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Chapter 3 River Environmental Survey

1. River Pattern

The Dajia River has been through river management planning for many times. You can directly refer to the river management planning report

The project has been collecting topographic maps, aerial photos and river management plans.

Based on the historical evolution data of the river recorded in the 1980s, the author conducts a comprehensive analysis and judgment, and

Edge environment classification.

(I) Classification principles 1.

Classification based on flow path type

Lane divides river sections into braided river sections, straight river sections and meandering river sections according to their flow path types.

The characteristics of the segment are shown in Table 3-1.

2. Classification based on the "Taiwan River Form Survey and Research Report" Chen Shuqun's localized

river classification method in 2002 is an improvement on Rosgen's (1996) classification system to adapt to the characteristics of local

rivers. The detailed classification method is shown in Table 3-2. Based on the localized river classification method, combined with 1/5,000

orthophotos,

The basic river types can be classified into 7 types: A~G (relatively straight~winding river type), as shown in Figure 3-1 and Table 3-3.

3. Classification by river section location

In order to coordinate with the environment creation, river management also needs to be classified according to the location of the river sections to be managed.

The river sections of Sichuan can be divided into mountainous, hilly and flat sections according to their location. Their characteristics are shown as follows:

Figure 3-2.

4. Classification by surrounding land use

Land use around rivers is an important factor to be considered in river environment construction.

The surrounding land use conditions are divided into rural, village and urban river sections.

As shown in figure 3-3.

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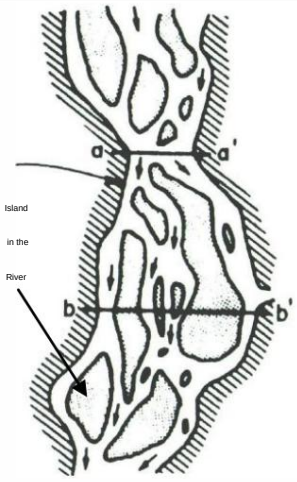
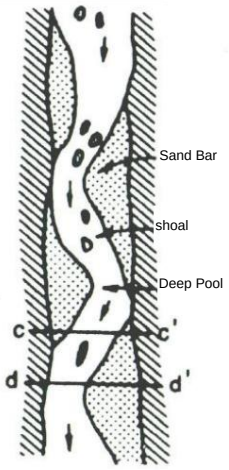
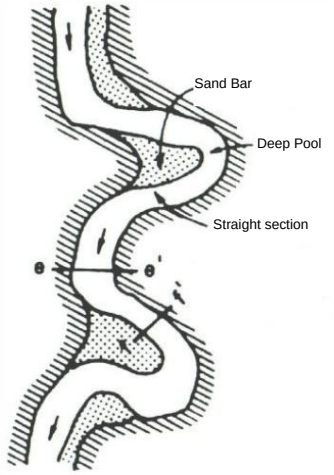
Table **3-1** River Flow Path Characteristics (Lane)

category	Braided river	Straight river section Winding river sectionÿ Gentle slopeÿ Contains a series
Flow Path Characteristics	sections: wide river width, unstable river banks and Not obviousÿSteep slope, shallow water, bifurcated flow pathÿUnstable riverbed, flow path changes due to water level And changes	of deep pools with stable river banks and not easily eroded. Short straight sections connect the concave banks to form a triangle-like deep and low-water flow path. The pools meander in the main river channel and silt up sections have a rectangular cross-sectionÿ The straight into sandbars when hitting the banks, while the straight sections have steeper slopes and are easily eroded. The gentle slopes cause river banks to silt up and the water flow
Cause	ÿ The upstream sand and gravel supply is greater than the sand transport capacity of the river section ÿ The steep slope and shallow flow form an island in the river	ÿThe flow is slow and the scouring force is small. ÿThe river bank is hard and not easily scoured. Redirection ÿ Geological control causing water flow to change direction
photo		 
Flow path type		 

Source: Liang Wensheng, "Reference Manual of River Ecological Engineering Methods", 2005, Public Works Committee, Executive Yuan.

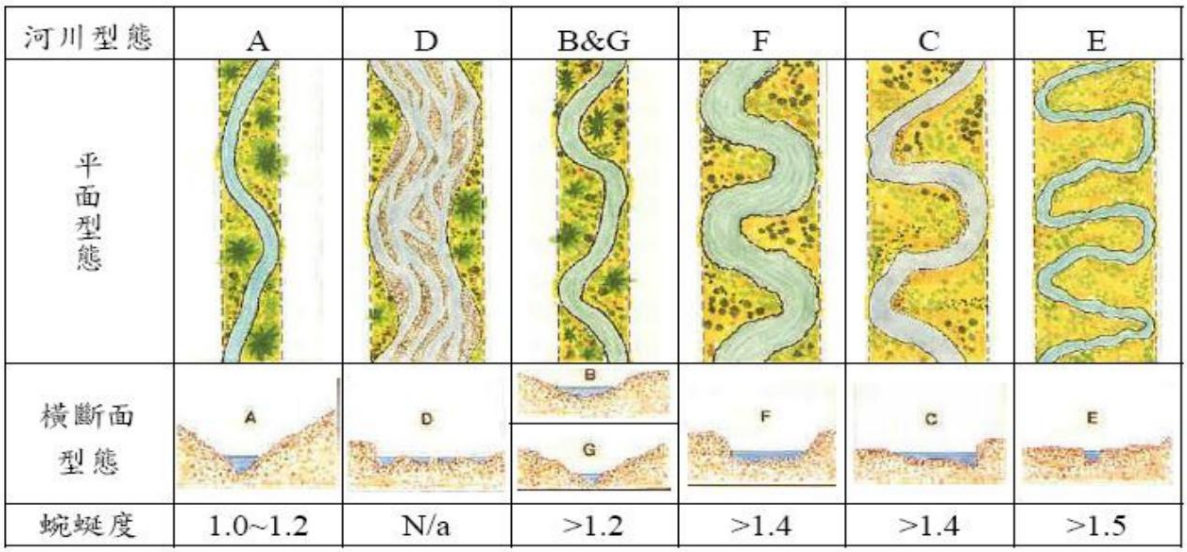


Figure **3-1 Classification of basic river types (A~G)**

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Table **3-2 Chen Shuqun's (2002)** classification of localized river mainstream types

River Pattern		Basic description: Windingness	Slope		Topographic and geological features
In order	Mountain Straight	1. Mainly affected by topography 2. The river bank is mainly composed of bedrock and is controlled by linear faults	1.0 ~ 1.2	>1/200	1. The terrain is very undulating. 2. There are erosion, bedrock or sediment features; there is a potential for landslides. 3. Deep troughs and rivers 4. Deep scour pits causing vertical drops 5. Waterfalls
	Junichi Hara	1. The river bank is controlled by linear faults 2. The river bank is mainly composed of clay soil, There are reefs distributed, which are controlled by linear faults or buried faults.		1/1000 ~ 1/200	1. Moderate terrain relief 2. Erosion or sediment and bedrock 3. Rivers with deep troughs and small waterfalls 4. Comprehensive deep pools, steps/pools
Circumstances Sinipes	Mountain winding	1. The riverbed is meandering due to the influence of topography. 2. The riverbed is composed of bedrock, controlled by X-shaped faults or X-shaped joints, mostly transverse valleys, and is strongly winding by neotectonic movements. 3. The riverbed is mainly composed of shale and siltstone, with interlayered structures, small rock layer dips, and is slowly uplifted by neotectonic movements.	>1.2	>1/1000	1. Obvious terrain 2. Moderate erosion and width-to-depth ratio 3. Narrow and steep valleys 4. Mainly rapids
	The	1. It is naturally winding due to the alluvial plain 2. The river bank is composed of clay and sand layers. It has a binary structure		<1/1000	1. There are floodplains, wide valleys, and alluvial soil 2. Slightly eroded and well-defined meanders channel 3. Riffle/pool type river phase 1. Wide river valley
Braided	Fork	1. The river island is stable and forms a single braid. 2. The river bank is mainly composed of sand layers, sandwiched with clay layers, with a sandwich structure, and the river bank has nodes. 3. The upper part of the river bank is alluvial, and the lower part is composed of bedrock and semi-cemented sand and pebbles. The river bank has stone nodes.		>1/500	formed by alluvial layer and steep alluvial fan 2. Features of glacial deposits 3. Abundant mud and sand supply 4. High bedload and deep trough erosion
	Wandering	1. The river island is unstable and forms a braid. 2. The river bank is mainly composed of silt and fine sand, and the clay layer is lens-shaped. structure		<1/500	1. Low slope, fine alluvial layer forms a wide river valley 2. There are vast wetlands and flood plains, and fine sediments form laterally stable beaches 3. Very little riverbed material, mainly flushing material

Note: The slope classification standard is provisional and there may be exceptions for special rivers. Source: Chen Shuqun, "Taiwan River Form Survey and Research Report" 2002, Water Conservancy Planning Laboratory.

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Table **3-3** Basic river type classification table

item (Second-rate)	Rivers Type		Basic Description	Topography and soil characteristics	Remark
1 A order	Mutually Stage/Deep Pond River Soil Straight Very stable		1. Steep slope, trench-like, waterfall-like 1. Obvious undulations in terrain 2. A river with high energy for transporting soil and rocks and depositing soil 3. A river with deep troughs and small waterfalls 3. The channel is a straight line of rock or large boulders.	2. Erosion or sediment and bedrock type 4. Comprehensive deep pool, stage/deep pool river phase	Depth ratio <1.4 Aspect ratio <12 Winding degree 1.0~1.2 Slope 0.04~0.10
very stable .	Low with Certainly	3. Stable deep groove	1. A gentle trough, a gentle slope, and a shallow lagoon. 2. The river meanders are mainly 4. The deep and gentle slopes are longitudinal profiles.	1. Moderate terrain undulations 2. Appropriate erosion and aspect ratio	Deep groove ratio 1.4~2.2 Aspect ratio>12 Winding degree>1.2 Slope 0.02~0.03
16. Slight 17.	19. Slight Slight 18. Slight 19. Slight 20. Slight 21. Slight 22. Slight 23. Slight 24. Slight 25. Slight 26. Slight 33. Slight	34. Slight 35. Slight 36 .	shallow 2. Slightly eroded and well-defined winding channels 3. Slight 3. Slight 4.	1. There are floodplains, wide valleys, alluvial soil with a small slope, winding, with dotted beaches, Slight 5. Slight 6. Slight 7. Slight 8. Slight 9. Slight 10. Slight 11. Slight 12. Slight 13. Slight 14. Slight 27 Slight 28. Slight 29. Slight 30. Slight 31. Slight 32. Slight	Depth ratio 2.2 Aspect ratio>12 Winding degree>1.4 Slope < 0.02
4 D	braid channel		1. Braided with longitudinal and transverse beaches. 1. Wide river valleys formed by alluvial deposits and steep alluvial fans. 2. Deep eroded troughs and very wide 3. Abundant mud and sand supply	2. Features of glacial deposits 4. High pile displacement and deep groove erosion	Groove depth ratioN/A Aspect ratio>40 Winding degreeN/A Slope < 0.04
5 E 2.	song fold	Very stable	1. Sloping shallow and winding rivers And low aspect ratio 3. High winding degree	1. Broad River Valley 2. Alluvial deposits form flood plains 3. High winding and stable deep groove 4. Shallow lagoon/deep pool river phase with extremely low aspect ratio	Depth-to-groove ratio>2.2 Aspect ratio <12 Winding degree>1.5 Slope < 0.02
	aspect ratio , high aspect ratio, erosion aspect ratio>12	Asase/Deep Tan Channel		1. Product of high weathering 2. Gentle slope with low 3. Meandering river, lateral instability caused by high erosion rate of river bank 6 F meandering degree> 1.4 Certainly 4. Shallow Lagoon/Deep Pool River Phase	Depth ratio <1.4 Slope < 0.02
	depth ratio <12 7 G Deep meanders with low width-depth ratio			1. Canyon, stage/deep pool river phase, gentle slope and low aspect ratio or deep cuts in alluvial or gravel layers on gentle slopes, erosion into canyons/ Width- Cut, that is, alluvial fan or delta Unstable slope due to stage control problems and high erosion rate of river banks Certainly	2. Narrow river valley, Winding degree > 1.2 3. 0.02~0.039

