and Huanjiang Karst, which is implemented by the Section of Urban Planning and Forestry; the Department of Housing and Urban-Rural Development in Yunnan is responsible for the administration of Shilin (Stone Forest) Karst, which is implemented by the World Heritage Sites Administration Office in Yunnan Province; Chongqing Administration of Forestry is responsible for the administration of Wulong Karst and Jinfoshan Karst, which is implemented by the Administration Office of World Natural Heritage Sites in Chongqing (Administration of Tourism Attraction Spots).

The sites level means the special organization for protection and administration in heritage sites, which strengthened the functions of administration organizations and staff establishing.

**Tab 1 Organizations in charge of administration of different sites involved by South China Karst and the staff**

<b>Heritage Site</b>	<b>Administrations</b>	<b>Properties of administrations</b>	<b>Total staff members</b>
Shilin Karst	Shilin Tourism Attraction Administration	Governmental organization	826
Libo Karst	Libo County World Natural Heritage Administration	Governmental organization	18
	Zhang River Tourism Attraction in Libo Administration	Governmental organization	154
	Maolan National Natural Reserve Administration	Governmental organization	145
Wulong Karst	Wulong County World Natural Heritage Administration Committee (Wulong County Tourism Attraction Administration)	Governmental organization	48

Guilin Karst	Li River Tourism Attraction Administration Committee in Guilin	Governmental organization	155
Shibing Karst	Shibing Karst World Natural Heritage Administration	Public institutions	78
Jinfoshan Karst	Jinfoshan Administration Committee in Nanchuan District of Chongqing	Governmental organization	48
Huanjiang Karst	Huanjiang Karst World Heritage Administration	Public institutions	7
	Mulun National Natural Reserve Administration in Guangxi	Governmental organization	42

### **2.1.2.2 Establishment of Protection and Administration Coordinating Committee for South China Karst World Heritage Sites**

The Phase I of South China Karst was inscribed by the World Heritage List successfully, after which, coordinating administration was paid high attention by Chinese governments and different heritage sites. In 2008, the joint administration mechanism was launched formally, while in 2011, a preliminary framework for coordinating administration-a temporary coordinating institution for South China Karst was established.

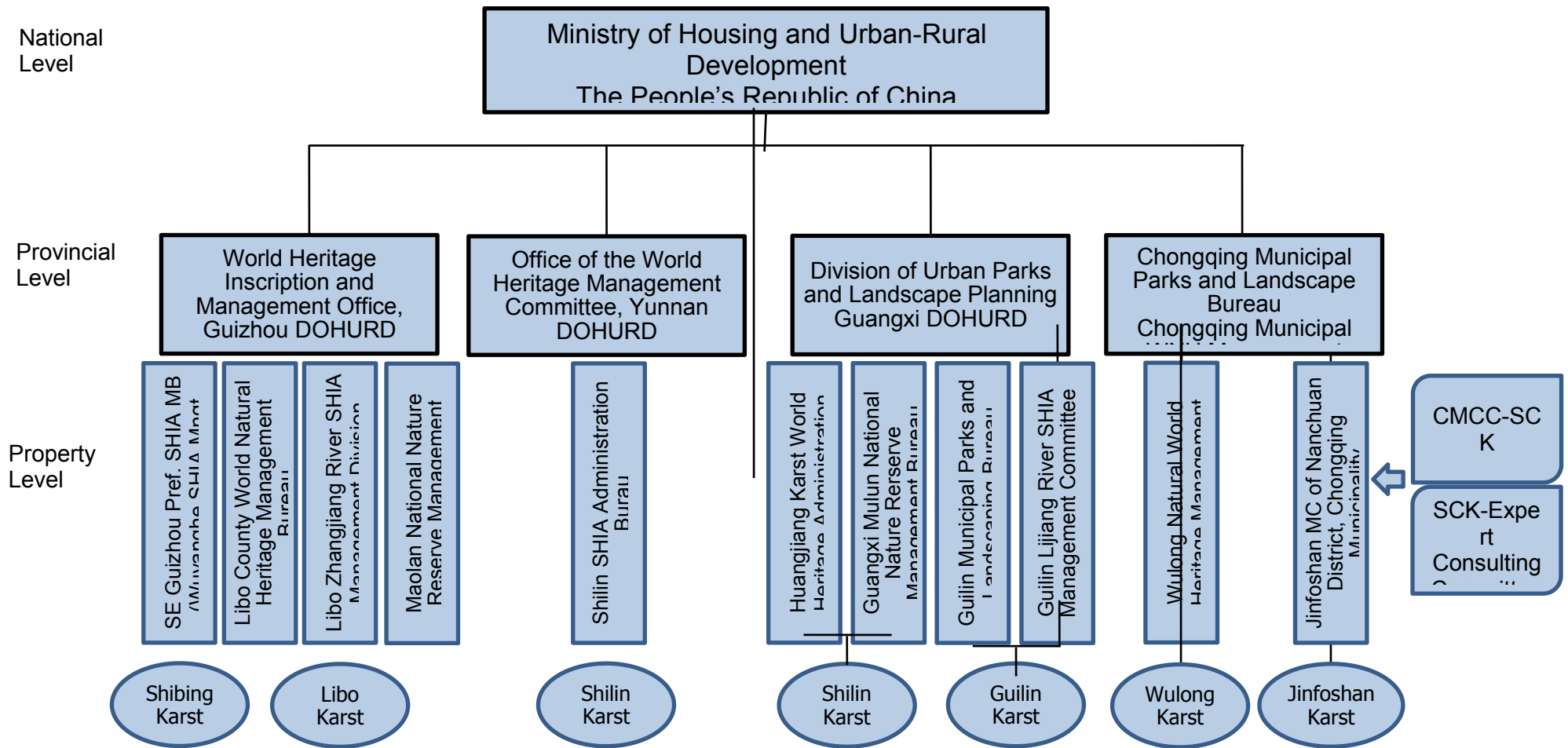
In order to promote the overall protection of South China Karst, according to *Convention Concerning the Protection of the World Cultural and Natural Heritage* and the requirements for unified and coordinating administration of South China Karst defined by World Heritage Committee and International Union for Conservation of Nature, the Protection and Administration Coordinating Committee for South China Karst World Heritage Sites(PACC) was hence established after the coordination of Protection and Research Center for South China Karst World Natural Heritage Sites under MOHURD in 2015. A consensus has been achieved among DOHURD (Administration of Forestry) in 4 provinces (autonomous regions, municipalities), as well as the administration institutions of 7 sites, that it is necessary to generally administrate and coordinate with all the involved sites to carry on protection and management jointly.



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PACC adopted the rotation system, which means the DOHURD (Administration of Forestry) in 4 provinces (regions, municipalities) will take responsibility of overall coordination and administration in rotation. The rotating period is 1 year. The secretariat of PACC set in the Protection and Research Center for South China Karst World Heritage Sites, which is in charge of daily coordination and administration.

PACC is responsible to constitute and implement the annual work plan, design project, organize seminars and international academic exchange, supervise and inspect daily work, construct monitoring system, popularize related outcomes, enhance capacity building etc. PACC also organized the compilation of Overall Plan for Protection and Administration of South China Karst World Natural Heritage Sites, periodical monitoring reports, and protection status reports etc. Meanwhile, PACC has also set up a Consultation Commission (Experts Database), which may provide technical instructions and assessment to world heritage sites protection and administration.



**Fig 1 Overall Administration Framework of South China Karst World Natural Heritage Sites**

*(Note: For those Properties whose venue concurrently belongs to nature reserves or national geoparks, their competent authorities are not indicated in the figure).*



**Fig 2 Inauguration of Protection and Administration Coordinating Committee of South China Karst World Natural Heritage Sites**

### **2.1.2.3 Well-implemented comprehensive administration**

Since 2014, in which the South China Karst-Phase II was inscribed by World Heritage List successfully, PACC has played a very important and effective role for overall plan and administration, service and popularization under the instruction of MOHURD. The administration measures adopted are as follows:

a) The Constitution for PACC and the Administration Regulation for Funds has been constituted.

b) The Overall Plan for Protection and Administration of South China Karst World Heritage Sites and the protection status reports have been compiled.

c) Remote sensing monitoring of every sites involved has been implemented. It has also conducted the field inspection, assessment and communication. The key focus for inspection is the protection of outstanding common values, establishment and operation of monitoring system, management of construction, implementation of protection and administration plan, community coordinating development etc.

d) In Nov.2016, the seminar-World Heritage · Targeted Poverty Alleviation was held in Libo Karst of Guizhou, the major focus of which is the protection of heritage sites and sustainable development of local community.

e) The unified popularization platform for South China Karst World Natural Heritage Sites has been established.

f) Two training courses for administration with more than 100 persons involved has been carried out, which has enhanced the work ability and administration capacity.



**Fig 3 World Heritage · Targeted Poverty Alleviation Seminar (Left)**

**Fig4 Training for Protection and Administration of Jinfoshan Karst (Right)**

## **2.2 Threaten from tourism and the countermeasures**

The 7 sites all located in undeveloped area in Southwest China. In order to protect the heritage sites well, different local industries have adjusted their structures, in which, many industries were removed, and high-influencing agricultures were reformed and transferred. The primary economic industry in most part changed from industry and agriculture into tourism industry and the related third industry. However, the economy is still worse than that of surrounding areas. With this background, the major challenge facing to the heritage sites is the contradiction between fast growth of tourists with facilities and the protection and administration of heritage sites. Shibing Karst and Huanjiang Karst just began their tourism industry, except them, the other sites have been threatened by tourism at different scales. In order to realize heritage sites protection and sustainable development of tourism, it is necessary to combine local socio-economic status and the community's development.

### **2.2.1 Regulations taken by State Party**

a) Administrate effectively by legal programmes. Since enrolled by World Heritage List, 7 heritage sites in China have compiled and implemented the Protective

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Management Plan of South China Karst World Nature Heritage, and the State Council approved the general regulation involved all the landscape and famous scenery on national level, MOHURD approved the detailed plan concerning on construction regions and the major functioning areas' plan was approved by National Development and Reform Commission. All these regulations and plans declare that South China Karst World Nature Heritage is forbidden construction region, definite the building scale in buffer zones, and put forward a maximum limit to the tourism facilities, that is seen as the direct basis of all the construction activities.

b) Set the capacity in tourist activities area and monitor the situation of crowded section in real time, composing and improving an early warning system on timing capacity overload, such as in Stone Forest, 4.85 million tourists per year is the maximum capacity calculated by route and section research methodology.

c) Establish a strictest approval system aiming to construction projects approval. In heritage sites, all the construction activities need to meet the space plan and strict approval system also. Normal engineering needs the approval from the administration of the heritage to build with the procedure. As to the key engineering, besides the approval of the administration, it should put on record according to the 172th item in The Operational Guidelines for the Implementation of the World Heritage Convention, and then start the construction.

d) Verify the heritage with the remote sensing satellite monitoring. After the South China Karst Nature Heritage figured into World Heritage List, MOHURD has conducted verifying and remote sensing satellite monitoring 4 times. In these work, amount of illegal constructions were found and rebuilt to protect the resources and environment of the heritage effectively.

e) Establish a specific operating system in world heritage, landscape and famous scenery gradually, regulating the management of tour operation activities in the heritage site.

