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**REPORT ON SURVEY OF NEEDS FOR RURAL BRIDGES
IN THE SANJIANGYUAN AREA**

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A. Introduction and overview

This report aims to document the rural transportation situation in one remote county of Qinghai Province, particularly in regard to the need of local communities for small bridges. The resources available for development in small communities in remote areas is usually very limited, while the transport needs of nomads, for instance, will not be less than in areas with more concentrated populations. So our interest is to note what need for bridges those communities have, and to consider how that need might most effectively be addressed. It is expected that the findings in one specific area may be applied to the San Jiang Yuan // Sanjiangyuan areas of Qinghai Province as a whole.

Zaduo County was chosen for this survey because it may be considered typical among the remote counties in Qinghai Province. Its geography has a variety of landforms, and it is inhabited by nomads who move and travel as part of their traditional livelihoods, so the need for pedestrian or other small bridges may be more likely. In addition, large parts of Zaduo County are included in the San Jiang Yuan National Nature Preserve. (Please see maps in Section G.) So it has many areas where the nature conservation priorities will apply.

The survey was conducted in cooperation with the Poverty Alleviation Bureau of Yushu Prefecture, and its branch in Zaduo County. Preliminary discussions were held to describe our interest in light bridges for remote areas, and to discuss work done in other areas to address this need. A meeting was called with leaders from all of the xiangs in Zaduo County represented, except for one (Aduo Xiang). They were asked to list locations in their xiangs which they knew about, where small or light bridges were needed.

Then we visited as many of these locations as possible in the time available, to see the situation first-hand and to document the general data. Over 8 days (2010 September 14 - 21) we visited locations in 5 xiangs (of the 7 xiangs and 1 zhen which comprise Zaduo Xian), driving more than 1,250 km within the county for that purpose.

The sites we visited and were informed about are described in Section E, and the locations are indicated on the maps in Section H. Based on these visits and on discussions and conversations made in the course of the survey, we make some general observations and comments in Section B. This is followed by specific recommendations in Section C.

In summary, we find that there are many locations in Zaduo County where the residents express a pressing need for small bridges to facilitate access in their local areas. We may expect that this situation to pertain throughout the Sanjiangyuan Area as a whole. Therefore, we recommend that a systematic approach should be developed to assist remote communities to build small bridges for their own local purposes. Since these small bridges are normally not a priority of the transportation authorities, a separate exploratory project is proposed to take this objective. (Please see Recommendation 1.)

B. General comments:

1. It is not possible to make a comprehensive assessment of the needs for bridges in the county in a single survey with the time we had available for this trip. Still, we believe that the process which we worked through has provided a general overview of the situation regarding the need for bridges in the county, and that some of the more important locations have been documented through this survey. We hope that this survey may be useful in helping to prioritize the needs to be addressed in the county and in considering ways to meet those needs. We also believe that this survey provides a picture of what may be similar conditions in other counties in Yushu Prefecture and of the Sanjiangyuan areas of Qinghai Province. Specifically, the survey indicates that there still is a

widespread need in remote areas for relatively simple, reliable, and inexpensive bridges and crossings.

2. The priority in this survey was to assess the need for small bridges for local use by the communities in the immediate area. Our assumption was that some of these locations may be served by light bridges for pedestrians, livestock and motorcycles (such as suspended bridges), or by simple truss bridges for light traffic. We did find such locations as documented below.

But we also found that many of the locations we visited require heavy bridges for trucks. For the purpose of this survey it is useful to distinguish between the two:

- Bridge for local access (BLA): These are generally for remote communities in their own areas. Typically, either a suspended cable pedestrian bridge, or light truss bridge may be suitable. These bridges could be implemented through small-scale projects assisting the communities involved.
- Main route bridge (MRB): These are generally for travel and transport to xiang centers. Usually concrete bridges for heavy vehicles may be necessary for these. Normally these bridges would be the responsibility of the county transportation bureau.

3. The county comprises a large area with 30,161 km² and it is quite remote (over 1,000 km from Xining). With a population of 53,925 at the end of 2009 its population density is below 2 persons per km². Natural conditions are also difficult with most of the area at elevations between 4,300 and 4,800 meters.