Source: Chen Shuqun, "Taiwan River Form Survey and Research Report" in 2002, Water Conservancy Planning Laboratory.

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ÿMountainous river sections ÿNarrow valley, steep slopes and fast currents ÿRiverbed with large rocks or pebbles ÿThere are often rapids and deep pools ÿ Often trees and shrubs ÿThe water quality is not polluted ÿExcellent ecological habitat	ÿ Hilly river sections ÿWide valleys form flood plains ÿSand bars, gravel beaches and pebble riverbeds ÿVegetation gradually changes to trees and shrubs ÿEcological habitats affected by artificial structures ÿ Water quality is gradually polluted ÿOccasionally the ecological habitat is destroyed	ÿ Prototype river section ÿThe flood plain is wide and the water flow is gentle ÿSilt and sand riverbed ÿLow water meanders ÿRiverside land is often used as farmland ÿ Serious water pollution Poor ecological habitat

Figure **3-2** Overview of river section location characteristics

		
ÿRural river sections ÿLow level of development ÿResidential houses and farmhouses are scattered ÿField landscape ÿPrefers natural environment	ÿVillage and town river sections Medium-density development ÿ Small and medium-sized dense residential types ÿFarmland village style ÿEnvironmental map combining	ÿUrban river sections ÿHigh-density development ÿResidential and industrial concentration ÿUrban style ÿEnvironment with a focus on humanistic characteristics

nature and humanities **3-3** Overview of surrounding land use characteristics

(II) Results of river pattern survey

1. Classification by river characteristics

This project collects river management planning results, historical images, and cross-sectional measurement reports.

and on-site surveys, and then using the above data to classify rivers according to Chen Shuqun's (2002) localized river classification

The main stream of Dajia River is classified into river types according to its riverbed particle size, river

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The slope and sinuosity of the river bed form different river types. The sinuosity (SI = river length /

The length of the river valley is divided into straight river sections (SI ÿ 1.1), curved river sections (1.1 < SI < 1.5) and meandering river sections.

There are three types of segments (SIÿ1.5).

According to the classification results, the meandering degrees of each section of Dajia River range from 1.02 to 1.49, except for Dajia River.

The river section from Jiaxi River Mouth to Shigang Dam is a straight river, while the rest of the river section is a curved river.

The meandering degree of the lower reaches of Dajia River (from the river mouth to Shigangba) is about 1.02, while Shigangba

The meandering degree of the river section above Gangba is greater than 1.2 but less than 1.6, which is a tortuous flow path.

3-4 and Figure 3-4.

Table **3-4** Dajia River River Type Survey Results

No. River section	Classification by river type		According to river section location Classification	By land use Classification
	Winding slope (%)	Rivers Type		
A1 Hekou~Shigang Dam 1.02 A2 Shigang	1.109 Straight and flat prototype		village type/rural type	
Dam~Tianlun Dam 1.16 A3 Tianlun Dam~Deji	1.061 Curved Hilly Type	2.013	Curved Mountain	Countryside
Dam 1.38	Type			Countryside

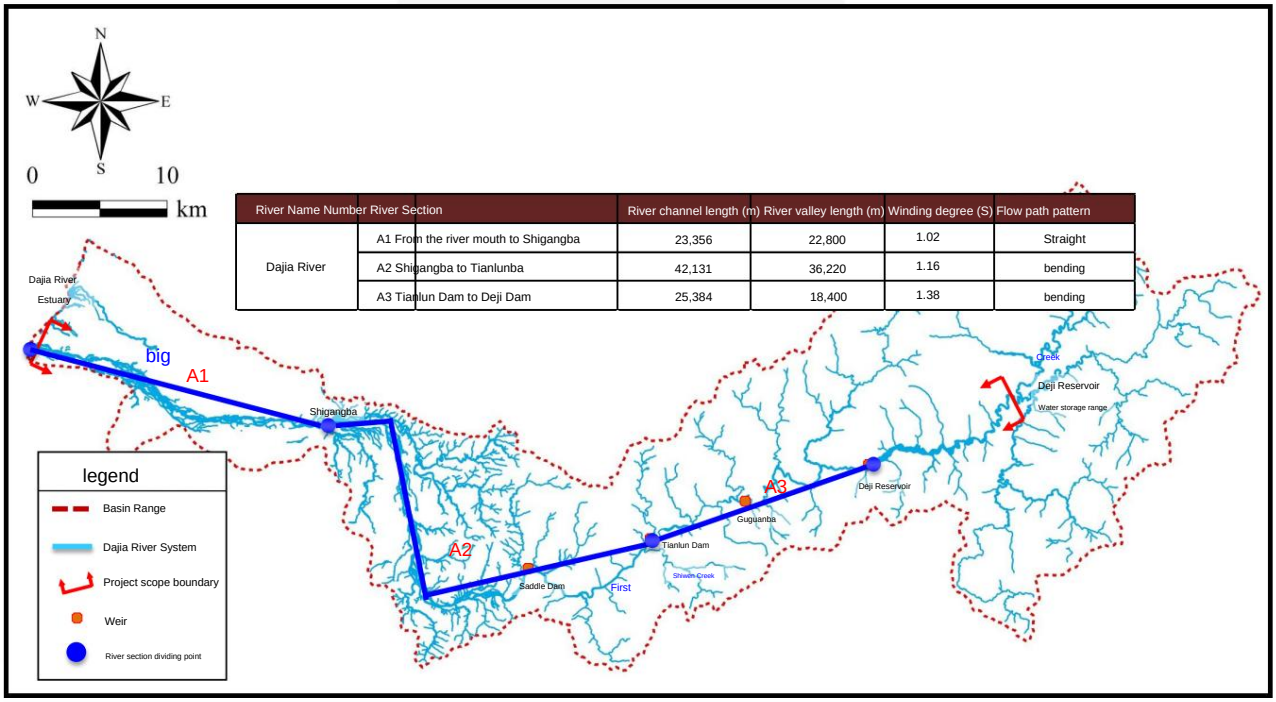

Figure **3-4** Classification of river meandering in the Dajia River Basin

2. Classification by river section location

This project is based on the Taiwan River Type Classification Technical Manual and is coordinated with the land use

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Using aerial photographs and on-site survey results, the rivers in the area are classified by river section location, from the river mouth to Shigangba is a prototype. The area from Shigangba to Tianlunba is hilly, while the area from Tianlunba to Deji is The dam is of mountain type, as shown in Table 3-4.

3. Classification by surrounding land use

Between the mouth of Dajia River and Tianlun Dam, the two banks are mostly rural areas, mixed forests and unused The land use belongs to rural type, and the river section near Shigangba, such as Fengyuan and Dongshi area, with factories and residential buildings on both sides, is a medium-level development town. Between the dam and Long'an Bridge, most of the land on both sides is woodland or planted with fruit trees, which is a rural type. The river section above Long'an Bridge begins to enter the river valley terrain, except for Guguan, Lileng and Except for some settlements in Songhe and other places where the terrain is relatively flat, most of the banks are forest land. The river section from Shigang Dam to Deji Dam is all rural, see Table 3-4 for details. And Figures 3-4.

Rural river section (lower reaches of Dajia River)

Village and town river section (middle reaches of Dajia River)

Rural river section (upstream of Dongshi Bridge)

Rural river section (upper reaches of Dajia River)

Figure **3-5** Land use classification map around the Dajia River system

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II. River habitat survey and analysis

1. Overview of river habitat survey

River habitats can be divided into macro-habitat, meso-habitat and micro-habitat according to their size (see Figures 3-6).

The contents of the morphological and environmental survey are summarized as follows:

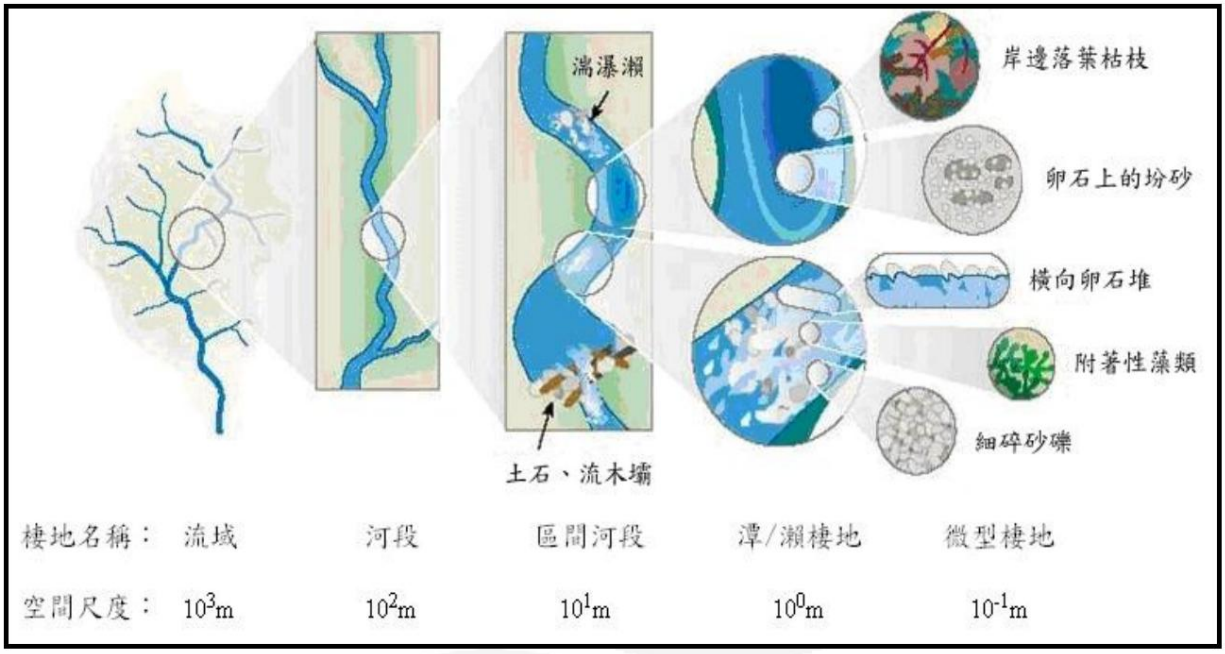

Figure **3-6** Overview of habitat types

1. Macrohabitat: The watershed and river section pattern, generally between 100 and 1,000 meters in size.

Generally speaking, the environment at this scale is relatively stable. Environmental surveys are mainly based on data collection.