## **2.2.2 Provincial level in charge of heritage sites protection and administration and the related measures**

### **2.2.2.1 Shilin(Stone Forest) Karst**

Tourism is the most serious threaten to Shilin Karst. Shilin Karst is not only the heritage site, but also the hot tourism destination at home and abroad. Recently, the tourists in Shilin Karst have grown year by year. Although the maximum tourists is still under the planned capacity (4.85 million annually, while it reached to 3.8 million

in 2014), yet there are still two major threatens: 1) the tourists mainly crowd in a scope less than 1 km<sup>2</sup> (Large Shilin and Small Shilin), which makes the sites crowded and insufficient environmental carrying capacity as well as potential risk for safety etc; 2) some facilities for tourism in the buffer zone are out of effective administration and control, e.g. more large scale projects in the buffer zone have been constructed (hotel, golf course, start garden for Taiwan farmers), especially the two major roads construction planned recently (the special road for tourism in Long Lake Scenic Spot of Shilin County, and the special road for Long Lake-Dadieshui Scenic Spot). The two roads will cross the scope of the heritage site, which will influence the outstanding common values and their integration negatively. Since the successful inscription of World Heritage List, Shilin County adjusted its industrial structure greatly. The quarries, coal mines and cement factories have been closed, with few industries and enterprises in this county. The major measures adopted are as follows:

a) Planning, administration and control: since the inscription into World Heritage List, Shilin Karst has reported the Overall Plan of Shilin Tourism Attraction, the detailed plan for core zone, Long Lake Scenic Spot, and Dadieshui Scenic Spot to the competent authorities. In these plans, it has defined clearly the protection status and scope for Naigu Shilin, Shuoyi Mountain, and Long Lake; it has also defined clearly the controlling scope of the constructions in the buffer zone. The tourists capacity for the area open to the public is set, the maximum of which is 4.85 million annually, through Line Measure method and AreaMeasure method.

**Tab 2 Overall Distribution of Service Offices in Administration Area for Shilin Karst (Tourism Attraction)**

<b>Tourism Municipa-lities</b>	<b>Tourism Cities</b>	<b>Tourism Towns</b>	<b>Tourism Villages</b>	<b>Tourism Spots</b>
—	—	Comprehensive service office at the entrance for Shilin)	On the back of NaiguShilin, at the end of Long Lake, and on Yaobao Mountain of Moon Lake	Service office at the entrance of Wukeshu Village, Dalaowa Village, and Dadieshui Scenic Spot

b) The core area of Shilin Karst Heritage Site including Shuoyi Mountain and Naigu Shilin will be closed and protected. The tourists are forbidden to enter into the core zone, only a few of scientists are allowed to enter into the core zone for research

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and investigation, which may guarantee the authenticity and integration of the outstanding common values of the core zone.

c) The regulations for administration and control have been implemented, which control the constructions strictly. Within the heritage site, all development and constructions are forbidden except the reserve of aboriginal villages and constructions. Within the buffer zone, there is a set of very strict approval regulations for the constructions, including the assessment on contents, scales, site selection, environmental evaluation and reporting procedures. During the inspection of construction projects, all the facilities for tourism such as the parking lots of the hotels built up on the boundary of heritage site and the buffer zone have been removed. For the golf course, Start Garden for Taiwan Farmers, the rectification notice has been released. They are now being removed or rectified.

d) After sufficient negotiation with the agreements signed, the Wukeshu Village which influenced the core zone seriously has been moved out of the core zone. The village will be constructed as a concentrated tourism service area. Local government has helped local residents to set up industries and provided necessary support. The environment after the removal has been restored ecologically, which helps to minimize the hurts to heritage sites and the buffer zone caused by human tourism and social activities.

e) The regulations for civilized tour and the regulations for limiting tourists in the scenic spots as well as the pre-plan for emergent cases and the pre-plan for evacuating tourists have been formulated. Meanwhile, the video monitoring system with GPS controlling system has also been set up. The administration level and capacity have therefore been enhanced.



**Fig 5 Central controlling office for digitalized scenic area in Shilin Karst**

f) NaiguShilin, Long Lake, and Dadieshuietc are under active development, meanwhile, the Yi Minority cultural programmes asking for people participated like Torch Festival and Mizhi Festival and other ethnic cultural tourism programmes have been developed well. All these programmes have enriched the tourism products in Shilin Karst. Different tourism routes have been adopted to avoid crowd of tourists so that it could also avoid the over load of environmental bearing capacity. These measures have alleviated the pressure from tourism on Large Shilin and Small Shilin.

#### **2.2.2.2 Wulong Karst and Jinfoshan Karst**

Under the instruction and arrangement of Chongqing Administration of Forestry, the unified measures adopted by Wulong Karst and Jinfoshan Karst are as follows:

a) The overall arrangement for reception facilities has been arranged in the towns and cities outside the buffer zone, and the related facilities within the heritage sites have been controlled strictly.

b) The constructions for large-scale tourism facilities in the heritage sites have been controlled strictly. These major and significant constructions should follow a strict assessment: firstly, it requires demonstration of necessity; secondly, it requires environmental impacts evaluation and research; thirdly, it requires approval procedures defined by related regulations.



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c) According to the overall plan for the tourism attraction spots in the heritage sites and the overall plan for natural reserves, taking consideration of real status, service spots of different levels inside the sites and buffer zone or outside them have been arranged to meet different demands related to local tourism.

d) Improve the necessary supporting facilities for tourism to meet different demands from tourists. The tourism service facilities have been classified into different levels and arranged accordingly in the sites and buffer zones. The detailed numbers and the allocation should be defined according to the reality.

e) The tourist numbers have been made public. The tourists have been guided to visit different routes through making appointments. The prices of the tickets have been adjusted reasonably according to the low season and boom season, by which, the visitors number and distribution may be possible to control.

f) The franchise business for tourism has been promoted. The franchise operational regulations have been formulated and improved. Meanwhile, the operating contracts have also been standardized.

g) The temporal and spacial distribution of the visitors has been researched, which may be used to optimize the tourism routes and may also be helpful to the administration and adjustment to the display area of heritage sites.

h) The contacts among different scenic spots inside the heritage sites have been strengthened. The serial sight-seeing tourism products have been created. The general values for sight seeing have been enhanced.

i) The heritage site has accepted the supervision from social media positively.

The major measures adopted in Wulong Karst:

a) “Intelligence Tourism” in Wulong: 80 million yuan has been invested into this project from the competent institution of the heritage sites. A unique first-class digital information monitoring system for safety is designed and developed independently. More than 200 high-resolution cameras have been fixed at the entrances and exits of the scenic spots, important sections and parking lots, which may realize the real-time and dynamic monitoring to the visitors who are purchasing tickets and who have enter into the scenic spots already. Once the visitors number is over the critical value, the system will generate warning, which may help the scenic spots to adopt effective

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measures. The system will inspect the vehicles number entered into the scenic spots. The vehicles may be deployed according to the reality so as to reduce the parking lots' pressure and ensure the normal reception capacity for tourists. Besides, the heritage site has also fixed 150 early-warning systems for forest fire. Once there is fire risk or fire disaster, the early-warning system will send message to the mobile phones of the staff in charge of safety supervision through the coupling sensor. At the same time, the digital platform will also monitor the fire in time, and will help the related staff to take actions to put out the fire.



**Fig 6 Digital information monitoring (Commanding) system for safety in Wulong Karst**

b) Enhancing scientific research level: the Wulong Karst Research Base has been set up by the collaboration among Wulong Heritage Administration, the International Research Center on Karst and the Institute of Karst Geology (IKG). The research base may help to enhance the investigation and research, scientific administration and development, as well as monitoring and protection of Wulong Karst. It will also take full advantages of the subjects, scientific research capacity, human resources and international influence endowed by IKG, which may help the scientific research results to meet the demands of the heritage sites.



**Fig 7 Wulong Karst research base**

c) Strengthening monitoring for environment: the Wulong Karst has cooperated with IKG to set up the monitoring system for Wulong Karst World Natural Heritage Site, which could be used for real-time monitoring. This system is mainly composed of automatic monitoring system for environment and information processing center.



**Fig 8 Monitoring system for environment in Wulong Karst Heritage Site**

Furong Cave is the first cave using automatic remote real-time monitoring system in China. This monitoring system could be fixed at different locations, so as to monitor the temperature, humidity, and CO<sub>2</sub> concentration in real time. Through the accumulation of data, the influence of tourism activities on the cave environment has been studied, so as to provide scientific and reasonable reference for decision makers in the organization in charge of administration of the heritage site. The three natural bridges monitoring system mainly focused on hydrological conditions and water

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quality in the scenic area, which may prevent the impact on water quality from tourism activities.

Other measures adopted by Jinfoshan Karst:

a) Initiating the establishment of “Chinese Culture and Natural Heritage Day”: the citizens, students and teachers, as well as visitors have been organized to join the signature for supporting the initiative of “Chinese Culture and Natural Heritage Day” for twice. More than 20 000 people have been involved. The scheme for setting “Chinese Culture and Natural Heritage Day” has been approved by State Council in Sep.17 of 2016. Every second Saturday of June will be “Chinese Culture and Natural Heritage Day” after 2017.

b) Strengthening legislation for protection: the Protection Methods for Jinfoshan Karst World Heritage Site in Chongqing was approved and published on June 15, 2016.

c) Promoting the social coordinating development: more than 50 aboriginal residents have been employed to patrol the site, and the nearly 10 times of discussion with community residents on protection of heritage site have been organized. Around 5 000 flyers on the Regulations of Tourism Attractions and the Protection Methods for Jinfoshan Karst World Natural Heritage in Chongqing have been released to public.

### **2.2.2.3 Libo Karst**

The tourism in World Nature Heritage in Libo developed relatively earlier, and the main influence is the disturbance to visual landscape caused by tour activities, like construction projects, agritainments and the expansion of shopping. Along the increasing of tourists amount with the fluctuation, the tourism facilities also expands after the enrollment of World Heritage List. At the same time, the administration in Libo took a serial measures to manage and control the influence on Libo Karst World Nature Heritage from tourism, so that the tourism affect the heritage little. Measures taken are as follows:

a) In order to figure out the capacity of the tourist in each region scientifically, make out an ecological tourism plan. As to the golden tourism week, such as May

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Day and National Day in October, the timing capacity overload maybe appeared, tourists will be guided by the change of price and other economic measures to avoid the overload. Besides that, government and other administrations will evaluate the ecological tourism regularly.

b) Enhance the inspection, education and supervision to regulate the tourism and construction activities in heritage site. No less than 25 times inspection and supervision will be implemented in Dongtang, Wengan and other core heritage regions every year.

c) Make the comprehensive administration on stalls regular in heritage site. The joint working group has been established aiming to conduct the regulation on heritage tourism environment, which takes the comprehensive action on economic stalls regulation in Xiaoqikong scenery as the key point. The inspection according to laws and regulations remit the concentrated and obvious problems, like open fire cooking, beyond business scope, build privately and illegally, dirty, disordered and bad business environment, improving the commercial operation environment in heritage site greatly.