This means that the task of providing roads and bridges for rural transport is very large, relative to the number of people that are served. It is clear that the county transportation bureau has worked very hard to fulfill its mission in these conditions. (In conducting this survey, we saw many fine bridges in the county built by the transportation department. A few of these bridges are mentioned in Section F.) In these circumstances, not every need and situation can be addressed, and it is important to continue to prioritize the most important tasks.

4. We note that the economic conditions in these areas have been changing quickly. This also affects the need for transport structures. For instance, in some locations the nomads only needed bridges for pedestrians and for their livestock in the past. But now many of them have vehicles and trucks, and so naturally they would like to have motorable bridges.
5. At the same time, ecological concerns also affect the expansion of the road network. Such development may bring about harmful results for the environment, for instance by facilitating unregulated extraction of resources. On the other hand, transportation systems will also have a beneficial role as a necessary part of the conservation effort. Therefore, the relevant environmental aspects must also be considered in the planning process case by case.

For example, forested areas have restrictions from building new roads and motorable bridges. In those places, such as in Angsai Xiang, the needs of the local populations may best be served by pedestrian bridges. Degradation of the grasslands is also reported in the county. Therefore the direct or indirect connections between this degradation and the transportation networks should be considered.

6. Since this survey was relatively brief, specific information taken down for the relevant sites should be verified before decisions are made, with regard to the recommendations.

C. Recommendations:

1. In carrying out this survey, we note there are many communities which need small bridges to serve their own requirements in their own local area. (We refer to these as “bridges for local access” or BLAs, which we distinguish from “main route bridges” or MRBs.) These locations often are not on the main routes to or from the xiang centers, and are unlikely to be prioritized by the county transport bureaus or other county government bodies.

Communities with needs for BLAs usually do not have a systematic approach with which to pursue their hopes for building a small bridge. Typically, they need to look for funding from any sources that may show interest and concern in their need. Design and construction is often carried out on an ad hoc basis by locally available contractors, without appropriate standards and consistent oversight. Thus the communities are very much on their own in trying to achieve a successful outcome.

We recommend that a project should be undertaken to address the need for BLAs in remote communities, separate from the MRBs – for which the county transportation departments already take responsibility. The project for BLAs should have these goals:

- To develop standards for design and construction which are appropriate to the local setting. Bridge types should include suspended pedestrian bridges and light weight truss bridges, which are typically not built for heavy traffic.
- To systematize an approach for assessing and prioritizing the locations with needs for such bridges.
- To provide a means through which local communities can find assistance for BLAs in their areas.
- To establish procedures through which BLAs can be planned and implemented.

Experience in other places may serve as a guide in developing such a project. For instance, the following photos show suspended pedestrian bridges and light truss bridges built by a project which focused on rural bridge construction in other areas of the Tibetan plateau.



Still there is likely to be many factors that are unique to the Qinghai context. Therefore it may be good to begin with a pilot project to test implementation approaches in a limited number of locations. Based on this experience the project could then aim for a wider application.

Through our survey in Zaduo County, the following sites were identified as having needs for BLAs. A pilot project could aim to begin with them.

Location	Location	Xiang & Cun	Type of bridge	Reference number
Suitable for a pilot demonstration project	Raching	Angsai, Raching	Suspended cable	A1
	Nyemdo	Angsai, Nyemdo	Suspended cable	A2
	Nalung Panko	Sulu, Panko(?)	Suspended cable	D16
For further investigation for light truss bridges	Zunggyechyo	Zachen, Dechen	Light truss	C13
	Chyo Nyiba	Tradang, Bachen	Light truss	B5
	Dzasi	Tradang, Yuni	Light truss	B11

2. We recommend that of the approximately 20 sites we visited or were informed about on this study, the following locations should be considered for main route bridges - MRBs. These would normally be concrete bridges or possibly concrete fords. Since the county transportation department has responsibility for the county transportation network, these locations should be referred to them.