The survey contents mainly include meteorological hydrology, geomorphological characteristics and river characteristics.

2. Mesohabitat: A water habitat that reflects the diversity of aquatic habitats, such as ponds.

The distribution of fish is also called fish habitat, which is generally between 1 and 10 meters in length. The environmental survey is divided into longitudinal continuity survey and transverse continuity survey.

The survey items include the location of river dam structures, the difference in height between upstream and downstream, fishways and fishways.

The latter not only investigates the discontinuity of the river's lateral waters, riverbanks (the junction of land and water), high beaches and the causes of discontinuities at the junctions with the plains, but also investigates the continuity of the tributary drainage confluence and its impact on the upward or downward migration of aquatic organisms.

3. Microhabitats: Environmental surveys include water flow patterns, riverbed structure, river water quality and shoreline Coverage, etc., are indicators that directly affect the behavior of individual organisms and are generally 0.1 meters. scale.

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Habitat pattern surveys are conducted during low-flow periods in rivers, using visual observations or flow measurements. The survey results of river habitat distribution are marked on a topographic map (scale greater than 1/5,000), and the proportion of lakes and the average value of lake flow conditions are calculated. The river habitat profile survey is first interpreted with aerial photos based on the survey experience of the survey sample station, and the survey area is demarcated. The scope of the survey will be confirmed by on-site inspection along the line.

As shown in Figure 3-7. Generally speaking, a river section that includes shallow riparian areas, deep pools, shallow currents, and rapids is called a rapid river. A habitat unit must contain at least one habitat unit during the survey.

Table **3-5** Habitat type classification standards

Habitat type	Asase ÿRiffleÿ	shallow stream ÿGlideÿ	Deep Pool ÿPoolÿ	Rapids ÿRunÿ
Flow conditions	The water surface is obviously turbulent and similar to shallow riptides, but the bottom is mostly turbulent and the water surface is slightly turbulent. Deep flow is slow, the water surface pattern is water splash, the flow rate is fast, and the bottom is small sand and gravel. It is shallow riptides and deep pools. The transition is slow and there protrude from the water surface and change with pebbles. Shallow water (<30cm), Shallow water (<30cm), Deep water (>30cm),		The water surface is smooth, the flow rate may be backflow areas. Stones may	
	Deep water (>30cm), Rapid water (>30cm/s) Rapid water (>30cm/s) Slow water (<30cm/s) Rapid water (>30cm/s) Small sand, gravel and pebbles are mostly small bottom stones. Occasionally large boulders are buried.			
Riverbed boulders and boulders		stone		Gravel-based

Note: Flow velocity in cm/s; water depth in cm. Source:
Wang Jingming, 1990, "Key Points for River Situation Survey Operations", Water Resources Planning Laboratory.

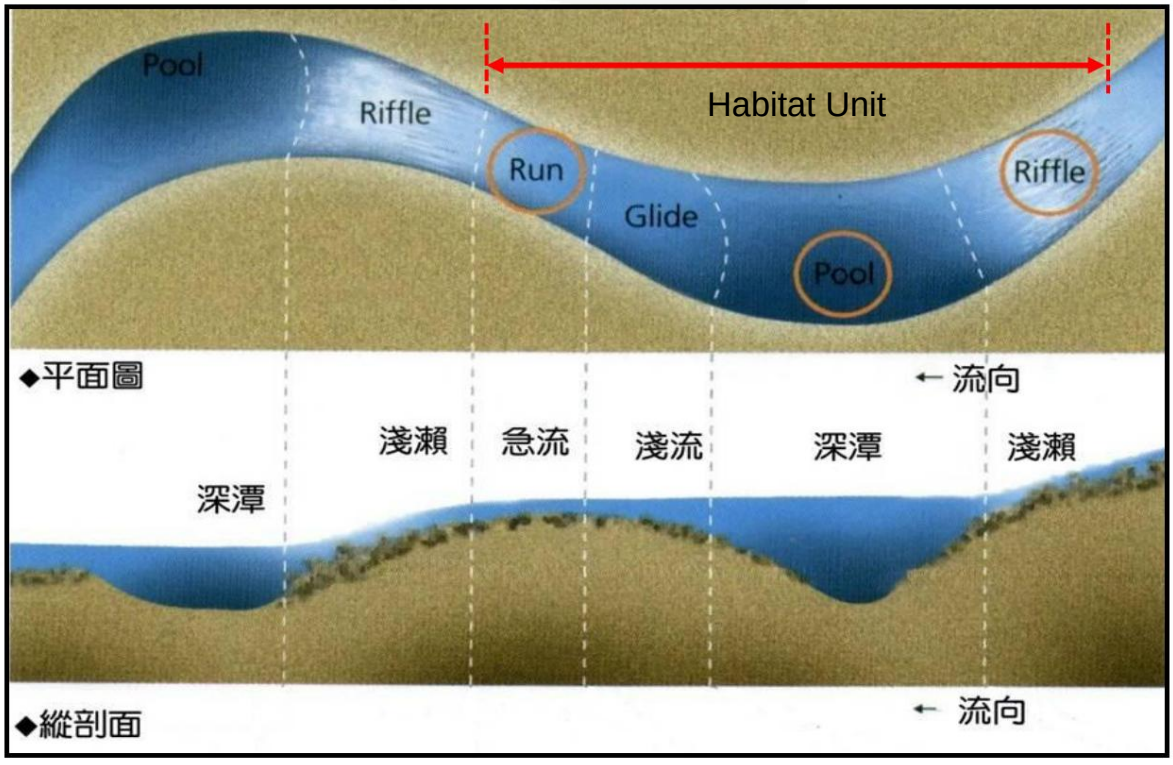

Figure **3-7** Schematic diagram of different types of water bodies

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(II) Results of the River Habitat Environment Survey

The habitat environment survey should be conducted when the river has low flow as much as possible (this project was conducted in April 2012). Visual observation and judgment should be made during the survey, and relevant information should be supplemented according to the on-site conditions and survey needs.

The fixed stations (5 points) and supplementary stations (6 points) are explained as follows:

1. Fixed sample station

(1) Dajia River Estuary The

Dajia River estuary was surveyed and aerial photographs were taken to determine that its river morphology is braided. The river is about 1~2 kilometers wide, with sandbars scattered throughout the riverbed and good vegetation coverage. The water pattern is mainly shallow rip currents, shallow currents and deep currents, and there are scattered deep pools on the concave banks. The river is mainly muddy and sandy, with some round gravel. Cement revetments have been built on both sides of the river. From photos 3-1~3-2, it can be clearly seen that during the flood season, due to the abundant water, the water bank The vegetation on both sides is richer and denser than in the dry season.

Photo **3-1** Dajia River estuary (dry season **102/1)**

Photo **3-2** Dajia River estuary (flood season **101/7)**

(2) High-speed railway bridge

The high-speed railway bridge is about 1.3 km from the river mouth, and the river type is still classified as braided The maximum water surface width is about 100 meters, with large and turbulent water volume and some sand mixed in. The waters of the island are mainly deep and shallow currents. There are slow currents near the shore and a few at the bridge. Some shallow riparian areas appeared near the pier. The riverbed is mostly gravel, and the streamside plants are dense during the flood season. The water level is higher than that in the dry season. The right bank of this river section is higher due to the high shoal and no dikes are built. There are embankment facilities on the left bank, but collapse often occurs. The habitat environment here changes dramatically during the wet and dry seasons, see photos 3-3~3-4 for details.

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Photo **3-3** High-speed railway bridge (dry season **102/1)**

Photo **3-4** High-speed railway bridge (flood season **101/7)**

(3) Upstream of Dongshi Bridge

Dongshi Bridge is located about 6 km upstream of Shigang Dam. The river type is still classified as

The braided river has a maximum water surface width of about 200 meters, and the water is clear and transparent with abundant water.

The river water pattern is mainly deep and shallow, and the bank side is due to the accumulation of round gravel and

Hydrophilic plants are more prosperous, and the water pattern changes to slow flow and shallow rip currents near the shore.

The area is mainly composed of round gravel and muddy sand. During the flood season, the streamside plants are quite abundant and the vegetation coverage is good.

Well, parts of the river banks are made of cement embankments, see photos 3-5~3-6.

Photos **3-5 Dongshi Bridge (dry season 102/1)**

Photos **3-6 Dongshi Bridge (Flood Season 101/7)**

(4) Li Leng Bridge

Li Leng Bridge is located in the middle reaches of Dajia River. As it gradually enters the valley area, the river

The river is classified as a meandering river with a maximum water width of about 30 meters. The water is clear and transparent.

The current is gentle, and the waters are mainly shallow riptides and shallow currents, with some deep currents.

The water area is a slow flow near the shore, see photos 3-7~3-8. The riverbed downstream of the bridge is mainly composed of egg

The main part is stone, with some gravel and mud sand. The left bank is a natural river valley wall.

The vegetation coverage is good, and the right bank of some river sections is protected by snake cages.

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Photo **3-7 Li Leng Bridge (dry season 102/1)**

Photo **3-8 : Lengqiao (Flood season 101/7)**

(5) Confluence of the Piasang River

The confluence of the Piasang River is located in the upper reaches of the Dajia River (about 2 kilometers upstream of Guguan Dam). The maximum water surface width is about 50 meters. The water is clear and transparent with abundant water. The water pattern is mainly deep currents, with shallow currents and shallow currents mixed in.