**Figure 9 Joint working group was conducting comprehensive administration on stalls in Xiaoqikong scenery in Libo Karst**

d) Impel the tourism poverty alleviation accurately, and enrich the ways of residents' income. The Tourism Bureau of Libo County gives the tour guide service training in the towns and villages near the heritage sites, push the village tourism growing with minority features, arrange the employment position for local farmers and promote citizens develop the industries like artifacts production and local specialities sale, to realize the transformation of poor people and increase their incomes locally that impelling the accurate tourism poverty alleviation.





**Figure 10 Training in the community impelling the accurate tourism poverty alleviation in Libo Karst**

e) Push the creative tourism growing with more cultural elements injected, and disperse the traditional tourism resources. Build the cultural creativity tourism brand of Libo Karst that relying and utilizing the sufficient ecological, natural and ethnical tourism resources to innovate the current situation of tourism.

f) Supervise the tourism service quality and safety jointly to ensure the tourists safe in peak season. The major content of supervision includes the service facilities, safety management measures, the system meeting the emergency and certificate-holding working.

#### **2.2.2.4 Guilin Karst**

In August 2014, so as to enhance the management on tourism building and the protection of Guilin Karst resource, Li River Administrative Committee was set up. As the organization belonging to the Guilin Municipal Party Committee and Guilin Government, it is responsible for law enforcement, protection and administration of Guilin Karst and scenery landscape areas in Li River. Following works concerning on tourism activities' administration have been done, since Guilin Karst listed in World Heritage List in 2014,

a) Strictly execute the tourists' capacity in the essential section of Li River, from Mopan Mountain to Yangshuo County. Based on the General Plan on Li River Scenic Spot in Guilin, the maximum of tourists' capacity is 19,000 per day, and 15,000 people at the same time. In the golden tour period holiday, make out a plan for emergency in advance, facing to the case if amount of tourists beyond the maximum capacity, so that will remove the danger of safety, like limit the tickets sale controlling the total reception amount and other measures could insure the requirement of safety,

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harmony and environmental friendly of scenic area. Besides that, the regime of group tickets booking was conducted in heritage site that not only improve the working efficiency, but also avoid the phenomenon that tourists stay in the wharf for a long time.

b) Control the illegal constructions and business activities in heritage site to make the tourism environment better. From 10th December, 2015 to February, 2016, the key action majoring in disordered stalls and illegal buildings was implemented. Totally, 762 stalls and 41 illegal buildings were dismantled, accounting for over 5,150 m<sup>2</sup> and 20,000 m<sup>2</sup> respectively. From November, 2015 to now, 338 illegal rafts for carrying passengers and 19 private canoeing with no license or number, overload, transport secretly and other illegal activities have been detained. A raft company was established in Li River section, Yanshan District, which finished the rafts unifying purchase, unified the symbol and pattern, and implemented operation according to the requirement of timing, region and amount limit. Started on 7th April, 2016, comprehensive law enforcement team conducted the law enforcement action with the cooperation of market expansion, marine, police, transportation, tourism and other related administration in Li River scenic area. The joint law enforcement team was divided into two parts in river and land, to treat the illegal carrying passengers of ships and rafts, illegal attracting customers of travel agency, and other illegal activities that disordering the tourism. After around half a year controlling, the amount of illegal activities decreased month by month in Li River scenic spot, the tourism safety got better obviously.

c) Improve the fundamental facilities. So as to regulate the administration of heritage site, Guilin Karst completed the related fundamental facilities continuously from June, 2014, and updated the existed facilities, including the Rongshu Pond Wharf, Chaoban Hill Wharf, Fozi Cave Wharf, Mashan Parking Lot, I and II phrase of Binjiang Road expansion engineering in Xingping County, Mashan pavior, public toilets, monitoring system in scenic area, standardizing reformation of rafts shape and intelligent management system of rafts. All of these have been finished 80%.

d) Reform the pure electric power environmental friendly raft. It aimed to solve the oil, gases and noise pollution from rafts in Li River that could affect the ecological environment and tourism figure. The Working Management Committee organized relevant departments and experts assess the functions of pure electric power rafts lively, and make out a Guideline on the Touring Rafts with Pure Electric Power

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Devices in Li River Scenic Areas with the ships'examination department, which pushed the reformation and perfection project of touring boat in Li River.

### **2.3 Water quality management**

The influence on water quality in heritage sites is mainly come from Wulong, Libo, Jinfoshan, Guilin and Shibing areas. The faced significant threats are mainly origin from two aspects. The first is the water pollution treatment and water environment improvement in the heritage site and the upper stream areas of buffer zones. Secondly, the water system protection in heritage is threaten by agricultural production and tourism activities. Generally, the water quality in heritage site and upper stream catchment is good, and a serial of further treatments could make it better gradually.

#### **2.3.1 Wulong Karst**

The water quality in Wulong Karst heritage site is good in a total view with some potential problems. The first one is the potential threat of waste water of the towns in upper stream areas of Furong Cave, living and agricultural pollutants as a non-point source pollution Baiyanwan Village, Liuleng Villiage and other villages in heritage site. The second threat is living waste water, agricultural non-point source pollution and the emission of tourism activities of residents in the northern buffer zone of Third Natural Bridge areas and the inhabit regions in heritage site, and the living waste water of residents in the Xiannyv mountain town locates in western buffer zones. The third one is the living sewage and agricultural non-point source pollution of residents in eastern, western and northern part of Houping area threaten the cave system development and evolution.

Addressing this situation, a serial comprehensive treatment projects have been implemented, including natural forest protection, returning the grain plots to forestry, set up forest containing water, removing companies with pollution, controlling the breeding livestock farms and small workshop, salving daily flotages and rubbish in the river, establishing a long-acting salving mechanism, stopping the pollutants to treat the pollution discharge in heritage site comprehensively, setting auto monitoring measures in key point of pollutants, sewage treatments, establishing the monitoring system on water quality and water quantity initially and amount of facilities for sewage treatment.

a) Strictly control the sewage emission in surface water and the upper stream areas of underground rivers in Furong Cave areas.



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b) Complete the sewage discharge system of each tourism site and village in heritage site.

c) Encourage and guide the resident near Erwang Cave and Sanwang Cave in Houping tiankeng region to develop the ecological agriculture. Rely on the tourism in the surroundings to arrange the working position for residents that diminishes the agricultural non-point source pollution.

d) Enhance the hydrological and water quality monitoring in some regions maybe influenced by the hydropower station in estuarine area.

### **2.3.2 Libo Karst**

Libo Karst located in the middle stream of Dagou River, which is belonging to Hongshui River of Pearl River Drainage Area. The surface water system doesn't develop well, with smaller flow rate. However, the groundwater occurrence presents obvious two-dimensional structure, which means the fissure groundwater in upper karst has smaller flow rate but stable dynamic, while the karst water in lower karst has larger flow rate and dramatic dynamic. The Zhang River and Di'e Underground River as well as Huanghou Underground River influenced the water environment directly, therefore they are key rivers under protection. The Qikong District of the site may be influenced by the sewage discharging from the cities and towns and the industries as well as tourism in upstream area of Zhang River, Di'e Underground River and Huanghou Underground River; Maolan Natural Reserve Area may face the threaten from the sewage from local residents concentrated mainly in its Northern and Eastern parts. Since the successful declaration of World Natural Heritage, Libo County has adopted a serial measures for the protection and administration of water environment. The current status of water environment in Libo Karst is better, whose water quality reaches the standard of Type II defined by the Standard of Surface Water Environmental Quality (GB3838-2002).

a) Legislation, planning and control: there are regulations and plans formulated for the protection of the site, including the Regulations for Protecting Libo World Natural Heritage Site in Buyi and Miao Autonomous Prefecture in Southern Guizhou proposed in 2016, the Overall Planning of National Natural Reserve in Maolan of Guizhou Province (2004-2015) and (2016-2025) implemented already, as well as the Overall Planning for Zhang River Tourism Attraction in Libo (2007-2020). The operation of water conservancy facilities in upstream of water body in protection area and its periphery should meet the demands for world natural heritage protection. It is

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forbidden to construct new enterprises and factories which may influence the core zone negatively or contaminate the environment seriously.

b) Removing the constructions that are unfavorable to water environment: the small coal mines, quarries and processing factories for calcites and dolomites within the Huanghou Underground River Drainage Area will be closed gradually; The high-energy-consumption polluters were restricted to be constructed in Mawei Industrial Garden at the source of Zhang River, while the ecological industries were supported instead. In 2013, rectification was conducted at many sites, including: Rainbow Bridge in Dongmen, the revetment, and the square construction in Xiaoqikong, as well as the construction of Shuangziting Pavillion and Old Bridge in Daqikong, which may reduce the contaminant to water environment in the heritage site.

c) Water source conservation forest has been planted in upstream of the drainage area: the afforestation was conducted in many mountainous areas in Dongla Village of Dongtang Town and Jilong Village of Weng'ang Town in 2007; the afforestation about 333.33hm<sup>2</sup> was conducted in Gulei Village of Yaoshan Town and Qunli Village of Laocun Town in 2011-2016; the afforestation and returning farmlands to forest were conducted in Lanei Village of Weng'ang Town, whose involved area is 666.7 hm<sup>2</sup> and 333.3 hm<sup>2</sup> respectively.

d) Water environment improvement: Water Pollution Prevention Plan and Special Action Plan for Environmental Protection“Storm” were constituted in 2016. The special action “with Swords to Protect Environment under Six Musts” was carried out. All the sewage outlets along Zhang River and the water quality status were examined. It required all the sewage must be treated to reach the standard before discharging. The enterprises in Zhouqin Town and Jiuqian Town in Sandu Autonomous County locating at the upstream area of Zhang River were required to be rectified and improved. All the enterprises with over standard sewage discharging were investigated and treated, even banned according to law.

e) Improving domestic sewage treatment: the new projects for treating domestic rubbish and sewage have been implemented actively since 2012. Sewage collection network and concentrated man-made wetland treatment station for sewage were established. More rubbish cars and waste bins were purchased. Facilities for environmental protection in the farms for domestic animals and fowl were improved. The Temporary Regulations for Domestic Sewage in Rural Area and Treating

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Facilities for Domestic Rubbish were formulated. All these measures help to improve the water environment of the heritage site significantly.