	Location	Xiang & Cun	Reference Number
Clearly a high priority. (One or more of these 3 locations, which are in the same general area.)	Nya tsangka	Tradang, Bachen	B7
	Gyeba Samchyo	Tradang, Bachen/Tango	B6
	Pamangon	Tradang, Yuni	B3
Likely to be a high priority	Sanggye Retzong	Tradang, Chijyong	B8
Likely to be middle priority	Warenda	Tradang, Chijyong	B10
	Magonda	Sulu, Sanyun	D15
	Lamichyo	Zachen, Dechen	C14

May be a lower priority	Gyajongjung	Tradang, Yuni	B12
	Gyira anka	Tradang, Bachen	B4
For future reference	Longmu Kyenda	Tradang, Chijyong	B9

3. Sites which we were not able to visit on this survey, or for which we were not able to get substantive information, should be followed up in the future, as there may be significant needs there. These locations include:

Location	Xiang & Cun	Reference number
Menama	Sulu, Shiyun	D17
Danga (several sites)	Jieduo, Danga	E18
Waha (several sites)	Aduo, Waha	F19
Megojyong	Moyun	G20
Zichyo (several sites)	Sahuteng Zhen	H21

4. The western part of the county is sparsely populated, is less accessible, and gets less attention than the eastern part. The western part also has more plains and wetlands, whereas the east is more mountainous. Therefore the rivers and streams in the west tend to have low gradients and are relatively wide. (This area includes the headwaters of the Jechyo (Changjiang) and the Dzachyo (Langcanjiang.) This means that where bridges are built, they need to be relatively longer. Where there are no bridges, it is common to drive across the rivers, fording them when the water level is low enough. But in many places it is difficult to do this without the vehicle getting stuck. This is because the low river gradients mean that the riverbeds have finer sediments such as silt and sands, which do not provide a hard base to drive on in the water.

(In freezing weather, fine sediments are also more subject to heaving, from the expansion of ice. The requirements for foundations in fine soils are more demanding than for coarse soils.)

To provide reliable and cost-effective crossings in these conditions, it may be helpful to consider some alternative technical approaches:

- In some locations, concrete fords might be used instead of bridges. These are built at the level of the riverbed, so the river passes over the roadway. The water level needs to be shallow enough for vehicles to pass through (except perhaps in times of flooding.) The concrete roadway provides a hard bottom so that the vehicles can pass without getting stuck in the riverbed. This will be less expensive than constructing bridges, and may be suitable for locations where the traffic may not be very frequent.
- In places with fine sediments, lightweight bridges could be built by driving piles and supporting the bridges directly on the piles. This may be an alternative to building concrete piers and abutments for the bridges. (This approach is used for building docks in coastal river

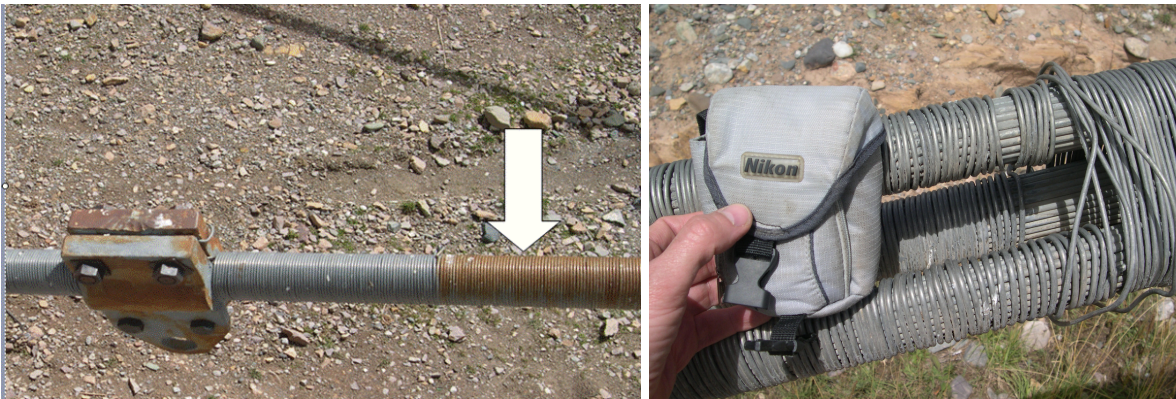
estuaries.) The sediments in the river bed of some locations may be fine enough to accommodate this, and this may be cheaper and simpler than excavating in the riverbeds for the foundations of concrete structures.