Slow flow near the bank. The riverbed is mainly gravel and pebbles, with some small gravels. Except for the river section near Taipower Qingshan Office, which has revetments, the rest of the river sections are natural slope protection with good vegetation coverage. Slope collapse often occurs. See photos 3-9~3-10 for details.

Photo **3-9 :** Piasang River confluence (dry season **102/1)**

Photo **3-10 :** Piasang River confluence (flood season **101/7)**

2. Supplementary sample station

(1) Downstream of Shigang Dam (Pifeng Bridge)

Pifeng Bridge is located about 200 meters downstream of Shigang Dam. The river type is classified as meandering. The river has a maximum width of about 100 meters, clear water and steady flow, and is a good habitat for

In terms of topography, the left bank is mainly shallow or shallow current, the right bank is mostly deep current, and the

There are deep pools and deep currents on both sides of the river, see photos 3-11~3-12. The riverbed is composed of round gravel.

The main layers are sedimentary mud, with a smaller proportion of small pebbles, and the vegetation on both sides is well covered.

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However, the water volume, depth and flow rate are often affected by the release of water from Shigang Dam.

The impact is showing severe erosion and a tendency to canyonization, as shown in the current situation of the habitat directly below the Pifeng Bridge.

The survey (Photo 3-13) was compared with the on-site survey in April 2012 (Photo 3-14). The area around the bridge pier was severely eroded

and lost. In less than a year, the habitat here was

The environment has undergone considerable changes.

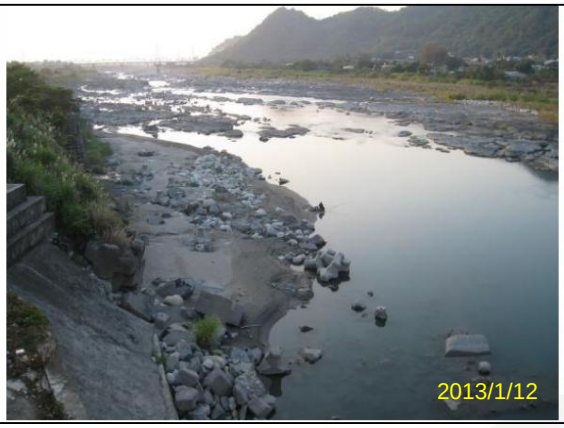

Photo **3-11** Downstream of Shigang Dam (dry season **102/1)**

Photo **3-12** Downstream of Shigang Dam (Flood Season **101/7)**

Photo **3-13 Downstream of Shigang Dam (102/1)**

Photo **3-14 Downstream of Shigang Dam (101/4)**

(2) Ryoan Bridge

Longan Bridge is located in the middle reaches of Dajia River. The river type can be summarized as a winding river.

The water surface is about 30 meters wide, with large and turbulent water volume, transparent and clear water body, and water area type

The water is mainly shallow current and shallow rip current, and there is slow current near the shore. See photos for details.

3-15~3-16. The riverbed is mostly pebbles, mixed with coarse gravel, and the vegetation on both sides is rich.

This river section has entered the valley terrain, and the bank protection is mainly natural slope protection without obvious artificial structures.

Creation.

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Photo **3-15** Downstream of Longan Bridge (dry season **102/1)**

Photo **3-16** Upstream of Longan Bridge (Flood Season **101/7)**

(3) Downstream of Ma'anba

Ma'anba is located about 9 kilometers upstream of Long'an Bridge. The river type can be summarized as a meandering

The river has a maximum water surface width of about 30 meters, and the water is transparent and clear.

The amount, depth and flow rate are affected by the Ma'an Dam. The general water pattern is shallow current and shallow rip current.

When the water is released, the water area changes to deep currents and deep pools. The riverbed is composed of gravel and small eggs.

There are many rocks, abundant plants along the river, and valley terrain on both sides, with good vegetation coverage and no

Obvious artificial structures, see photos 3-17~3-18.

Photo **3-17** Downstream of Ma'an Dam (dry season **101/4)**

Photo **3-18** Downstream of Ma'anba (Flood Season **101/7)**

(4) Downstream of Tianlun Dam

Tianlun Dam is located in the middle and upper reaches of Dajia River. The river type can be summarized as a meandering river.

The maximum water surface width is about 5 meters, the water is clear and transparent, and the water volume and water level in the flood and dry seasons are

The depth and flow rate are affected by the Tianlun Dam, and the habitat water type is mainly shallow flow or shallow riparian.

The bottom of the river is mostly pebbles and coarse gravel. The left bank is a natural hillside cliff with good vegetation coverage. The right

bank is protected by a cement retaining wall in the Guguan Hot Spring Hotel area. This section of the river is a hot spring area.

The area is highly developed, see photos 3-19 and 3-20.

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Photo **3-19** Downstream of Tianlun Dam (dry season **102/1)**

Photo **3-20** Downstream of Tianlun Dam (Flood Season **101/7)**

(5) Downstream of Guguan Dam (Guguan Bridge)

Guguan Dam is located in the upper reaches of Dajia River. The river type can be summarized as a meandering river.

Guguan Dam blocks the flow of water, so the water volume is quite scarce and the riverbed is almost dry.

The water area is just a small, still shallow pool. The riverbed is mostly gravel, with revetments on both sides.

They are all the main structures of Guguan Dam, with poor vegetation coverage, see photos 3-21~3-22 for details.

Photo **3-21** Downstream of Guguan Dam (dry season **101/4)**

Photo **3-22** Upstream of Guguan Dam (Flood Season **101/7)**

(6) Downstream of Qingshanba

Qingshanba is located in the upper reaches of Dajia River. The river type can be summarized as a meandering river.

The water surface is about 20 meters wide, the water is clear and transparent, the water volume is huge, and the water area is

The riverbed is mainly composed of pebbles and boulders.

They are all natural vertical cliffs with good vegetation coverage and little human development.

Tablets 3-23~3-24.

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Photo **3-23** Downstream of Qingshan Dam (dry season **102/1)**

Photo **3-24** Downstream of Qingshan Dam (Flood Season **101/7)**

(7) Lower reaches of Shishui River

Shishui River is located in the middle and lower reaches of Dajia River. The river type is summarized as a straight river. The maximum water surface width is about 10~12 meters. The water body color is blue-green. It is mainly due to the large number of algae attached to the water. The water volume is very large. The water area type is shallow riparian and shallow stream. The riverbed is mainly composed of pebbles, mixed with gravel and mud.

Both banks are vertically reinforced with cement, with poor vegetation coverage and a high degree of artificial development. The degree is quite serious, see photos 3-21~3-22.

Photo **3-25 Shishui River (dry season 102/1)**

Photo **3-26** Shishui River (flood season **101/10)**

In summary, the water habitats in most sections of the Dajia River are in good condition. The water quality is good, but the waters downstream of Tianlun Dam and Guguan Dam are affected by artificial structures. The ecological environment is relatively lacking in change, and the quality of biological habitat is poor; in addition, the Shishui River is often affected by human activities. Due to pollution and often due to engineering renovation without considering ecological engineering methods, the habitat environment is seriously damaged. The water ecological environment has been seriously affected.

In addition, the riverbed of the upper and middle reaches of Dajia River is mainly composed of pebbles and boulders, while the riverbed of the lower reaches is mainly composed of gravel and sand.

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There is siltation. The current status of the river habitat environment at each survey station is summarized in Table 3-6 and attached.

As shown in Record 3.

Table **3-6** Survey on the current status of habitats in the Dajia River Basin

Rivers name	Sample Station serial number	Survey points	Structure Habitat Water Type Bottom														
			weir dam	solid floor work	remove Wave piece	bridge Liang	Embankment Defend Protection shore	deep Tan	shallow Seto	deep flow	shallow flow	product sand	mud sand	Small Gravel stone	Gravel stone	egg stone	piece stone
Dajia River	A	Dajia River Estuary					ÿ ÿ ÿ ÿ ÿ ÿ ÿ										
	B	Downstream of the high-speed railway bridge		ÿ ÿ ÿ ÿ ÿ ÿ ÿ ÿ ÿ ÿ													
	C	Downstream of Shigangba			ÿ ÿ ÿ ÿ ÿ ÿ ÿ ÿ ÿ ÿ												
	D	Upstream of Dongshi Bridge				ÿ ÿ ÿ ÿ ÿ ÿ ÿ ÿ ÿ											
	E	Ryoan Bridge		ÿ		ÿ ÿ ÿ ÿ ÿ ÿ									ÿ ÿ		
	F	Downstream of Ma'anba			ÿ			ÿ ÿ ÿ ÿ							ÿ ÿ		
	G	Downstream of Lilengqiao Tianlunba				ÿ ÿ ÿ ÿ ÿ ÿ ÿ ÿ											
	H		ÿ		ÿ ÿ				ÿ ÿ						ÿ ÿ		
	I	Downstream of Guguanba													ÿ ÿ		
	J	Piasan Creek confluence				ÿ			ÿ ÿ ÿ					ÿ ÿ ÿ			
	K	Qingshan Dam downstream							ÿ ÿ ÿ							ÿ ÿ	
Shishui River K		downstream of Dengfeng Bridge		ÿ		ÿ ÿ ÿ ÿ ÿ ÿ ÿ ÿ ÿ ÿ											

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3. River Structure Survey

The focus of the river area artificial structure survey is to investigate the river longitudinal (embankments and revetments), transverse

The distribution and function of structures (weirs, bed reinforcements, bridges and dams, etc.) and fishways,

And understand the relationship between structures and river patterns, so as to understand the impact of artificial structures on river patterns and

The impact of habitats, and the relationship between different flow conditions and structures during dry seasons and floods need to be understood.

(I) Vertical structures

After collecting the existing longitudinal structural engineering layout in the Dajia River Basin, the detailed table 3-7 and

As shown in Figure 3-8. The total length of the existing embankment is 37,733 meters, and the total length of the existing revetment is 5,373 meters.

The left bank includes Gaomei dike, Hakka dike, Fengzhou dike, Danan revetment,

Changgeng revetment, Baimaotai revetment, Lilingqiao revetment and Songhe revetment.

Pu dike, Liukuaicuo dike, Ciyao dike, Sikaicuo dike, Jiushe dike, Dongshite dike

No. 1 dike, Shizui revetment, Liyang revetment and Guguanqiao revetment, etc.

Obviously, the river section below Dongshi has a dense population and a booming industrial economy, so flood control is necessary.

Most of the structures are concentrated in the middle and lower reaches of Dajia River.