**Fig 11 Sewage treatment pool in Libo Karst**

### **2.3.3 Jinfoshan Karst**

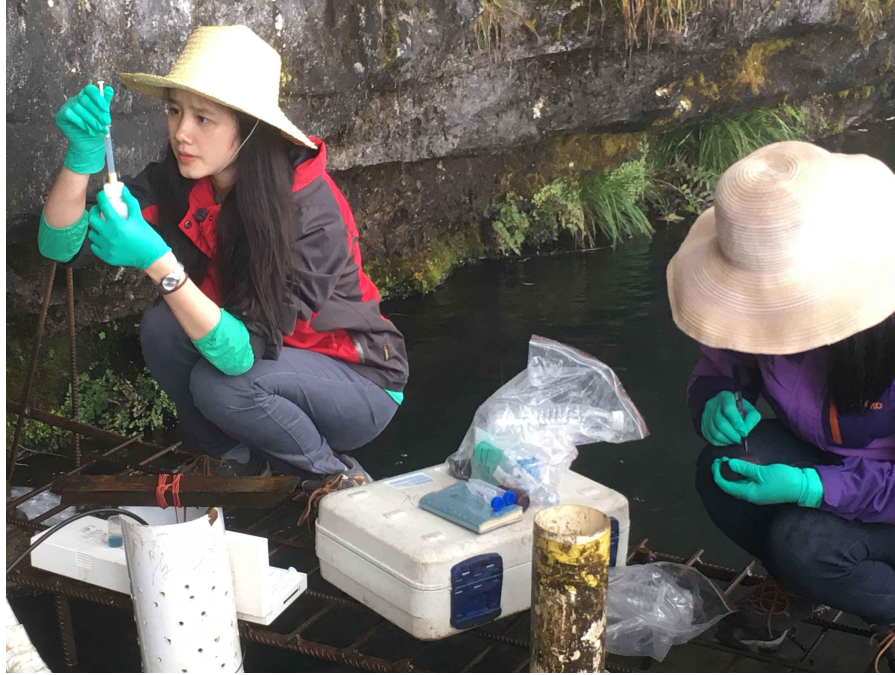
Water quality problem in Jinfoshan Karst is not so serious. The major threaten is that the sewage treating in Jinfoshan Holiday Hotel and Qianniuping is not enough, which makes the karst groundwater environment of the heritage site threatened. The sewage treating facilities and rubbish removal mechanism in local farmers' restaurants of the buffer zone need to be improved, this may pollute the surface water and groundwater in buffer zone. Therefore, two major actions were carried out:

a) Serial projects for comprehensive water environment improvement were implemented, including: conservation of natural forest, returning farmlands to forest, establishing water-source conservation forest, moving out the polluters, rectification of the farms for domestic animals and fowl and the small workshops, the establishment of long-term salvage mechanism, blocking sewage and improve the sewage discharging outlets of the drainage area in heritage site, deploying automatic monitoring facilities for pollutants' source, the preliminary establishment of the water quality and water quantity monitoring system, and the installment of facilities for sewage treatment.

b) Pollutants source administration and control: improve the sewage collection and treating system within Jinfoshan Heritage Site and the buffer zone, meanwhile, it has established supporting facilities for sewage treatment outside the heritage site;

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c) Strengthening the construction of monitoring system: Jinfoshan Karst has cooperated with research institutions and universities including the Institute of Karst Geology, Chinese Academy of Geological Sciences, and Southwest University to set up the monitoring system for heritage site's protection preliminarily.



**Fig 12 Monitoring of water quality in Jinfoshan Karst**

Two permanent monitoring stations for hydrology and 25 manual monitoring points were set in Shuifang Spring and Bitan Spring in Jinfoshan heritage site. The water quality analysis results showed that the groundwater quality of Jinfoshan Karst is natural and good without obvious pollutants. Meanwhile, the data from the two stable monitoring points for groundwater indicates that the pollutants indexes present downward trend in 2016.

#### **2.3.4 Guilin Karst**

Water environmental protection and treatment in Guilin Karst was paid high attention. The National Development and Reform Commission published the Plan of Comprehensive Treatment of Water Environment in Key Drainage Areas for the Thirteenth Five-Year. 11 counties and 6 districts under the administration of Guilin were all involved as the key areas mentioned in this plan, which made a good foundation for the management and enhancement of water quality in Guilin Karst. In 2014-2015, the overall water environment of Li River was fine, and the pollutants

were all lower, while all 100% of monitoring indexes reached the standards. In 2016, the trunk and branches of Li River had nice water environment, the pollutants concentration is lower. Except the instant over-standard of BOD and TP of Yangshuo Section, 100% of the monitoring indexes reached the standards.

**Tab 3 Monthly report of water quality from July 2014- Oct 2016 in Guilin Karst**

Water quality of monitoring section Monitoring Month	Trunk of Li River			Yangshuo Section of Li River		
	Water quality classifications	Targets set for water environment protection	Major pollutants indexes over standard (average value exceeding the standard, over standard rate)	Water quality classifications	Targets set for water environment protection	Major pollutants indexes over standard (average value exceeding the standard, over standard rate)
July in 2014	II	III	—	II	II	—
August in 2014	II	III	—	II	II	—
September in 2014	I	III	—	I	II	—
October in 2014	I	III	—	I	II	—
November in 2014	I	III	—	I	II	—
December in 2014	I	III	—	I	II	—
January in 2015	I	III	—	I	II	—
February in 2015	II	III	—	II	II	—
March in 2015	III	III	—	I	II	—
April in 2015	II	III	—	II	II	—
May in 2015	II	III	—	II	II	—
June in 2015	I	III	—	II	II	—
July in 2015	II	III	—	II	II	—
August in 2015	III	III	—	II	II	—
September in 2015	II	III	—	II	II	—
October in 2015	II	III	—	II	II	—
November in 2015	II	III	—	II	II	—
December in 2015	II	III	—	II	II	—
January in 2016	II	III	—	II	II	—
February in 2016	II	III	—	II	II	—
March in 2016	II	III	—	II	II	—
April in 2016	II	III	—	III	II	BOD (0.2),TP (0.1)
May in 2016	III	III	—	II	II	—
June in 2016	III	III	—	II	II	—
July in 2016	I	III	—	II	II	—
August in 2016	II	III	—	II	II	—
September in 2016	II	III	—	II	II	—
October in 2016	I	III	—	II	II	—
November in 2016	I	III	—	II	II	—

Remarks: 26 parameters are monitored, including pH, dissolved oxygen, potassium permanganate, BOD, volatile phenol, ammonia nitrogen, prussiate, Hg, Cr6+,Pb,As, Cd, petroleum, fluorid, COD, total nitrogen, sulfide, total phosphorus, water temperature, Cu, Zn, anionic surface active agent, Se, fecal coliform, conductivity and flow rate.

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In order to strengthen the protection of water environment and prevention of water contamination, the measures adopted by Guilin government are as follows:

a) Set up natural reserve at upstream of Li River to protect the water quality. In order to protect Li River and conserve water sources, Guilin government has set Mao'er Mountain National Natural Reserve, Water Source Forest Natural Reserve on Haiyang Mountain and Qingshitian Water Source Forest Natural Reserve approved by Guangxi at the upstream of Li River. The total area is  $14.65 \times 10^4$  ha, accounting for 24% of Li River Drainage Area.

b) Since August of 2015, the sewage from the outlets of 7 drainage areas including Li River (urban section), Xiaodongjiang River, Lingjian Creek, Taohua River (Wujin River), Wayao River, Qingfeng River and Nanxi River have been blocked and treated. The total investment is about 467 million yuan. After great efforts made for more than one year, the water environment has been improved effectively. 45 km long sewage pipes have been constructed, 2 permanent pumping stations have been established, 25 pumping wells have been developed and 6 contamination sources (24 points) have been treated. The total amount of sewage intercepted are summed up to 2.37 ton/d, 147.9% of the sewage interception mission have been completed. The rate for concentrated-treatment to sewage of Guilin (urban districts) increased from 93% to over 97%. In 2016-2017, the sewage interception and treatment will be promoted according to the plan. It is planned and tried to eliminate direct discharge of sewage of urban area in Guilin generally at the end of 2018.

c) Water quality monitoring has been conducted periodically. There are 17 sections for water quality monitoring in Guilin, including the monitoring of significant sections like the trunk of Li River, Yangshuo Section and Mopan Mountain Section. The monitoring of the sections has been conducted once a month.

d) The cooperation with research institutions and universities is strengthened. Collaborating with Guangxi University, the project "The research on how to utilize sludge as resources from industrial sewage and its application" was launched, which has focused on the treatment of industrial sewage sludge. Cooperating with Guilin University of Electronic Technology, "Water environmental functional zoning" has been implemented. Moreover, the Guilin Central Station for Environmental Monitoring undertook the project "Investigation of typical agricultural environmental quality in Li River Drainage Area and the research on the constitution of monitoring

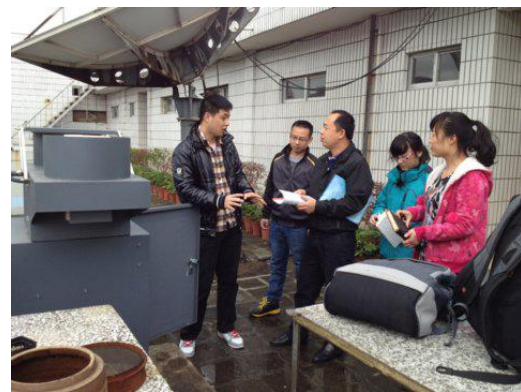


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indexes system”, which helps to set up the suitable indexes system for monitoring the agricultural environmental quality within Li River Drainage Area.

e) The Special Fund for Ecological and Environmental Protection of Li River has been set up. The fund was set by collaboration between Administration Committee of Li River Tourism Attraction and the Guilin Branch of China Environmental Protection Foundation. The fund raised has been mainly used for the projects to protect the Guilin Karst World Natural Heritage Site and ecological environment of Li River Drainage Area, and the related popularization. The fund has also been used to support business for public welfare on ecological protection of Li River Drainage Area, as well as other businesses related to sustainable development of ecological environment of Li River.

f) The trainings for water environmental protection and administration as well as monitoring have been organized for many times. In 2014-2016, the technicians and administrative staff have been sent to take part in seminars and trainings held in different places across the country, including: seminar on urban water source protection and monitoring, training on automatic monitoring technology of water resources, training on field operation of automatic sampling of acid rain, national training on automatic monitoring on surface water and the training on regular monitoring of water quality and soil of water source in Guangxi. The administration capacity has therefore been enhanced.



**Fig 13 Training on field monitoring technology in sewage plant**

**Fig 14 Training on field operation of automatic sampling of acid rain**



**Fig 15 National training on automatic monitoring on surface water ( left )**



**Fig 16 Academic exchange and mutual study on automatic monitoring of water quality ( right )**

### **2.3.5 Shibing Karst**

The water system of Shibing Karst is mainly composed of Shanmu River system and Waqiao River system. Shibing Karst located at the catchment of low land in valleys, the population density is about 4 persons/km<sup>2</sup>. Local residents' villages were relatively concentrated, the domestic and agricultural sewage from which may threaten the water environment. So far, the water quality of Shibing Heritage Site has been protected well. The section for drifting of Shamu River has the water quality with poor nutrition, clean water and no contaminants. According to current monitoring results, the surface water quality has reached the standard of Type II water defined by the Standard of Surface Water Environmental Quality (GB3838-2002). Aiming to the status of water environment and the threaten in Shibing Karst, the related departments adopted a serial measures to protect the water environment as follows:

a) Natural forest has been used to protect the heritage site in upstream area, and a water source conservation forest was hence planted. It has strengthened the administration and protection of returning farmlands to forest and meadow. The land that may influence the water quality and ecology of Shibing Karst was returned to be forest or meadow, which may prevent the water loss and soil erosion, and intensify the adjustment capacity of water environment and its anti-contamination capacity.

b) The cleaning project of rural area has been implemented in upstream village of Shanmu River located in Eastern, Western and Northern parts of the heritage site and buffer zone. Sewage treating pool and rubbish collection facilities have been established in demonstration villages. The agricultural environmental-friendly planting and raising have been promoted, the local residents have been instructed to choose the ecological fertilizer and green pesticide and use them reasonably.