5. One technical concern arises from our visit to the Dzachen Da Qiao (Number **22C**). This is a suspended bridge built across the the Dzachyo River (Langcangjiang) in 2005. It is about 13 km from Zaduo Xian on the road to Dzachen Xiang. Our concern has to do with the galvanizing of the main cables of the bridge. In order to prevent the wire strands of the cables from rusting, the specifications for cables used in bridge construction normally require that:
- The wire strands should have Grade A (heavy) galvanizing.
 - The cables should also be impregnated with non-drying oils during the cable manufacture, to prevent moisture from gathering among the wire strands within the cable.

The galvanizing of the wire strands in the cables of this bridge appears not to be of very good quality, since they were showing signs of rust, now after only 5 years. The cables also were not impregnated with oil, which means that moisture within the cables may accelerate the rusting there. (The cables of the bridge were not the steel wire rope cables normally used for suspension bridges. The cables appeared to be locally made from simple, heavy gauge GI (galvanized iron) wire, with many strands of the GI wire drawn together, and wrapped around with other wire.)

Rusting in the main cables of a bridge is a critical issue. We recommend that the rust development in the main cables should be regularly monitored. Since it has already started, it will at some point become a safety issue.

This concern may also apply to other suspension bridges in Zaduo County or elsewhere.



D. General statistics of Zaduo County (provided by the County Poverty Alleviation Bureau)

Location: Between 92°33' and 96°03' E Long. and 32°08' and 33°50' North Lat.

Area: 30,161 km²

Elevation: Generally between 4,300 and 4,800 meters.
Lowest at 3,900 and highest at about 6,000 meters.

Population: 53,925 with 90% herders. (Livestock population 417,000.)

Economy: Rmb 9,500 per capita income
(with a large disparity between urban / rural incomes,
and large part of the income deriving from caterpillar fungus.)

Administration: 7 xiangs and 1 zhen (county center of Sahuteng) as indicated on map.

		<u>Chinese</u>	<u>Pinyin</u>
A.	Angsai Xiang	昂赛乡	Angsai xiang
B.	Tradang Xiang	查旦乡	Chadan xiang
C.	Zachen Xiang	扎青乡	Zhaqing xiang
D.	Sulu Xiang	苏鲁乡	Sulu xiang
E.	Jieduo Xiang	结多乡	Jieduo xiang
F.	Aduo Xiang	阿多乡	Aduo xiang
G.	Moyun Xiang	莫云乡	Moyun xiang
H.	Sahuteng Zhen	萨呼腾镇	Sahuteng zhen

A list of the locations referred to in this report is indicated in Section I, with Tibetan transliterations and Chinese versions in characters and in Pinyin, for cross-referencing purposes.

E. Locations of potential bridge sites

<p><u>Number:</u> A1</p> <p><u>Location:</u> Raching</p> <p>Angsai Xiang Raching Cun Xiaodui #5 Over the Lancang/ Dzachu/ Mekong River</p> <p><u>Visited or not?</u> Yes</p> <p><u>Recommendation</u> To investigate this location as a possible site for a bridge for local access (BLA) as a demonstration project.</p>	<p><u>Summary of situation and need:</u></p> <p>This location is on the road to Angsai Xiang, about 3 km from the turnoff from the main highway. About 20 to 30 families reside on the far (south) side of the Lancang River. They presently use ropeways to cross the river back and forth from the road. There is a vehicle bridge about 9 km downstream from the site for the road going to Angsai Xiang. When a new bridge was built at that location in 2005, they asked about moving the old bridge to this location, but this proved impractical.</p> <p>A suspended bridge would be suitable here for pedestrians, livestock and motorcycles. The bridge would need a span of about 65 meters.</p>
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The Langcanjiang (Mekong River) at Raching.