Table **3-7** Survey of existing vertical structures in Dajia River

Shore number	Structure name	Embankment (m)	Seawall (m)	Shore number	Structure name	Embankment (m)	Seawall (m)
Left Bank	1 Gaomei dike 5,077 3 Sankuaicuo dike 881 5 Hakka dike	·		right bank	2 Nanpu dike 2,157 4 Liukuaicuo dike 3,918	·	
	2,686 7 Sankuaicuo dike 525 9 Wufuzhen dike 52 13	·			6 Shuimeiheng dike 237 8 Ciyao dike 2,449 10 Skuaicuo dike	·	
	Yangmingshan revetment - 15 Fengzhou dike 6,255 17	400			1,673 12 Jiushe dike 2,575 14 Zhenglong dike 826 16	·	
	Danan revetment 21 Pifeng dike 352 23 Pitou revetment	·			Neipuzhen dike 402 Changgeng revetment 20 Xiaolipu	·	
	- 25 Changgeng revetment 27 Meizi revetment 29	·			revetment 22 Yuexin dike 1,800 24 Dongshi Special No. 1 dike	·	
	Xiatunniu revetment - 31 Tuniu dike 3,668 31-1	175			1,284 26 Shizui revetment 28 Fengshujiao revetment - Nanshi	·	
	Tianfuqiao revetment - 33 Baimaotai revetment - 35	500			dike 30 916 32 Mingchuan revetment 34 Zhonglen revetment	·	
	Lilengqiao revetment 37 Songhe	82			36 Liyang revetment 38 Guguan suspension bridge revetment	·	
	revetment	·			18 40 Guguan	·	75
			283		bridge revetment Total	·	300
		·	118				·
		·	159				·
			75			·	158
			·				125
			200				·
			523			·	300
			150				350
			1,000				270
							50
							80
	Total 18,237 1,708	19,496 3,665					

Source: Water Conservancy Planning and Research Institute, 2000 "Review of the Dajia River Management Plan (Tianlun Dam to the Estuary Section)"

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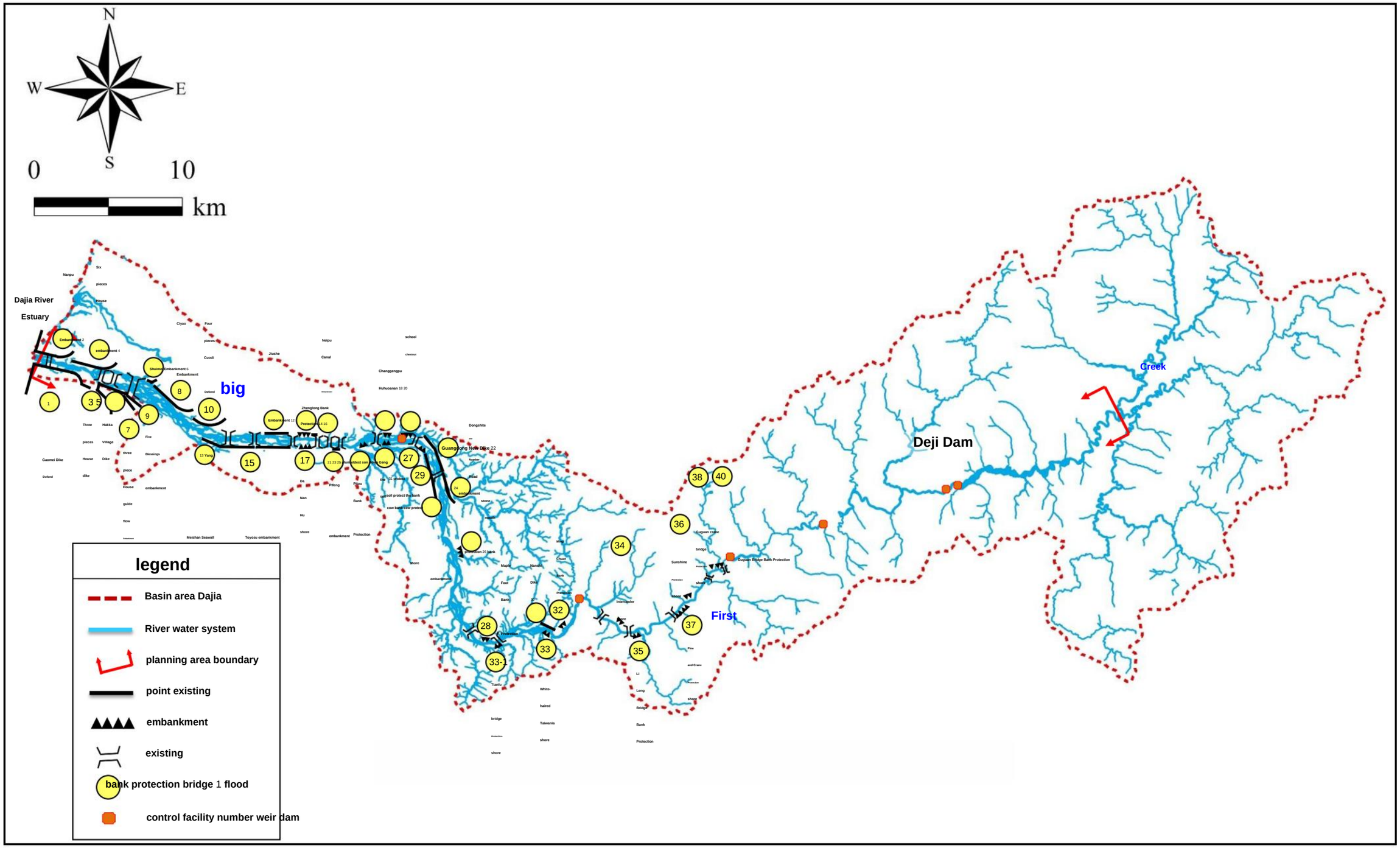

Figure **3-8** Overview of existing vertical structures in the Dajia River Basin

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(ii) Horizontal structures

There are 21 bridges in total from Tianlun Dam to the river mouth of Dajia River (including one

The weir facilities include Tianlun Dam, Ma'an Dam and Shigang Dam.

The river section above Tianlun Dam only has a temporary engineering bridge at the confluence of Piasang River.

Iron bridges, weirs and dams include Guguan Dam, Qingshan Dam and Deji Dam.

3-8 and Figure 3-9. According to the on-site investigation, the section from Houfeng Bridge to the water pipe bridge has been demolished.

A bed fixer with a large height difference (more than 50cm).

Table **3-8** Survey of existing horizontal structures in Dajiaxi River

Structure name	Section serial number	Cumulative bridge length (m)	Bridge pier (m)	Bridge width (m)	Bridge deck elevation (m)	Beam bottom elevation (m)	Channel bottom elevation (m)
Xibin Highway Bridge 1-1 1k+314 1385.66 2.40*41 Dajiaxi Highway				39.00	22.83	20.53	10.12
Bridge 7-1 5k+366 1320.67 5.20*32 Haixian Railway Bridge 7-2				25.14	66.72	64.58	51.73
5k+514 1153.88 2.50*36 Second Expressway Bridge 9-1 6k+793				15.00	66.49	65.45	52.82
1150.40 2.60*27 High-speed Railway Bridge 19-1 12k+888 1086.47				35.00	106.09	103.85	67.63
4.20*30 Expressway Bridge 23-1 15k+458 970.00 2.30*27 Houfeng				13.50	163.94	161.44	134.27
Bridge 28-1 18k+345 640.76 2.00*15 Water Pipe Bridge 28-1A				34.00	185.04	182.96	168.10
18K+445 485.25 2.90*8 Xinshan Line Railway Bridge 30-1				31.00	217.21	214.91	196.04
19k+645 969.40 2.2 *31 Old Shan Line Railway Bridge 32-1				2.20	216.80	214.60	200.81
20k+782 381.48 3.00*5 Pifeng Bridge 35 21k+218 380.40 2.00*12				10.50	240.71	237.31	209.21
Changgeng Bridge 38 24k+355 400.78 2.60*12 Meizi Bridge 43-1				5.42	243.70	242.50	221.46
27k+509 413.23 2.87*17 Dongshi Bridge 47-1 29k+658 564.71				11.05	257.73	255.70	235.19
3.00*11 Longan Bridge 57 40k+027 260.25 1.60 *7 Tianfu				13.20	281.46	279.51	271.96
Bridge 62 43k+303 155.44 1.30 *3				4.57	319.12	316.61	291.03
				30.12	331.71	329.83	317.78
				9.30	452.35	450.44	436.03
				8.56	488.70	486.76	471.98
Qiuan Bridge 70-1 53k+038 167.48 Li Leng			2.2*2	4.68	594.75	592.65	582.15
Bridge 73-1 54k+975 120.96 Songhe Bridge 79-2			-	13.53	616.26	614.53	552.74
58k+213 120.28 Duming Bridge 88 62K+096			-	13.78	649.80	648.05	601.18
155.34 Guguan Bridge 92 63k+731 90.44			-	12.00	708.27	705.28	683.00
			2.20 *2	8.42	721.51	719.48	703.48
Dam name	**Section No.**	**Pile No.**	**Dam crest length (m)**	**Bridge pier (m)**	**Dam crest width (m)**	**Dam crest elevation (m)**	**Beam bottom elevation (m)**	**Dam bottom elevation (m)**
Shigang Dam 36 23k+228 275.50 Ma'an Dam				-	8.62	282.45	-	269.89
67-01 50k+276 230.00 Tianlun Dam 94 65k+080				-	9.88	563.37	-	545.46
82.05				-	10.69	755.76	-	739.89
Guguan Dam --		-	149.00	-	4.00	951.50	-	864.90
Qingshan Dam -- Deji		-	100.00	-	6.40	1250.30	-	1205.30
Dam --		-	290.00	-	4.50	1411.00	-	1230.00

Source: Water Conservancy Planning Laboratory, "General Report on the Review of the Overall Management Plan for the Dajia River Basin" in 2011.