**Fig 17 Cleaning project and sewage treating pool in villages**

c) The environment has been improved by different measures. The drifting river course of Shanmu River scenic area has been evacuated, the sewage treatment projects at the gate of Yuntai Mountain scenic spot and Pailouchong Village has been completed. A man-made wetland covering over 500 m<sup>2</sup> was constructed. Meanwhile, the environmental sanitary administration and rectification in the heritage site have been enforced. Waste bins and rubbish transfer box have been set to collect rubbish from the villages along the roads in the scenic areas and heritage site. All the rubbish have been collected and transferred to garbage treating plant for further treatment. The water quality and soil environment of concentrated drinking water source areas in Niudachang Village, Baiduo Village and Shuangjing Village have been monitored.

### **2.3.6 Huanjiang Karst**

So far there has been no people lived in Huanjiang Karst, only a few residents living on the boundary of Southwest part of the buffer zone, with the population density as of 7 persons/km<sup>2</sup>. The farmlands are less than 50 mu with the silkworm breeding as the major agriculture. There isn't large scale tourism developed within the heritage site, except the only two programmes: Ancient Tea Routes and Climbing Site. A few hikers hiked within the site. For the buffer zone (former Experimental Area of Mulun National Natural Reserve), there is only drifting programme in Gubin River at the outer edge of Eastern part. The total length for drifting is 9km. Under the status that there isn't serious threaten or challenge to water environment in Huanjiang Karst, all the current comprehensive measures adopted to protect the water environment make the water quality protected rather well. According to the

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monitoring data, the surface water quality reached to the standard of Type II defined by the Standard of Surface Water Environmental Quality (GB3838-2002).

In order to reserve the good water quality and maintenance the integration of the heritage values. Since the successful inscription, a serial measures have been adopted as follows, such as:

a ) Natural forest in upstream has been preserved to protect the water source and return farmlands to forest for the same aim. The water source conservation forest has been established to prevent water and soil loss, which may help to enhance the adjustment capacity for water environmental health and anti-pollution ability.

b ) The Temporary Administration Regulations for Huanjiang Karst World Heritage Site was approved in 2015. The regulations stipulated that it is banned to destroy water body, pour rubbish to water body and discharge over standard sewage to water body, it is also banned to wash vehicles or vessels ever stored oil or poisonous pollutants, besides, it is banned to pour industrial waste slag, domestic garbage or other wastes to the water body, and at last, it is banned to discharge virulent liquid waste to water body.

c ) The administration capacity and self-restriction capacity have been enhanced through village regulations and villagers' agreements. For example, the Regulations and Agreements of Bannan Tun in Mulun Village of Chuanshan Town has proposed very detailed requirements for water resources protection.

d ) Water quality monitoring has been carried out. The monitoring indexes suiting the water quality administration requirements of heritage site have been set. Many monitoring points have been deployed at inlet to buffer zone of Gubin River and its outlet from buffer zone, and Xiazhai Tun where there are relatively concentrated residents and drifting programme. The water quality has been traced and feedback in time.

#### **2.4 The threaten from farming and the countermeasures**

Among the sites involved by South China Karst, three of them have been influenced greatly by farming, they are Shilin Karst, Shibing Karst and Guilin Karst.

### 2.4.1 Shilin Karst

Shilin Karst and the buffer zone cover an area of 350 km<sup>2</sup>, accounting for 20% of the whole territory of Shilin County. Over 68 000 people are involved, accounting for 28% of the total population of the county. There are 30 village committees, 75 natural villages, 425 000 mu of mountainous forest, and 82 000 mu of farmland involved. Since the population within the heritage site and buffer zone is large, and most of which is farmer, the protection of the heritage site is threatened greatly. The major threatens and the scales are shown in the following table:

**Tab 4 Analysis of threatens from agricultural activities to Shilin Karst**

The types under influences	Influencing factors	Type o values	Intensity of the activities	Scales of the threatens
Production activities	Planting of crops and cash crops	Geological landform	<b>Xxx</b>	<b>Xxx</b>
		Aesthesis	<b>Xxx</b>	<b>Xxx</b>
	Animal husbandry	Geological landform	<b>Xx</b>	<b>Xx</b>
		Aesthesis	<b>Xx</b>	<b>Xx</b>
	Usage of pesticide and fertilizer	Geological landform	<b>Xx</b>	<b>Xxx</b>
		Aesthesis	<b>Xx</b>	<b>Xxx</b>
Living patterns	Cutting of woods	Geological landform	<b>X</b>	<b>Xx</b>
		Aesthesis	<b>X</b>	<b>Xx</b>
	Random disposal of garbage	Geological landform	<b>Xx</b>	<b>Xx</b>
		Aesthesis	<b>Xx</b>	<b>Xx</b>
	Enlargement of residential area	Geological landform	<b>Xx</b>	<b>Xxx</b>
		Aesthesis	<b>Xx</b>	<b>Xxx</b>
Illegal behaviours	Poaching	Geological landform	<b>X</b>	<b>X</b>
		Aesthesis	<b>X</b>	<b>X</b>
	Illegal mining of rocks	Geological landform	<b>X</b>	<b>X</b>
		Aesthesis	<b>X</b>	<b>X</b>

In order to address the threatens from agricultural activities, the major measures adopted by Yunnan government and Shilin County are as follows:

a) Shilin Karst is protected with legislation. In 2008, the Regulations for Protection and Administration of Shilin Tourism Attraction in Kunming was released to public. In 2016, the Regulations for Protection of Shilin Karst World Natural Heritage Site

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was also released to public. The two Regulations forbade the behavior like hunting, quarrying and planting environment-hurt plants. According to abovementioned Regulations, a series of regulations for the protection and administration of heritage site and buffer zone have been formulated by Shilin Administration, e.g. it is banned to firewood, it is banned to build up house by quarrying, it is banned to reclaim waste land, and it is banned to fend livestock in free range. Meanwhile, Shilin Administration also has a law enforcing team with 20 staff members, which may exercise the right for law enforcement to abovementioned illegal behaviors.

b) Local residents are encouraged to take part in the protection and administration. Shilin Administration has implemented Joint Administration for Resources since more than 10 years ago: 1) 50 persons have been employed to form a patrol team for environment and resources protection, which has made the community participated into the protection and administration by themselves. 2) 10 protection stations have been set up in village committees within the heritage site. There is an annual fund used by village committees to motivate villagers practice patrol and administration of the resources around the villages. They earned some salary and were trained by Shilin Administration irregularly. 3) 15 local residents have been employed to join the comprehensive law enforcement team for protection and administration of Shilin heritage site; 4) the ecological restoration of the site has been conducted, all the missions like afforestation and keeping environment have been undertaken by villagers; 5) the civilized villages have been established jointly by cooperation with local community. The agricultural activities in heritage site and the buffer zone have been guided, controlled and administrated. A lot of measures have been adopted to protect and administrate the site, including: returning farmland to forest, transforming development mode of agriculture, training farmers to enhancing farming capacity periodically, as well as guiding residents to choose and use ecological fertilizers and green pesticides scientifically and reasonably. Besides, some water quality monitoring sites have been set up at the area with intense agricultural activities (aiming to the influence from fertilizer and pesticide), which have been used to monitor the pollution of water environment caused by agriculture in heritage site.

c) The living status of the community have been improved. 1) The policy of “promoting tourism to compensate agriculture” has been practiced. Since 2010, 10 million yuan from financial tourism fund of Shilin County has been used as allowance

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of local farmers annually. At the same time, 40 million yuan has been used for the construction of anti-poverty projects for new villages and towns. 2) The living pattern of villagers has been helped to be improved, with more energy saved. More than 4 000 marsh gas tanks have been built up by local residents with assist from local government, which could be used as the major fuel instead; 3) The land has been rented for ecological restoration like returning to forest. The total area of the mountainous land rented for ecological restoration has reached over 10 000 mu. 4) The planting structures in villages have been helped to be adjusted with the collective incomes increased. Since 2000, Shilin Administration has invested to help Wukeshu Village to plant economic forests covering nearly 200 mu like waxberry, cherry, plum, and pear. The expenses on annual administration and nursery have also been covered by Shilin Administration. 5) Villagers of Wukeshu Village and Xiaoqing Village have been taken priority for jobs of tourism service, resources protection, and garden construction. More than 7 000 jobs have been provided to local community directly and over 4 000 jobs have been offered indirectly. 6) Infrastructure construction of villages have been assisted to be carried out with living environment improved. So far, Shilin Administration has invested over 50 million yuan to help to improve the facilities for sewage collection and disposal and garbage clearance and transport. The villages received the investment has improved their environment greatly and enhanced their living standard.

#### **2.4.2 Shibing Karst**

There is no resident in Shibing Karst World Natural Heritage Site. Generally, traditional agricultural activities are popular, which generated few negative influence to its outstanding common values and environment. However, there is relative large population outside the buffer zone. The residents may pursue relative more intense agricultural activities, which may threaten the vegetation and ecological environment to some extent. The growth of crops, the usage of agricultural film, old spoiled agricultural instruments, and the packing bag of pesticide or fertilizer are the main issues that may influence the environment, there is lack of disposal facilities for agricultural and domestic waste. Through the measures to administrate and control the

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agricultural infrastructure of agricultural activities, the influence from agriculture to Shibing Karst World Natural Heritage Site is controlled effectively, which has been minimized.

a) The agricultural and industrial structures have been adjusted. It is encouraged to return farmland to forest or plant economic forest, and develop green and clean agriculture. The transform from traditional single agricultural economy to the new pattern with the third industry as the major leading role and diversified economic industries accompanied has been advocated. The high-quality vegetables, greenhouse vegetables, fruits, herbs cultivation, as well as the newly agriculture like nursery cultivation, special breeding have been developed in priority. The new technology for agriculture has been promoted, the diversified cultivating and breeding system has been set up, as well as the industrialized agriculture and modernized agriculture have been put forward.

b) The agricultural solid waste disposal facilities have been constructed. The garbage pool has been set in the villages with concentrated residents. Besides, the garbage collection sites and transferring facilities have also been set in villages-concentrated area. The construction garbage from the facilities for tourism has been removed and carried to the designated sites in time. With closed package, all the construction waste has been carried to Shibing County for concentrated treatment. The waste could be treated on the same day. The temporary movable waste bins have been set along drifting section of Shanmu River at peak hours. The barbeque waste on the river bank has also been administrated strictly. The owners of the barbeque stalls are responsible to keep the environment clean and dispose all the related wastes.

c) The environment-friendly planting and breeding patterns have been promoted, which may improve the monitoring network for agricultural pollutants and the controlling system. The agricultural non-point contamination source to the heritage site and buffer zone has been reduced indeed.

d) The pesticide and fertilizer have been controlled strictly, with the organic manure being promoted instead. The agricultural activities within the heritage site and buffer zone have been instructed, adjusted and supervised. The residents have been trained

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for enhancing their farming capacity periodically. The local residents have been guided to choose ecological fertilizer and green pesticide scientifically and reasonably. Besides, the monitoring sites for water quality have been set up in the area with intense agricultural activities to monitor the pollution of water environment caused by agriculture.

e) The community development has been strengthened with the self-development capacity of farmer enhanced. The service facilities for tourism and villages construction in the community have been combined. The energy consumption mode and production pattern of local residents have been improved, which minimized the pressure to ecological environment.