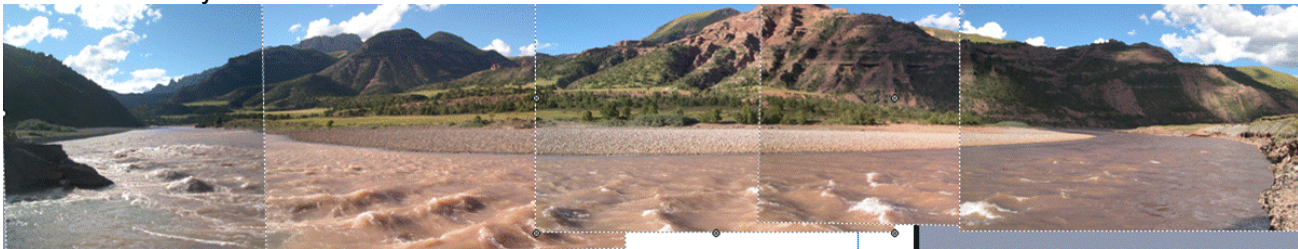


Present ropeway crossing at Raching.



<p><u>Number:</u> A2</p> <p><u>Location:</u> Nyemdo Angsai Xiang Nyemdo Cun Over the Lancang/ Dzachu/ Mekong River</p> <p><u>Visited or not?</u> We visited the area, but were not able to investigate specific locations for a possible bridge</p> <p><u>Recommendation</u> To investigate this location as a possible future project for a bridge for local access (BLA).</p>	<p><u>Summary of situation and need:</u></p> <p>This is in a remote part of Angsai Xiang. The xiang center is on the south side of the Lancang River, and Nyemdo lies about 30 km to the east from there, by a mountain road which passes over a high ridge a descends down to the river again. About 43 families reside on the north side of the river, in two separate areas. Presently they use a difficult motorcycle path which traverses a large distance on the north side of the river, to reach their homes from the county or the xiang.</p> <p>Since this is a forested area, the construction of main motorable roads and briges is not allowed. But a suspended bridge would be suitable here for pedestrians, livestock and motorcycles. We did not have time to investigate specific locations for a possible bridge. An important question is whether one bridge could serve both the areas where the people live, since the two areas are separated from each other by a ridge.</p> <p>A bridge was reportedly begun to be constructed several years ago, but was not completed by the contractor. A bridge in this area may need a span of 70 meters or more, pending a detailed site selection.</p>
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Panorama at Nyemdo



<p><u>Number:</u> B3</p> <p><u>Location:</u> Pamangon Tradang Xiang Yuni Cun</p> <p><u>Visited or not?</u> Yes</p> <p><u>Recommendation</u> Refer this location, along with B6 and B7 to the county transportation bureau since it seems a high priority to build an MRB at one or more of them.</p>	<p><u>Summary of situation and need:</u></p> <p>The main route crosses the wide riverbed of the Sachyo River here, just north of the monastery. Presently vehicles drive through the river, which can be a problem in high floods.</p> <p>Since this is on a main route a motorable bridge would for trucks would be necessary, probably a multi-span concrete structure, 30 or 40 meters long.</p> <p>A bridge here would serve about 300 families in Bachen Cun and about 80 families in Yuni Cun, as well as the monastery.</p>
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Crossing at Pamangon.



<p><u>Number:</u> B4 <u>Location:</u> Gyira anka Tradang Xiang Bachen Cun Xiaodui #2</p> <p><u>Visited or not?</u> Not visited</p> <p><u>Recommendation</u> Refer this location to the county transportation bureau for investigation as a likely lower priority for a MRB.</p>	<p><u>Summary of situation and need:</u></p> <p>This location is 25 to 30 km south or south east from Pamangon monastery. We did not visit there, but were informed there is a crossing similar to the one at the monastery, across a wide riverbed. So a multi-span concrete bridge may be necessary here. It would serve about 50 families in that community.</p>
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<p><u>Number:</u> B5 <u>Location:</u> Chyo Nyiba Tradang Xiang Bachen Cun</p> <p><u>Visited or not?</u> Yes</p> <p><u>Recommendation</u> To investigate this location as a possible future project for a bridge for local access (BLA).</p>	<p><u>Summary of situation and need:</u></p> <p>This location is in the southern part of Bachen Cun, on the Trachyo River, not far from the southern border of the county. About 70 families of nomads cross the river here in the spring and summer here to graze their livestock in the area south of the river. A bridge of about 30 meter span would serve them. They would like a bridge to take trucks across, but a light truss bridge for motorcycles and livestock would also be useful for them.</p>
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Chyonyiba: Flood levels as indicated by the cunzhang.