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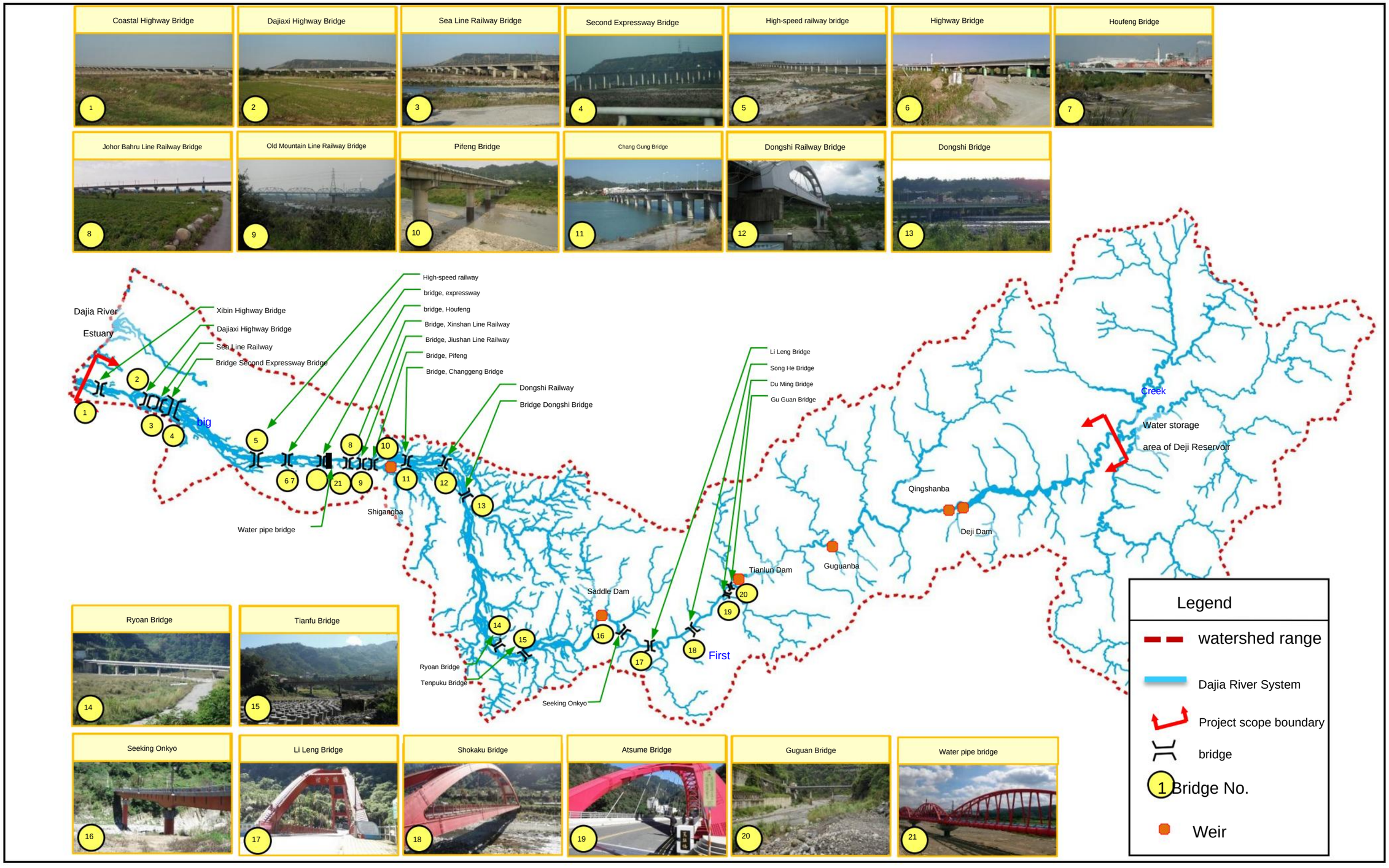

Figure **3-9** Overview of existing horizontal structures in the Dajia River Basin

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IV. Survey on the distribution of river space utilization

The purpose of the river use survey is to understand how people and industries use rivers and

The survey is conducted once during the wet and dry seasons. The wet and dry season surveys have been completed between May and June 2012 and January and February 2013. The survey content includes "River and high beach utilization status" and "Water space utilization status", recording the river and high beach utilization status.

and the actual use of water space, so as to serve as a basis for future river space utilization assessment and management

according to.

(I) Utilization of rivers and high beaches

The relevant space utilization survey was conducted along the line from downstream to upstream. The survey results

The details are as follows:

1. The lower reaches of Dajia River

(1) Dajia River Estuary This

section of the river is the lower reaches of Dajia River, with a wide river and gentle current. Both sides of the river are protected by embankments and some river beaches are used for farming.

There are large wind turbines on the south side, in conjunction with the famous ecological conservation attraction Gaomei Wetlands, people go there every day to watch birds and the ecology of the intertidal zone, and before the holidays

The number of people going there for fun has increased significantly, see photos 3-27~28.

Photo **3-27** Wind turbines at the mouth of Dajia River

Photo **3-28** Farmland on the left side of the Dajia River estuary

(2) The river section of the

high-speed railway bridge is located in the lower reaches of Dajia River.

Except for the section where the water flows into Dajia River, which has not yet been regulated, the rest of the river section is protected by dikes and banks;

The right bank has no embankment protection, and most of its high beach is used as farmland.

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Some landslides have occurred, and this section of the river is less visited on weekdays and holidays.

On the left bank downstream of the bridge, there is an earthwork storage yard and several gravel yards.

Stone carts come and go frequently, see photos 3-29~30.

Photo **3-29:** Collapse of high-rise land on the right downstream of the high-speed railway bridge

Photo **3-30 :** Open dike on the left bank downstream of the high-speed railway bridge

(3) Houfeng Bridge

Houfeng Bridge is an important trunk road connecting Houli and Fengyuan areas.

It is protected by dikes and revetments, and the high beaches on both sides are currently used for farming or wasteland.

There are few people coming and going on weekdays and holidays. Factories and residences on both sides of the embankment of Houfeng Bridge

It is a densely populated area with a relatively prosperous economy. See photos 3-31~32 for details.

Photo **3-31** Industrial area beside Houfeng Bridge

Photo **3-32** Cement factory next to Houfeng Bridge

(4) Downstream of Shigang Dam (Pifeng Bridge)

Pifeng Bridge is located downstream of Shigang Dam. The left bank of the river is protected by a revetment, while the right bank is

The two sides of the bridge are mostly residential houses, and the high beach on the right bank is used as a

It is used for farmland and orchards. There is also a Shigang Waterway at the confluence of Dajia River and Shishui River.

The Yuanyuan Special District Wastewater Treatment Plant is dedicated to treating wastewater from Shigang, Dongshi and Xinshe areas.

Sewage. The old mountain railway bridge downstream of Pifeng Bridge is the Houfeng Horse Trail and Dongfeng Bicycle Trail.

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At the starting point of the road, a few people come here to ride bicycles and enjoy the riverside scenery.

During holidays, more people come here to ride bicycles, see photos 3-33~36.

Photo **3-33** Zuoan Sewage Treatment Plant upstream of Pifeng Bridge

Photo **3-34** Right bank downstream of Pifeng Bridge

Photo **3-35** Houfeng Iron Horse Trail

Photo **3-36** Dongfeng Bicycle Path

2. The middle reaches of Dajia River

(1) Dongshi Bridge

Dongshi Bridge is located in the middle reaches of Dajia River. This section of the river is protected by dikes.

The outer two sides are mainly commercial and residential areas.

The left bank is now the Dongshi Riverside Park and Tuniu Sports Park.

It is a place for residents in Gang area to relax and exercise after get off work. On holidays, people are also found playing

with remote control airplanes, running and riding bicycles here. The use of some high beaches is mainly farmland and

Mainly orchards, see photos 3-37~38.

(2) Ryoan Bridge

The river section above Long'an Bridge gradually enters the valley hilly terrain, and the two sides of the river are

The high beach is flooded every time there is a typhoon or heavy rain, and is rarely used.

Natural slope protection, no obvious artificial structures. The two sides of the river are affected by the valley topography.

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The land use is mainly orchards, scattered residences and natural woodlands, see photos for details

3-39~40ÿ

Photo **3-37** Riverside Park on the right bank upstream of Dongshi Bridge

Photo **3-38** Pastoral scenery on the right bank downstream of Dongshi Bridge

Photo **3-39** Scattered houses on the left bank upstream of Longan Bridge

Photo **3-40** High beach downstream of Longan Bridge

(3) Tianfu Bridge

Tianfu Bridge is located between Long'an Bridge and Ma'an Dam, with natural slope protection on both sides.

There are no obvious artificial structures. Provincial Highway 8 is close to the river bank, with beautiful scenery along the coast.

Occasionally, people who like to ride bicycles go up along Provincial Highway 8 to Guguan.

The main planting areas are areca palms, orchards, scattered houses and natural woodlands, see photos 3-41~42 for details.

Photo **3-41** Scenery on both sides of the upstream of Tianfu Bridge

Photo **3-42** Land use on the left bank downstream of Tianfu Bridge

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(4) Ma'anba

Ma'an Dam is located in the middle and upper reaches of Dajia River. The upstream of the dam is Taipower Dajia River Power Plant.

The high beaches on both sides of the river are limited by the valley terrain and have little room for development.

Many people come here to play. On holidays, people often drive to Guguan to play and stop by or ride their bicycles.

People passing by the river, the land use on both sides of the river is mainly orchards and natural woodlands, details

Photos 3-43~44.

(5) Li Leng Bridge

Li Leng Bridge is the main communication route for the Li Leng tribe.

The section is protected by revetments, and Provincial Highway 8 is close to the river bank, with beautiful scenery along the coast.

People who drive to Guguan for sightseeing and people who like to ride bicycles often pass by.

There is less space available, and land use is mainly orchards, natural woodlands and scattered residences.

Main page, see photos 3-45~46.

Photo **3-43** Land use upstream of Ma'anba

Photo **3-44** Land use downstream of Ma'an Dam

Photo **3-45** Right bank protection downstream of Lileng Bridge

Photo **3-46** Left bank protection upstream of Lileng Bridge

(6) Guguan Bridge

Downstream of Guguan Bridge is the famous Guguan Hot Spring Scenic Area, which is developed for tourism.

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The main land use pattern is hot spring hotels and natural scenery, which attracts many people on holidays.

Tourists come here to relax and enjoy the fun of hot springs. In addition, the scenery along the banks of Dajia River is very beautiful.

On weekends, some people who like to ride bicycles will ride along Provincial Highway 8 from Dongshih to

Guguan. There are cement revetments and retaining walls on both sides of the river, see photos 3-43~44 for details.

Photo **3-47** Retaining wall on the left bank upstream of Guguan Bridge

Photo **3-48** Hot spring hotel area downstream of Guguan Bridge

3. The upper reaches of Dajia River

(1) Guguanba

The downstream section of the river from Guguan Dam is affected by the release time, and the flow and water level vary greatly.

The two sides of the road are adjacent to the valley and Provincial Highway 8, and there is no obvious high land available for use.

There are frequent landslides on the Guguan to Lishan section of the road, and entry and exit are restricted.

The vegetation coverage rate on both sides of the road is high, and most of them are maintained

The original natural forest landscape, but some of the slopes are protected by concrete slope protection to avoid

To prevent the slope from continuing to collapse and obstructing water flow, see Photos 3-45~46.