### **2.4.3 Guilin Karst**

Agricultural contaminants have threatened Guilin Karst Heritage Site, mainly including pesticides and fertilizer in arable lands, rural domestic sewage and wastes coming from the heritage site, the buffer zone and farmland on upstream riverbanks of Li River. According to the present status of agricultural conditions, such measures as development of pollution-free agricultural production and green food production, promotion of new modes of ecological agricultural technology, have been employed to provide scientific protection for Guilin Karst Heritage Site. It has made the traditional agriculture transferred into eco-agriculture effectively, thus promoted the coordinated development of rural economy, society and environment.

a) Development of ecological circular agriculture: with low consumption, low emission and high efficiency as the major aim, such modes as “livestock (pigs and ox) + biogas + fruits (vegetables) + lamp + fish”, “rice + lamp + fish (ducks) + mushrooms”, and straw returning, as well as over 40 ecological cycles of agricultural techniques, such as soil testing and formulated fertilization, dry farming for water saving and green control for plant diseases and insect pests prevention, have been employed on 939.39 *mu* of arable lands in total.

b) Realizing zero growth of fertilizers and pesticides. Straw returning, planting green manure, increasing organic fertilizer have been carried out to regulate the structure of fertilization, and the farmers have been guided to accumulate manure and

improve the utilization rate of fertilizers. Biological, physical and other green technology to prevent crop diseases and insect pests, and high efficiency, low toxicity and low residue pesticides application have been recommended to reduce the amount of pesticide usage. High toxicity and banned pesticides have been designated to be sold in authorized stores. As a result, the fertilizer and pesticides have kept decreasing in the heritage site and the buffer zone since 2014.



**Fig.18 Promotion of zero growth of pesticides(left)**

**Fig.19 Promotion of green plants protection technology for predatory mites(right)**

c) Cleaning up of cage fish culture, illegal fishing, and aquaculture field

Clean-up of cage fish culture in Taohua River has been completed in the end of May this year to purify the water environment, and those in the Guilin section of Li River would be all removed in this year, which involved 84 households including 8 565 m<sup>2</sup> of cages.

d) To carry out various forms of laws and regulations publicity

We also make great efforts in improvement of community participation in management, law enforcement and publicity efforts, farmers' ecological consciousness, and in development of convention on health management in the villages and towns, health management responsibility policies and other management policies within the scope of the heritage site. Ecological environmental sanitation in villages and towns has been actively organized and carried out, and formed "the ecological environment protection convention of Guilin Karst World Natural Heritage", thus the city's agricultural households and farmers' awareness of heritage protection has greatly improved.



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## **2.5 Management measures and implementation of urban development**

The agricultural population accounts for the majority in the scope of heritage sites, and the main influence comes from Wulong and Guilin area. However, due to the difference in economic development level in different regions, plus the interests of the urbanization development needs of stakeholders, which lead to a threat to the protection of the heritage sites caused by urbanization and construction. To solve this problem, it is needed to fully coordinate the relationship between heritage conservation and management planning and urban or town planning. Ideas should be established that protection is preferred, and utilization is secondary, and the urban construction land control and approval policies should be adhered to, and the effective protection of the heritage resources, the coordinated development of the local community can thus be achieved.

### **2.5.1 Wulong Karst**

a) Adhering to the principle of "original address, original size and original style", Aboriginal housing was strictly controlled, and ecological immigration was recommended then pushed forward step by step. Farmland and forest land transfer in the heritage site would be carried out to ensure the protection of natural eco-environment.

b) Standards for residential construction were strictly controlled, residential land and construction standards of different control types should be strictly in accordance with local laws and regulations. All development and construction projects must meet the requirements of the protection and management planning, and be submitted for strict pre-approval, management mode should be conducted that it is "not to engage in wholesale, adhere to the individual approval, and implement breakdown operation".

c) Strict administrative law enforcement was carried out in the scope of heritage site. Law enforcement inspection was intensified; especially in the core areas, illegal construction and destruction of vegetation activities resolutely investigated and dealt with. Inspection was performed in the scenic spots for more than 52 times with over 200 people in total; and several dozens of illegal activities was investigated and prohibited.

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d) Residential buildings should be coordinated with the landscape environment, the height of buildings was strictly limited, native materials was adopted as much as possible to maintain the traditional style of folk houses, at the same time, any valuable previous buildings and environment remains, buildings of cultural relics, typical houses, villages and rural architectures are strictly protected and remains traditional style.

### **2.5.2 Guilin Karst**

a) Coordination of urban& rural planning and heritage planning. Urban construction planning compiled by governments at all levels should comply with the "Protection management plan of karst in South China", " Planning of Li River scenic area in Guilin ", " Ecological environment protection ordinance of Li River in GuangxiZhuang Autonomous Region" and other relevant documents. Construction sites must be approved strictly according to the legal procedures. Excavating mountains, quarrying, mining, reclamation, repair grave tombstone, and other destruction activities of landscape, vegetation and terrain were strictly prohibited. Residential buildings should be coordinated with the landscape and environment, the size, shape, outlines, colors and textures of constructions were strictly limited to be harmony with surroundings.

b) Duties were strictly performed on the environmental protection supervision and inspection in heritage site. Periodical inspection supervisions on the quarry, sand excavation, illegal construction and other destructive activities of the ecological environment were carried out, illegal buildings and facilities in the heritage site were removed according to relative laws. Li River Scenic Area Administration Committee of Guilin has investigated and dealt with 11 illegal constructions with over 700 m<sup>2</sup> in Li River Scenic Area, and dismantle hardened ground for over 70 m<sup>2</sup> in Zizhou, a delta at Guilin section of Li River, completely shutdown 22 quarries united with public security department.



**Fig.20 Excavation for stones were prohibited      Fig.21 Quarries reforestation**

Natural landscape restoration project were implemented for demolition area and outage mine. Natural and artificial engineering measures were carried out to recover natural marshland of Lijiang River, and to maintain the authenticity and integrity of the natural landscape of Lijiang River in maximum extent. Scenic forest with 50-100 m in width was continuously planted.

d) Improvement of the urban sewage treatment and garbage disposal system in the heritage site and its buffer area.

Leading group of municipal sewage treatment facilities construction was organized in each county to instruct constructions of the above facilities. 3 newly built sewage treatment plants, such as Baisha Town etc., have the capacity of 6 000 t/d, the environmental impact assessment and construction plan of Putao sewage treatment plant with the capacity of 1 000 t/d have been approved officially, 8 small newly built transfer stations have also been operated.

## **2.6 Yi culture heritage protection and traditional production way of life in Shilin Karst**

In addition to the Han, Yi, Bai, Hani, Zhuang, Miao, Hui and other ethnic minorities also live in the scope of Shilin Karst heritage site, Ashima culture of Yi, the majority of ethnic minorities, is characterized by Sali culture. The vigorous development of tourism largely impacts Sani culture, classical folk customs and solemn ritual were packaged as vulgar commercial performances, and characteristic ethnic culture is undergoing serious threat. Such countermeasures are shown as follows.

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a) Cultural resources of the minority nationalities were investigated and collected, Ashima cultural gallery and demonstration area were built, as well as the minority culture villages, landmark facilities. Intangible cultural heritage protection center of Shilin was organized, and there are 3 national intangible cultural heritages up till now, that is, the Sani oral narrative poem "Ashima", Yi embroidery of Shilin and Big Sanxian, as well as 2 representative successors of national intangible cultural heritage.

b) Catalogue and planning of national traditional culture protection were compiled, database of the national traditional cultural resources and minority linguistic characters were established, furthermore, the display of intangible cultural heritage, teaching place and other facilities were constructed, which act as a showcase of multinational culture.

c) Emphasis was put on the creation of national and folk literature or art, such as "Magic place of Ashima" and "Big Sanxian", great efforts have also been taken to build a number of Ashima culture brands through the creation of national literature, music, art, dance, drama, film and television, clothing and crafts.

d) The town center and characteristic villages were highlighted, and the construction of public cultural facilities was strengthened, cultural activity room, book bars in farm house, popular science propaganda column, sports facilities and internet were implemented for each village.



Fig.22 The Torch Festival of Yi Nationality Fig.23 Mizhi Festival of Yi Nationality

## 2.7 Boundary adjustment of Wulong Karst

Wulong Karst was requested that the buffer zone should be expanded and refined to protect the upstream catchment at the 31st World Heritage Convention, then the propose that state parties should examine the borders of Wulong Karst was put

forward in assessment report of in South China Karst (Phase II) by IUCN, and In the same year, it was requested that the scope of Wulong karst heritage site should be expanded, and the border of buffer zone should be re-designed in the "World Natural Heritage Outlook Reportin 2014".

According to the points by Institute of Karst Geology, CAGS, the 3 parts of Wulong karst are relatively independent in geological structure, and biological community and biodiversity are not the remarkable characteristics of Wulong karst, which also means that migration of biological communities does not need the connection of landforms in buffer zone, and besides, over 20 townships with dense populations distribute around the heritage site, if which are incorporated into the buffer zone, great difficulties will consequently be brought about. For above reasons, the extent of heritage site was slightly regulated on the basis of previous border, with the increase of the area by 1,134 ha, which has incorporated all parts upstream of the heritage site.

The heritage site still includes 3 parts: Furong karst cave system, the 3 natural bridges system and Houping mechanical-erosion karst tiankeng system after regulation of the border and each part has its own buffer zone (detail in “Management planning for the protection of the world natural heritage of karst, in South China”

**Tab.5 Regulation of the extent of buffer zones of Wulong Karst**

Part	Area before regulation (ha.)			Area after regulation(ha.)		
	In total	Heritage site	Buffer zone	In total	Heritage site	Buffer zone
Furong karst cave system	28,000	3,000	25,000	27,965	3,941	24,024
the 3 natural bridges system	6,200	2,200	4,000	10,298	2,285	8,013
Houping mechanical-erosion karst tiankeng system	3,800	800	3,000	15,652	908	14,744
<b>Total</b>	<b>38,000</b>	<b>6,000</b>	<b>32,000</b>	<b>53,915</b>	<b>7,134</b>	<b>46,781</b>

### **3 Existing protection issues not mentioned in the resolution of the World Heritage Committee**

None.

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**4 Significant repairs, alterations, and/or new construction may be carried out in the heritage site and buffer zones in the future.**

Project of Guiyang-Nanning Railway Passenger Transport Special Line was planned to cross the buffer zone of Libo Karst heritage site. Through repeatedly discussions on the hydrogeology, engineering geology, safety, environment protection, costs and technological conditions, the results show that any other alternatives cannot avoid crossing the buffer zone, and the length of railway in optimal plan is 15.9 km in buffer zone, with the length of tunnel of 14.0km, the straight-line distance is over 3km from Libo karst heritage site. See the appendix for detailed discussions.

**5 Whether the protection report is for public disclosure**

Yes.