<p><u>Number:</u> B6</p> <p><u>Location:</u> Gyeba Samchyö Tradang Xiang Bachen and Tango Cun</p> <p><u>Visited or not?</u> Not visited</p> <p><u>Recommendation</u> Refer this location, along with B3 and B7 to the county transportation bureau since it seems a high priority to build an MRB at one or more of them.</p>	<p><u>Summary of situation and need:</u></p> <p>This location is between Bachen and Tango Cuns on the Damchyö River. We did not visit there, but we were informed that a long motorable bridge (50 meter span or more) would be needed there. It would serve people from Bachen and Yuni from the the south side of the river, going to the xiang center, who go a long way around via other routes at present.</p>
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<p><u>Number:</u> B7</p> <p><u>Location:</u> Nya tsangka Tradang Xiang Bachen Cun</p> <p><u>Visited or not?</u> Yes</p> <p><u>Recommendation</u> Refer this location, along with B3 and B6 to the county transportation bureau since it seems a high priority to build an MRB at one or more of them.</p>	<p><u>Summary of situation and need:</u></p> <p>This location is said to be the most important place in Tradang Xiang where a bridge is needed. It is necessary to cross the Warchyo here, which has a wide riverbed. It can not be crossed in the summer because of the soft sediments in the riverbed and the depth of the water.</p> <p>A motorable bridge would be necessary here of 40 to 50 meters long. It would serve about 400 to 500 families in the area, giving them a good connection with the xiang center.</p>
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Nyatsangka



Number: **B8**

Location: **Sangye Retzong
Chyonda**

Tradang Xiang
Chijyong Cun

Visited or not?

Yes

Recommendation

Refer this location to the
county transportation bureau
for investigation as a likely
high priority for a MRB.

Summary of situation and need:


This crossing on the Sangye Chyo is an important location since it is used by about 100 families in Chijyong Cun (Xiaodui #2 and #3) and Bayong Cun (Xiaodui #3). Vehicles normally can not cross it in the summer months and they have no other access.

A motorable bridge would for trucks would be necessary, probably 30 or 40 meters long.

Sangye Retzong



<p><u>Number:</u> B9 <u>Location:</u> Longmu Kyenda Tradang Xiang Chijyong Cun</p> <p><u>Visited or not?</u> Yes</p> <p><u>Recommendation</u> Refer to county transportation bureau for future reference.</p>	<p><u>Summary of situation and need:</u></p> <p>The community here of about 30 families would like a short motorable concrete bridge. The river is not too wide and in most conditions it is manageable.</p>
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<p><u>Number:</u> B10 <u>Location:</u> Warenda Tradang Xiang Chijyong Cun</p> <p><u>Visited or not?</u> Yes</p> <p><u>Recommendation</u> Refer this location to the county transportation bureau for investigation as a likely middle priority for a MRB.</p>	<p><u>Summary of situation and need:</u></p> <p>The main route from the xiang center to 4 cuns (Bayang, Daying, Chijyong, and Dang go), crosses the Warenda Chyo river at this location, about 9 km from the xiang center. So a large number of people use this route, though the river is not very large in most conditions. A bridge of about 30 meters would be suitable.</p>  <p>Warenda</p>
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<p><u>Number:</u> B11 <u>Location:</u> Dzasi Tradang Xiang Yuni Cun</p> <p><u>Visited or not?</u> Yes</p> <p><u>Recommendation:</u> To investigate this location as a possible site for a bridge for local access (BLA) as a demonstration project.</p>	<p><u>Summary of situation and need:</u></p> <p>This location is the party headquarters for Yuni Cun, serving about 300 families. Meetings and festivals are held at this location regularly through the year.</p> <p>It would be very good to have a light truss bridge of 12 to 15 meter span across the small river there for people and motorcycles.</p>
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<p><u>Number:</u> B12</p> <p><u>Location:</u> Gyajongjung Tradang Xiang Yuni Cun</p> <p><u>Visited or not?</u> Not visited</p> <p><u>Recommendation</u> Refer this location to the county transportation bureau for investigation as a likely lower priority for a MRB.</p>	<p><u>Summary of situation and need:</u></p> <p>We did not visit this site, but were informed that about 50 families of Yuni Cun Xiaodui #3, as well as others in Moyun Cun, would be served by a motorable concrete bridge of about 30 meters span.</p>
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<p><u>Number:</u> C13</p> <p><u>Location:</u> Zunggyechyo Zachen Xiang Dechen Cun</p> <p><u>Visited or not?</u> Yes]</p> <p><u>Recommendation</u> To investigate this location as a possible future project for a bridge for local access (BLA).</p>	<p><u>Summary of situation and need:</u></p> <p>This is a mountainous region. The upper part of the Zunggyechyo valley is used by about 50 families during the summer for grazing their livestock. They do not stay in the valley for the winters. The nomads there ford their yaks across the river and have lost small yaks many times in the river.</p> <p>This site may be suitable for a light truss bridge for livestock and motorcycles with a span of about 20 meters.</p>
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Zunggyechyo