Photo **3-49** Water storage upstream of Guguan Dam

Photo **3-50** Land use on both sides of the downstream of Guguan Dam

(2) Confluence of the Piasan River

The confluence of the Piasang River is a silted river section. Although the two banks are valley terrain, the river

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The area is relatively wide, with no obvious artificial structures on both sides of the road, except for landslides on some slopes.

Except for this situation, the vegetation coverage rate is good.

Except for the occasional personnel coming and going from the Shan Engineering Office and the personnel working on the bank protection project, there were no other people on the river.

Obvious artificial use of space, see photos 3-54~52.

Photo **3-51** Qingshan Works Office at the confluence of the Piasang River

Photo **3-52** Construction of the Piasang River Confluence Project

(3) Qingshanba is

located in the upper reaches of Dajia River. The cliffs on both sides of the river are steep and almost unreachable.

The space is used, and there is now access control, only local residents and related engineering personnel are allowed to enter

There are few human activities except for entering and leaving. This section of the river is all natural bank protection, except for some hillsides.

In addition to artificial slope protection in case of collapse, most of the river banks are well covered with vegetation.

OK, see photos 3-53~54.

Photo **3-53** Land use on both sides of the downstream of Qingshan Dam

Photo **3-54:** Vegetation distribution on both sides of the downstream of Qingshan Dam

In summary, the lower reaches of Dajia River are wide, and the high beach land on both sides is mainly used in

Farmland, orchard or wasteland, etc. The land use on both sides of the embankment near Houfeng Bridge is

It gradually became mainly residential and factory areas, with the specific water source area from Houfeng Bridge to Shigangba being the

There are Houfeng Bicycle Trail, Dongfeng Bicycle Trail and a series of related leisure and recreation facilities.

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It often attracts many people to come and ride bicycles.

The development of the middle reaches of Dajia River is affected by the valley topography.

The utilization rate of land is not high. There are three places with large settlements along the coast, including Liling, Songhe and Guguan.

The rest are scattered farmland, orchards and natural forests.

The tourism industry is the main industry, and there are many tourist hot spring hotels and restaurants. In addition, the popularity of cycling in recent years

From Dongshi Bridge to the section of Line 8 at Guguan, people ride bicycles along the way.

The two sides of the river above the Guguan section are now under control and only local residents can visit.

Apart from the civilians and relevant engineering personnel entering and leaving, there are few human activities.

2. Utilization of water space

The scope of the river water space utilization survey includes the water surface, water

The utilization of river waters can be divided into fishing, farming, breeding and leisure activities.

The relevant space utilization is shown in photos 3-55~76. According to the announcement

of the Coastal Resources Development Office of the Bureau of Agriculture of Taichung City Government, 13 streams

in the Dajia River Basin are prohibited from using any means to catch aquatic animals, including Xin Community (Shishuixi

River and Chutengkeng River), Dongshi District (Ma'an Creek and Ruanpikeng River), and Heping District (Yousheng Creek,

Beikeng Creek, Zhongkeng Creek, Hengliu Creek, Liling Creek, and Zhulin Creek, etc.). The relevant content is detailed in the table

3-9ÿ

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Table **3-9** Dajiaxi River Basin Announcement of Closure of River Sections for Fish Protection

serial number	Jurisdiction	Stream Name	Fishing ban area	Fishing ban start and end time	Protecting fish species	Announcement Date Document Number
1	New Communities	Shishui River	The main and tributary sections of Shishuixi River in Xin Community are about 7 kilometers long from Malipu Nankui to the intersection of Babao Canal (except Shuangcui Dam 350 meters upstream of Shanshui Bridge). The	101/7/9 ~ 101/12/23	Betta, Taiwan whitefish, short-snout red-spotted goby	On July 9, 2012, the Taichung City Government granted the Agricultural and Marine Industry No. 10101097341
2		Chutengkeng Creek	main and tributary sections of Chutengkeng River in Xin Community are about 10 kilometers long from Xitou to Zhongxing	101/12/24 ~ so far	Betta, Taiwan whitefish, short-snout red-spotted goby	On December 25, 2012, the Taichung City Government granted the Agricultural and Marine Industry No. 10102276441.
3	Dongshi District	Saddle Creek	Fertilizer Plant. The main and tributary sections of Ma'an Creek in Qingfuli, Dongshi District are about 3 kilometers long from the source to Fuxing Bridge on Provincial Highway 8.	101/7/9 ~ 103/9/30	Taiwan rock loach, Taiwan shovel-jawed fish, grouper, sea eel	On July 9, 2012, the Taichung City Government granted the Agricultural and Marine Industry No. 10101097342. On
4		Ruanpikeng Creek	The river section from Yong'an Bridge on Dongguan Road in Dongshi District to the main stream and tributaries of Ruanpikeng Creek is about 8 kilometers long.	101/7/9 ~ So far	Snapper, silver carp, grouper and shrimp, etc.	July 9, 2012, the Taichung City Government granted the Agricultural and Marine Industry No. 10101097343. On
5	Heping District	Yousheng Creek	The Yousheng River in Heping District is about 13.5 kilometers long, starting from the Guishan Sand Dam to 65 Orchard and then extending to the border of Yilan County. (i) The section	101/11/23 ~ so far	Taiwan rock loach, Taiwan shovel-jawed fish, grouper, sea eel	November 23, 2012, the Taichung City Government granted the Agricultural and Marine Industry No. 1010196891.
6		Beikeng Creek, Zhongkeng Creek	from Beikeng Bridge in Zhongkeng Village, Heping District to the Beikeng Simple Tap Water Intake at the source of Beikeng River is about 2.5 kilometers long, and all the basins of its tributaries. (ii) The section from the starting point of Zhongkeng Bridge in Zhongkeng Village, Heping District to the source of Zhongkeng River is about 3.0 kilometers long, and all the basins	101/7/9 ~ so far	Taiwan shovel-jawed fish, Taiwan stonefish, Taiwan horsemouth fish, shrimp, etc.	Taichung City Government granted Agricultural and Marine Business No. 10101097345 on July 9, 2012
7		Cross Stream	of its tributaries. The Hengliu River in Heping District is about 10.5 kilometers long from the source to the confluence of Dajia River (including tributaries).	101/7/9 ~ So far	Taiwan shovel-jawed fish, Taiwan croaker, Taiwan stonefish, Taiwan mackerel, Taiwan	On July 9, 2012, Taichung City Government granted the Agricultural and Marine Industry No. 10101097348. On
8		Lilleng Creek	The section from the confluence of Liling River and Dajia River in Heping District to the source of Liling River, including the main and tributary sections of Liling River, is about 15 kilometers long.	101/7/9 ~ So far	rock loach, Taiwan stonefish, Taiwan shovel-jawed fish, sea eel, etc.	July 9, 2012, Taichung City Government granted the Agricultural and Marine Industry No. 10101097349. On July 9,
9		Bamboo Forest Creek	The Zhulin River in Heping District is about 15 kilometers long from the source to the Zhulin Bridge at the intersection of Dongqi Road, and all the main and tributary sections.	101/7/9 ~ so far	Mountain catfish, grouper, eel and stream shrimp, etc.	2012, Taichung City Government granted the Agricultural and Marine Industry No. 1010109734A.

Note: Taichung City Government Agriculture Bureau Coastal Resources and Fisheries Development Institute, announcement on December 25, 2012.

1. The lower reaches of Dajia River

(1) Dajia River Estuary

Both sides of the Dajia River estuary are embanked, and no relevant water-friendly facilities were found during the investigation.

The south side of the river mouth is the famous Gaomei Wetland.

Ecological conservation area, there are sporadic tourists here to relax and watch birds during the day, and many tourists come here on holidays.

Tourists flocked to the area, and the main activities were ecological tours such as bird watching or tide-seeing.

Catch small crabs in the interstices, see photos 3-55~56.

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Photo **3-55** Water area at the Dajia River estuary

Photo **3-56** Gaomei Wetland on the south side of the Dajia River estuary

(2) High-speed railway bridge

The river upstream and downstream of the high-speed railway bridge is relatively wide and has dense vegetation.

This makes the habitat diverse, but this section of the river is remote and difficult to access.

There are few tourists here. During the investigation, only a few people were found on the river bank.

Fishing and walking are also possible, see photos 3-53~54.

Photo **3-57** People walking downstream of the high-speed railway bridge

Photo **3-58** People fishing downstream of the high-speed railway bridge

(3) Houfeng Bridge

The river section near Houfeng Bridge is protected by embankments on both sides, and the cementation is quite serious.

There are many places in the river channel where bed reinforcement is installed, which affects the visual landscape.

After the on-site investigation in July, the bed reinforcement between the Houli Bridge and the water pipe bridge has been removed.

The water quality is seriously polluted due to the wastewater discharged by the neighboring factories, and there is an occasional odor.

During the investigation, no public was found to be using the water space here. See photos for details.

3-59~60ÿ

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Photo **3-59 :** Bed consolidation work downstream of Houfeng Bridge

Photo **3-60 :** Workers working on the bed consolidation under Houfeng Bridge

(4) Downstream of Shigang Dam (Pifeng Bridge)

The section of the river from upstream of Pifeng Bridge to Shigang Dam was flooded due to the construction of the Shigang Dam foundation protection project.

The river channel is full of soil piles and cement blocks, and the overall natural landscape of the river has been damaged.

The natural environment and landscape are preserved only in the downstream section of the river to Pifeng Bridge. During the investigation, it was found that

On holidays, there are a few people fishing on the river bank, and no other waters are used.

For details, see photos 3-61~62.

Photo **3-61** Construction of the downstream project of Shigang Dam

Photo **3-62** People fishing downstream of Pifeng Bridge

2. The middle reaches of Dajia River

(1) Dongshi Bridge

Dongshi Bridge is located upstream of the Shigang Dam Water Source Special Area, where the river habitat is quite diverse.

The water is very clear, making it suitable for living organisms.

Many people fish here on holidays, see photos 3-63~64.

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Photo **3-63** People fishing at Dongshi Bridge

Photo **3-64** People fishing at Dongshi Bridge

(2) Ryoan Bridge

From Long'an Bridge onwards, the terrain gradually changes from plains to hilly valleys.

The water is abundant and clear, and the water forms are diverse, making it a very suitable habitat for organisms.

During the investigation, it was found that people were fishing and catching fish here on weekdays and holidays.

Activities, see photos 3-65~66.

(3) Tianfu Bridge

During the investigation, it was found that the bed consolidation work downstream of Tianfu Bridge has been completed.

The water quality is much clearer than during the construction period, and local artificial

The deep pool makes the habitat here diversified.

Many people go fishing here on holidays, see photos 3-67~68.