**6 Official signature**

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## Annex 1

### **Decisions for Extensions of the South China Karst**

***adopted by the World Heritage Committee WHC-14/38.COM/16, page 169 at its 38th session (Doha, 2014)***

The World Heritage Committee,

1. Having examined Documents WHC-14/38.COM/8B and WHC-14/38.COM/INF.8B2,

2. Approves the extension of the South China Karst to include the South China Karst Phase II, China, on the World Heritage List under criteria (vii) and (viii);

3. Adopts the following Statement of Outstanding Universal Value: (abbreviated)

4. Urges the State Party to continue efforts to integrate planning, governance and management across the whole South China Karst World Heritage property including the proposed finalization of a management plan anticipated by 2015;

5. Commends the State Party for its efforts to manage diverse threats to the property arising from tourism, water pollution, agriculture and urban development activities and recommends the continued close monitoring of these potential impacts;

6. Notes that the inscription of this property completes the South China Karst serial property, thereby making a significant contribution to the recognition of karst sites on the World Heritage List and setting a high standard for the quality of argument required to support inscription of any further karst sites; and therefore signals that the numbers of additional karst sites suitable for inscription on the World Heritage List is likely to be very small;

7. Also recommends that the State Party consider future re-nomination of South China Karst properties under biodiversity criteria in light of the intact forest cover in many of the properties which are of high biological value;

8. Encourages the State Party to cooperate with the State Party of Viet Nam to ensure technical cooperation and exchange as well as the harmonization of management practice and promotion in line with the transnational dimension of the

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karst systems of the South China region, recognising sites in neighbouring States Parties that may have potential Outstanding Universal Value;

9. Requests the State Party to submit, by 1 December 2016, a report, including a 1-page executive summary, on the state of conservation of the property, including progress on the finalization of a property-wide management plan; the implementation of integrated governance arrangements; and the implementation of actions to manage tourism, water quality, agricultural and urban development impacts to ensure protection of the property, for examination by the World Heritage Committee at its 41st session in 2017.



**Report on the Planned Newly-Constructed  
Guiyang-Nanning High-speed Railway that is Proposed to  
Pass through the Buffer Zone of Libo Site of the South  
China Karst World Heritage Property**

**1. Overview of the Guiyang-Nanning High-speed Railway**

Guiyang-Nanning High-speed Railway ("GN Railway" in short) is a passenger railway line planned to be located at southeast of Guizhou Province and northwest of Guangxi Zhuang Autonomous Region in China, with a total length of 510.286 km. GN Railway is an important part of China's national integrated transportation network, an important trunk railway linking southwest China and coastal areas in southern China. The project will closely connects four of the seven components of the South China Karst World Natural Heritage Property, i.e. Libo Karst and Shibing Karst in Guizhou Province, and Huanjiang Karst and Guilin Karst in Guangxi, which will be of great significance in promoting the collaborative management and joint presentation of the South China Karst serial property.

**2. Comparing and selecting the plans**

(1) Away from the buffer zone in the eastern side of Libo Karst. This plan intends to allow GN Railway to run away from the buffer zone in the eastern side of Libo Karst, but the route cannot avoid a goaf (underground mined-out area) in the Pingzhai coal mine, which covers a large area of 3 km<sup>2</sup>. The goaf will directly affect the safety of construction and operation, so this plan has to be given up.

(2) Away from the buffer zone in the western side of Libo Karst. This plan intends to allow GN Railway to run away from the buffer zone in the western side of Libo Karst. In this plan, GN Railway will cross the Huanghou underground river system seven times, which is located at the upstream of Da-Xiao Qikong Part of the Libo

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Karst. The water volume, water quality and outstanding universal value of Libo Karst will be directly affected if the underground river system is impacted. Therefore, this plan has to be abandoned.

(3) Crossing the buffer zone in the shortest distance. This plan allows GN Railway to cross the buffer zone of Libo Karst in the shortest distance. While there are many faults creating unstable rock and falling rocks along the Dagou River in the south of the project, which will directly affect the safety of the construction of GN Railway and passengers during operation, so the plan has to be abandoned too.

(4) Cross the buffer zone in the center line. This plan intends to allow GN Railway to cross the buffer zone in the center of Libo Karst. With respect to safety route selection, geological route selection, environmental route selection as well as planning route selection and after taking account into the impact of the project on the property and buffer zone, impact of goafs on the route and impact of unstable and falling rocks as well as many other factors, this plan is recommended.

The recommended route intends to allow the GN Railway to cross the buffer zone of Libo Karst, with a total length of 15.9 km, divided into six segments, successively are: Yaoshan Tunnel buffer zone section of 10080 m, roadbed on the earth's surface in the Laocun Village of 144 m, Pingyanhe Bridge of 504 m, roadbed of 230 m, Laocun four-line bridge of 1022 m and the Laocun Tunnel buffer zone section of 3920 m. Then GN Railway turns to the southeast to Huanjiang County, Guangxi, China.

### **3. The project's impact on the "Aesthetic Value" of the Libo Karst Property and buffer zone based on criterion (vii)**

According to “the Special Research Report on the Impact of the Construction of Guiyang-Nanning High-speed Railway on Libo World Natural Heritage Property”, the GN Railway intends to cross the buffer zone of the Libo Karst Property. The construction and operation of the project will not directly affect the aesthetic value carriers of the Libo Karst, including peak clusters, peak forests and vegetation landscapes of the property.

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As the GN Railway is more than 3 km away from the Libo Karst Property in the straight-line distance and the landforms of the peak cluster along GN Railway is developed, the GN Railway will not cause any visual pollution to the landscapes and aesthetic value of Libo Karst Property.

Of 15.9 km of GN Railway in the buffer zone, two tunnels of 14 km is 200 m to 300 m below the ground surface, so GN Railway will not affect the peak cluster depression and vegetation landscapes in the buffer zone. The railway section of 1.9 km on the earth's surface is located at the non-karst region at the bottom of the Laocun Village, and the impact on the buffer zone is very limited.

**4. The project's impact on the "geological and geomorphological value" of the Libo Karst Property and buffer zone based on criterion (viii)**

According to “the Special Research Report on the Impact of the Construction of Guiyang-Nanning High-speed Railway on Libo World Natural Heritage Property”, the GN Railway intends to cross the buffer zone of the property, which will not directly affect the cone karst landforms and caves of Libo Karst property, so it will not directly affect the outstanding universal value of earth history and geomorphological characteristics of the Libo Karst Property based on criterion (viii).

Before the GN Railway enters into the buffer zone, it spans the surface river and underground river of Fangcun River in the upstream of the Da-Xiao Qikong component part of the Libo property in the forms of bridges and small tunnels. The construction of such bridges will not affect the surface water. The design elevation of the tunnel rail surface is higher than the elevation of water table of Fangcun River. Therefore, the bridges and tunnels will not affect the flow, flow direction and water quality of the Di'e River of Da-Xiao Qikong Part.

The two component parts of Libo Karst belong to different groundwater systems, which eventually converge into Zhangjiang River in the buffer zone. The surface water and groundwater among the two component parts of Libo Property are disconnected. Therefore, the project will not affect the hydrogeological process and karst process in these two component parts of Libo Property.

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After GN Railway enters into the buffer zone, it spans by way of a tunnel which is 60 m higher above the top of the Yaoshan Underground River. So the tunnel will not affect the main river flow direction and will not affect the karst hydrological and geological processes of the buffer zone.

The GN Railway may affect the karst landform of the buffer zone to some certain extent, because the tunnel construction may affect the substrate of the cone karst landform along the line. A total of 13 peak clusters and depressions of 5.32 km<sup>2</sup> may be affected, accounting for 1.22% of the total area of the buffer zone, so the impact is minor.

#### **5. The project's impact on the bioecological value of Libo Karst and the buffer zone**

According to “the Special Research Report on the Impact of the Construction of Guiyang-Nanning High-speed Railway on Libo World Natural Heritage Property”, Libo Karst does not meet the ecological and bioecological criteria (ix) and (x), but the effect of the project on the bioecological value of Libo Karst was also evaluated as if it is another value of Libo Karst. The construction of the proposed project will not result in the disappearance of vegetation types and plant species, so the impact on various natural ecosystems, vegetation and biomass is insignificant. There are no national key protected animals found in the proposed construction area of GN Railway. The construction may have some indirect impact on animals, because noise occurring in the construction period (for example, the blasting construction) may expel the animals to some extent, but such impact is minor. After the project construction is completed, the effect on the animals will be decreased because most sections of the railway in the buffer zone are tunnels deeply buried beneath the surface. The proposed GN Railway has no impact on the protected objects list in the inventory of Libo property and it almost has no impact on the structure and function of the property. The secondary bushwood ecosystem is dominated in the evaluated area. The actual construction area of GN Railway is small and it mainly occupies artificial vegetation. Therefore, it insignificantly affects rare and endangered wild animal and plant resources. It will not affect the protected objects in the inventory of

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Libo property, structure and functional integrity. After adopting measures to strengthen ecological environment protection during the project construction process, the impacts on the ecological environment and ecological processes are minor and the regional ecological functions will not be changed or degraded.

#### **6. The project's impact on integrity and protection management of Libo Karst and the buffer zone**

The GN Railway intends to cross the buffer zone of Libo Karst, which will not change the boundaries of Libo Karst property and the buffer zone, therefore it will not affect the integrity of Libo Karst from the boundary point of view. The project will not destroy the karst landforms, caves and hydrogeological conditions within the property and will not affect the preservation of the outstanding universal value of the property. The project will not destroy the karst forest ecosystems and habitats for rare and endangered species and therefore it has no effect on the integrity of the biological and ecological value of property. The GN Railway intends to cross the buffer zone, which will have some impact on the karst landform, caves, hydrogeology, karst landscape and biological ecosystem of the buffer zone. After the project is completed and put into operation, it will bring some pressure on the environment of the buffer zone, as well as the protection and management of the property and the buffer zone.

#### **7. Conclusions**

In summary, in considering the premise of linking Libo Karst and Huanjiang Karst properties, the GN Railway cannot avoid crossing the buffer zone of Libo Karst. The recommended route has no impact on the outstanding universal value and integrity of Libo Karst World Natural Heritage Property, but may exert some pressures on the protection and management of the property and have some impacts on the geological landscapes, biodiversity and the ecological environment of the buffer zone, but such impact is insignificant. According to the paragraph 119 of the "Operational Guidelines": "World Heritage properties may support a variety of ongoing and proposed uses that are ecologically and culturally sustainable and which may contribute to the quality of life of communities concerned. The State Party and its partners must ensure that such sustainable use or any other change does not impact

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adversely on the Outstanding Universal Value of the property. ", in view that the route selection plan will not affect the outstanding universal value and integrity of Libo Karst Property and does not conflict with the "Management Plan of the Libo Karst of the South China Karst World Natural Heritage Property (2006-2015)", the recommended route selection plan for GN Railway is feasible and acceptable.