<p><u>Number:</u> C14</p> <p><u>Location:</u> Lami chyo Zachen Xiang Dechen Cun</p> <p><u>Visited or not?</u> Yes]</p> <p><u>Recommendation</u> Refer this location to the county transportation bureau for investigation as a likely middle priority for a MRB.</p>	<p><u>Summary of situation and need:</u></p> <p>About 70 or 80 families of Xiaodui #1 use the pastures up in the valley of the Yetre Chyo. They cross the the Lami Chyo where it joins the Yetre Chyo. About 15 families stay in the valley during the winter. The river is about 30 meters wide at that point. A motorable concrete bridge would be best for this location.</p> 
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<p><u>Number:</u> D15</p> <p><u>Location:</u> Magonda Sulu Xiang Sanyun Cun</p> <p><u>Visited or not?</u> Yes</p> <p><u>Recommendation</u> Refer this location to the county transportation bureau for investigation as a likely middle priority for a MRB.</p>	<p><u>Summary of situation and need:</u></p> <p>About 100 families up in the Magocho valley cross the river at this point. It is about 40 or 50 meters wide and usually is shallow enough for them to cross without much trouble.</p> 
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<p><u>Number:</u> D16</p> <p><u>Location:</u> Nalung Panko</p> <p>Sulu Xiang Panko (?) Cun</p> <p><u>Visited or not?</u> Yes</p> <p><u>Recommendation</u> To investigate this location as a possible future project for a bridge for local access (BLA).</p>	<p><u>Summary of situation and need:</u></p> <p>About 70 or 80 families in 5 or 6 small villages live on the south side of the Samchyö River, which is a major waterway flowing from the Tibet Autonomous Region. At the present the ford the river when possible.</p> <p>A suspended bridge for pedestrians, livestock and motorcycles. A span of about 50 meters would be necessary.</p>
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Nalung Panko