Photo **3-65** People fishing upstream of Long'an Bridge

Photo **3-66** People fishing downstream of Long'an Bridge

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Photo **3-67 :** Bed consolidation workers downstream of Tianfu Bridge

Photo **3-68** People fishing under Tianfu Bridge

(4) Ma'anba

Ma'an Dam is located in the middle and upper reaches of Dajia River. It is a single hydroelectric power station.

A fishway is set up on the right to maintain the ecological balance of fish in Dajia River.

Currently, people fish in the artificial deep pool below the dam on weekdays and holidays. See photos for details.

3-69~70ÿ

Photo **3-69:** Fishway in use on the right side of Ma'an Dam

Photo **3-70** People fishing downstream of Ma'an Dam

(5) Li Leng Bridge

Li Leng Bridge is the main road for Li Leng tribe to travel to the outside world. This section of the river has sufficient water and good water quality.

The water is clear and diverse. During the survey, it was found that many people were swimming here on holidays.

Fishing activities are available, see photos 3-71~72.

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Photo **3-71** The water space upstream of Li Leng Bridge

Photo **3-72** People fishing downstream of Li Leng Bridge

(6) Guguan Bridge

Downstream of Guguan Bridge is the famous Guguan Hot Spring Scenic Area, with hot spring hotels on both sides of the river.

There are many hotels and hotels, and the water quality is easily affected by hot spring wastewater. During the investigation, it was found that there are

People go fishing here. Upstream of Guguan Bridge is Tianlun Dam, which is mainly used for power generation.

For details, please refer to photos 3-73~74.

Photo **3-73** Tianlun Dam upstream of Guguan Bridge

Photo **3-74** Water space downstream of Guguan Bridge

3. The upper reaches of Dajia River

(1) Guguanba

Guguan Dam is a single-purpose hydroelectric dam with two sides close to the mountain wall.

During the investigation, no public use of water space was found. See photos 3-75~76 for details.

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Photo **3-75** Guguan Dam

Photo **3-76** Water space upstream of Guguan Dam

(2) Confluence of the Piasan River

This section of the river is located upstream of Guguan Dam, with sufficient water and clear water quality.

The river section is affected by the dam and the water flow is slow, resulting in siltation.

Only a few people go fishing here on weekdays, see photos 3-77~78 for details.

Photo **3-77** People fishing downstream of the confluence of Piasang River

Photo **3-78** Upstream of the confluence of Piasang River

(3) Qingshanba

This section of the river is located in the upper reaches of Dajia River, with a relatively steep slope and turbulent water flow.

No water space utilization was found during the inspection, see photos 3-79~80.

Photo **3-79** Rapid currents downstream of Qingshan Dam

Photo **3-80** Water space downstream of Qingshan Dam

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In summary, the embankment of the lower reaches of Dajia River is well protected, but there is a lack of relevant water-friendly facilities.

In addition, there are many places in the river where bed consolidation workers are stationed, and the public does not use the water space very much.

During the investigation, only some sections of the river were visited by people for fishing.

It is rich in water resources, and there are saddle dams and Tianlun dams along the way for hydroelectric power generation.

Due to the diverse ecological habitats and clear water quality, you can see the people on weekdays and holidays.

People fish in the stream. The upper reaches of Dajia River are affected by the restriction of entry into the mountains by Guguan Control Office.

Apart from Cheng Shizuo's staff and residents of Lishan area, there is almost no human activity.

In general, the main uses of the Dajia River system space are: agriculture (rice

Rice, pears, peaches, citrus, betel nuts, plums, etc.), industry (iron factories, sandstone and cement

and Toyosu Science Park, etc.), tourism (hot springs, restaurants, camping and barbecue, etc.), military, transportation

There are many rivers and settlements, but the proportion is not high because the middle and upper reaches of this river system are hilly and mountainous rivers.

The river is a natural environment-based form; the current survey on space utilization during the wet and dry seasons is related to

The survey results on holiday and non-holiday utilization are shown in Tables 3-10~13.

Table **3-10** Survey results of Dajiaxi River utilization during non-holiday season during the flood season

land oints	Sample Station Numbered	Sample station name	Use Space			Number of people	Space utilization type				Remark
			High water beach		embankment Neighborhood		Fishing/ fishing activities	Farming, aquaculture		Leisure	
Down tour	A	Dajia River Estuary ×		ÿ	×	+	× ÿ ×	Farming		×	Farming
	B	Downstream of high-speed railway bridge		ÿ	×	+ ÿ ÿ ×				×	fishing
	C	Downstream of Shigangba		ÿ	×	++ ÿ ÿ ×				×	Farming fishing
	D	Upstream of Dongshi Bridgeÿ		ÿ	ÿ +++ ÿ ÿ × ÿ						Cycling car fishing
middle tour	E	Ryoan Bridge	ÿ	×	ÿ	+ ÿ × × ÿ					Cycling car fishing
	F	Downstream of Ma'anba		×	ÿ	+ ÿ × × ÿ					Cycling car fishing
	G	Li Leng Bridge	×	×	ÿ	+	×	× × ÿ			Cycling car
	H	Downstream of Tianlun Dam ×		×	ÿ ++++ × 0			× × ÿ	Sightseeing		
superior tour	I	Downstream of Guguanba ×		×	×		×	× × × ÿ			
	J	Piasan Creek confluence		×	×	+ ÿ × × 0				×	Fishing
	K	Qingshanba downstream ×		×	×		×	× ×		× ÿ	

Note: 1.ÿ: used, ×: not used.

2. Number of users: +: 1~5 people, ++: 5~10 people; +++: 10~20 people; ++++: more than 30 people.

3. Survey date: 2012/5/29 and 2012/06/01.

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Table **3-11** Survey results of river utilization during holidays during the flood season of Dajia River

land points	Sample Station Numbered	Sample station name	Use Space			Number of people	Space utilization type				Remark
			High water beach		embankment Neighborhood		Fishing/ Fishing	Farming	and leisure activities		
Down tour	A Dajia River Estuary ×			ÿ	ÿ + × ÿ ×					ÿ	walk Farming
	B Downstream of high-speed railway bridge			ÿ	×	+ ÿ ÿ ×				×	fishing Farming
	C Downstream of Shigangba			ÿ	ÿ +++ ÿ ÿ ×					ÿ	fishing Farming
	D Upstream of Dongshi Bridgeÿ			ÿ	ÿ +++ ÿ × ×					ÿ	sports Cycling
middle tour	E Ryoan Bridge			×	ÿ + ÿ × ×					ÿ	fishing Cycling
	F Downstream of Ma'anba			×	ÿ ++ ÿ × ×					ÿ	fishing Cycling
	G Li Leng Bridge			×	ÿ + ÿ × ×					ÿ	fishing Cycling
	H Downstream of Tianlun Damÿ			×	ÿ ++++ ÿ × × 0 + ÿ × × 0						go sightseeing
Down tour	I Downstream of Guguan Dam			×	×		× × ×			× ÿ	
	× J Confluence of Piasang			×	×					× Fishing	
	Creekÿ K Downstream of			×	×		× × ×			× ÿ	

Qingshan Dam × Notes: 1.ÿ: Used, ×: Not used.

2. Number of users: +: 1~5 people, ++: 5~10 people; +++: 10~20 people; ++++: more than 30 people.

3. Survey date: 2012/05/27 and 2012/06/02.

Table **3-12** Survey results of Dajiaxi River utilization during dry season and non-holiday season

land points	Sample Station Numbered	Sample station name	Use Space			Number of people	Space utilization type				Remark
			High water beach		embankment surrounding		Fishing/ Fishing	Farming and breeding		Leisure activities	
Down tour	A Dajia River Estuary ×			ÿ	× + × ÿ ×					× Farming	
	B Downstream of high-speed railway bridge		ÿ ÿ		×	+ ÿ ÿ ×				×	Farming fishing
	C Downstream of Shigangba		ÿ ÿ		× ++ ÿ ÿ ×					×	Farming fishing
	D Upstream of Dongshi Bridgeÿÿ				ÿ +++ ÿ ÿ ×					ÿ	Cycling fishing
middle tour	E Ryoan Bridge			×	ÿ + ÿ × ×					ÿ	Cycling fishing
	F Downstream of Ma'anba			×	ÿ + ÿ × ×					ÿ	Cycling fishing
	G Lileng Bridge × H Downstream			×	ÿ + × × × ÿ ++++ × × × 0 × × × 0					ÿBicycle	
	of Tianlun Dam × I Downstream			×	ÿ × × 0 × × ×					go sightseeing	
superior tour	of Guguan Dam × J Confluence			×	×					× ÿ	
	of Piasang Creek × K			×	×					× ÿ	
	Downstream of Qingshan Dam			×	×					× ÿ	

× Notes: 1.ÿ: Used, ×: Not used.

2. Number of users: +: 1~5 people, ++: 5~10 people; +++: 10~20 people; ++++: more than 30 people.

3.Survey date: 2013/1/18 and 2013/01/23.

Machine Translated by Google

Table **3-13** Survey results of river utilization during holidays during the dry season of Dajia River

land points	Sample Station Numbered	Sample station name	Use Space			Number of people	Space utilization type				Remark
			High water beach	embankment Neighborhood			Fishing/ Fishing	Farming, Aquaculture		Leisure activities	
Down tour	A	Dajia River Estuary ×		ÿ	ÿ + ×	ÿ ×				ÿ	walk Farming
	B	Downstream of high-speed railway bridge		ÿ	ÿ + ÿ	ÿ ×				ÿ	fishing Farming walk
	C	Downstream of Shigangba		ÿ	ÿ +++	ÿ ÿ ×				ÿ	fishing Farming
	D	Upstream of Dongshi Bridgeÿ		ÿ	ÿ +++	ÿ × ×				ÿ	sports Cycling
middle tour	E	Ryoan Bridge		×	ÿ + ÿ	× ×				ÿ	fishing Cycling
	F	Downstream of Ma'anba		×	ÿ ++	ÿ × ×				ÿ	fishing Cycling
	G	Li Leng Bridge		×	ÿ + ÿ	× ×				ÿ	fishing Cycling
	H	Downstream of Tianlun Damÿ		×	ÿ ++++	ÿ × ×	0 × × ×	0 ÿ × ×	0 ×	go sightseeing	
Down tour	I	Downstream of Guguan Dam		×	×	× ×				× ÿ	
	× J	Confluence of Piasang		×	×					× ÿ	
	Creek × K	Downstream of		×	×					× ÿ	

Qingshan Dam × Notes: 1.ÿ: Used, ×: Not used.

2. Number of users: +: 1~5 people, ++: 5~10 people; +++: 10~20 people; ++++: more than 30 people.

3.Survey date: 2012/01/19.