### **8. Suggestions**

The state party of China will urge all levels of governmental authorities and the construction party to further study and strengthen the supervision over the project, so as to minimize the project's negative impact on Libo Karst and the buffer zone, to:

(1) Improve the route design plan. Further strengthen the study on the geological and hydrogeological conditions of the sections the GN Railway passing by, especially the upstream of the Di'e underground river system in the Daqikong component part of Libo Property and the Yaoshan underground river system in the buffer zone. By using geophysical prospecting techniques, to verify the distribution of underground rivers and the burial depth of water tables as well as other basic information, so as to further improve and refine the route design plan and ensure the development and evolution of the hydrological and geological processes and karst landform in the property and the buffer zone not be affected during the construction and the operation period.

(2) Strengthen the protection during the construction period. Further study the construction technology of railway engineering, optimize the construction plan and formulate a reasonable and feasible construction schedule and construction organization plan in order to conserve soil and water and to reduce the impact on the ecological environment and scenic tours. Construction departments should cooperate with the management authority of Libo Karst in order to implement property protection measures, ensuring civil construction and ecological construction.

(3) Establish the ecological and landscape restoration plan. According to the ecological impact analysis, in order to minimize the impact on the ecological environment during the project construction and operation period and also in order to obtain good ecological and social benefits, it is recommended that, after the project is completed and upon the ecological restoration, we will grow as possible the local and

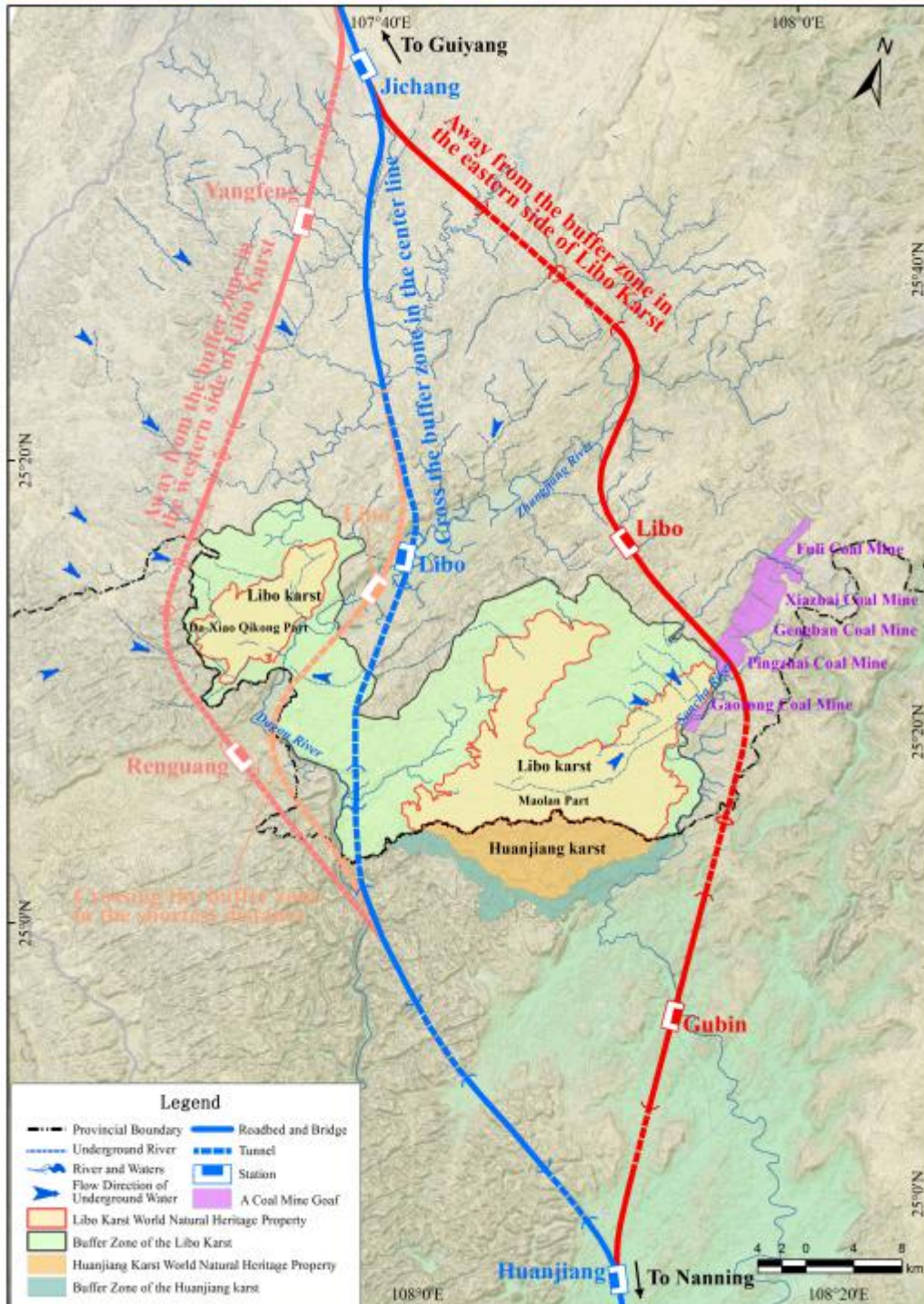
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native plants such as oriental white oak, lithocarpus glaber, sweetgum and pungent litse fruit on the railway slope, construction roads, temporary topsoil dumps and pay attention to coordination with the surrounding landscapes, so as to avoid damage to the landscapes of the buffer zone. It is recommended that wildlife protection measures be strengthened and wildlife be guided to avoid straying into the project area by using ecological measures.

(4) Carry out regular monitoring. In the construction and operation period, relevant departments involved in the construction at all levels should strengthen the full supervision and monitoring over the project construction and properly handle the relationship between the project construction and the property protection to achieve the coordinated development. Professionals should be hired to regularly monitor the threats of the project on the property and the impact on the buffer zone, formulating evaluation plans, systematically identify monitoring indicators, monitoring frequencies and monitoring locations. Authorities and persons who are responsible for the monitoring the content of each item should be determined and implement lifelong chase accountability. Monitoring expenditure should be independently accounted and a special monitoring report be submitted annually. In the event of abnormal findings, the construction should be immediately stopped and special rectifications be carried out.

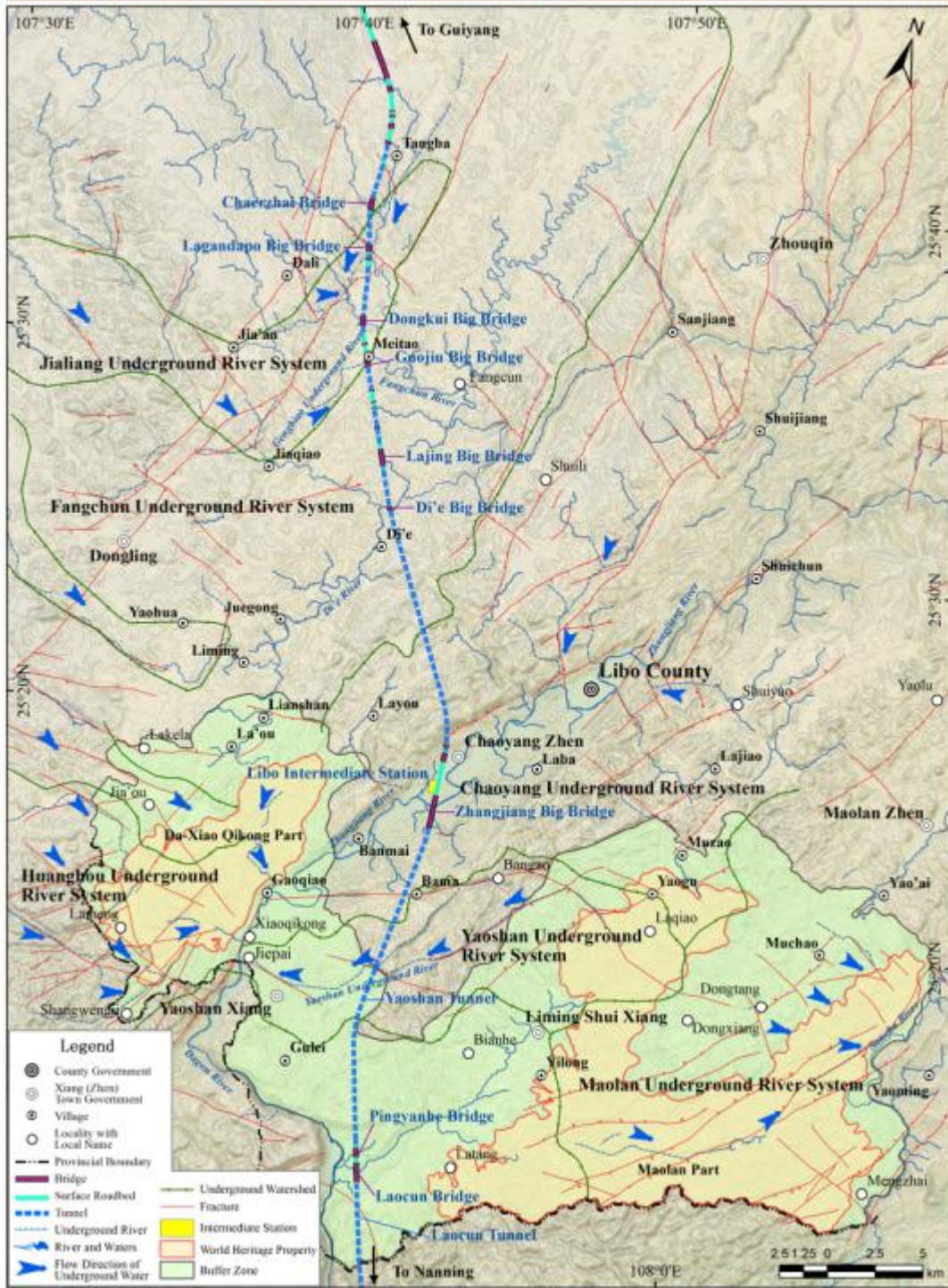
(5) Strengthen personal training. Although the project has no impact on the outstanding universal value of the Libo Karst, it has some impact on the resources, the environment and the buffer role of the buffer zone. Therefore, it is necessary to strengthen trainings for the constructors, managers and supervisors, allowing them to have deep understandings of the importance and protection measures of Libo Karst value, so as to minimize the threats to the heritage value and the negative environmental impact.

## Alternative Plans of the Newly Constructed Guiyang-Nanning High-speed Railway





## Brief Hydro-geology of the Project Area



# 中华人民共和国联合国教科文组织全国委员会

NATIONAL COMMISSION OF THE PEOPLE'S REPUBLIC OF CHINA FOR UNESCO  
COMMISSION NATIONALE DE LA REPUBLIQUE POPULAIRE DE CHINE POUR L'UNESCO

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30 November 2016

## **Subject: State of Conservation Report of the South China Karst World Natural Heritage Site**

Dear Mrs Rossler,

Referring to Decision 38 COM 8B.9 concerning the extension of the South China Karst World Natural Heritage Site, I am pleased to submit the State of Conservation Report on the world heritage site provided by the Ministry of Housing and Urban-Rural Development of China.

I look forward to your comments on the report at your earliest convenience.

Thank you for your long standing support to the protection of the World Heritage in China.

Yours sincerely,



Du Yue

Secretary-General

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cc: Chinese Permanent Delegation to UNESCO