<p><u>Number:</u> D17</p> <p><u>Location:</u> Menama</p> <p>Sulu Xiang Shiyun Cun</p> <p><u>Visited or not?</u> Not visited</p> <p><u>Recommendation</u> To note this location for future investigation.</p>	<p><u>Summary of situation and need:</u></p> <p>We could not visit this site, but we were informed that it is about 10 km upstream on the Yamchyö from the main road. About 40 families live in that area and need to regularly cross the river. A bridge would need to have a span of about 20 meters, and it would be enough if the bridge could carry motorcycles. Therefore a light truss bridge may be suitable for this location.</p> <p>A similar situation is found with about 8 families in Majyenda in Xiaodui #2 near the main road, where a small bridge of 10 meters span would help them cross a small stream. This is their only access to the main road.</p>
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<p><u>Number:</u> E18</p> <p><u>Location:</u> Danga</p> <p>Jieduo Xiang Danga Cun</p> <p><u>Visited or not?</u> Not visited</p> <p><u>Recommendation</u> To refer these locations for future investigations to the county transportation department.</p>	<p><u>Summary of situation and need:</u></p> <p>We could not visit these sites, but we were informed that they lie west from the xiang center.</p> <p>The most important location is Buchyo, a poor and remote village of 280 families, that would be served by a motorable bridge 20 or 30 meters span.</p> <p>We were also told of Gangching, where about 15 families need a bridge of about 10 meters span.</p> <p>They also mentioned a bridge in Buyong built in 2008 over the Jechyo, which has a limited width. They would like a wider bridge.</p>
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<p><u>Number:</u> F19</p> <p><u>Location:</u> Waha</p> <p>Aduo Xiang Waha Cun</p> <p><u>Visited or not?</u> Not visited</p> <p><u>Recommendation:</u> To note these locations for future investigation.</p>	<p><u>Summary of situation and need:</u></p> <p>Trapoyung, Tsewang, & Long</p> <p>We could not visit these sites, but we were informed about them for future consideration.</p>  <p>A collapsed bridge in Aduo.</p>
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<p><u>Number:</u> G20</p> <p><u>Location:</u> Megojyong</p> <p>Moyun Xiang</p> <p><u>Visited or not?</u> Not visited</p> <p><u>Recommendation:</u> To refer this location to the county transportation department for future investigation.</p>	<p><u>Summary of situation and need:</u></p> <p>We could not visit this site, but we were informed about it for future consideration.</p>
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<p><u>Number:</u> H21</p> <p><u>Location:</u> Zichyo River Dzaduo Zhen</p> <p><u>Visited or not?</u> Not visited</p> <p><u>Recommendation:</u> To note these locations for future investigation.</p>	<p><u>Summary of situation and need:</u></p> <p>We could not visit these sites in the Ziyong Valley, but we were informed about them for future consideration:</p> <p>Hongchi / Nuocun Dona Saching</p>
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F. Some existing bridges visited during the survey

<p><u>Number:</u> 22C</p> <p><u>Bridge:</u> Zachen Da Qiao</p> <p><u>Location:</u> Leaving Zaduo Xian on the road to Zachen Xiang, over the Dzachyo (Langcanjiang)</p> <p><u>Type:</u> Suspended motorable bridge.</p> <p><u>Built:</u> 2005</p>	
<p><u>Number:</u> 23B</p> <p><u>Bridge:</u> Wordamsamdo</p> <p><u>Location:</u> Tradang Xiang Main bridge over the Damchyo River, which joins the Changjiang.</p> <p><u>Type:</u> Multi-span concrete bridge, approx 160 meters long.</p> <p><u>Built:</u> 1995</p>	

Number: **24A**

Bridge: **Angsai Bridge**

Location: On the road to Angsai Xiang, over the Dzachyo River (Langcangjiang.)

Type: Suspended motorable bridge.

Built: New bridge built in 2005.



G. Acknowledgements

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- Plateau Perspectives staff for their commitment and hard work in assisting with the assessment.
- The xiang leaders and other individuals at the sites where we visited, who offered information, suggestions, and assisted with local travel.

H. Maps

1. Sanjiangyuan National Nature Preserve in Qinghai Province
2. Zaduo County with Locations of Possible Sites for Rural Bridges
3. Zaduo County Satellite Imagery

I. Location Names

<u>Name or Tibetan transliteration</u>	<u>Characters</u>	<u>Pinyin</u>
Qinghai Province	青海省	qing 1 hai 3 sheng 3
Zaduo County	杂多县	za 2 duo 1 xian 4
A. Angsai Xiang	昂赛乡	ang 2 sai 4 xiang 1
Raching	热情	re 4 qing 2
Nyemdo	聂多	nie 4 duo 1
Angsai Bridge	昂赛大桥	ang 2 sai 4 da 4 qiao 2
B. Tradang Xiang	查旦乡	cha 2 dan 4 xiang 1
Nya tsangka	聂从卡	nie 4 cong 2 ka 2
Gyeba Samchyo	格巴桑曲	ge 2 ba 1 sang 1 qu 1
Pamangon	布门寺	bu 4 men 2 si 4
Sanggye Retzong	萨艾热宗	sa 4 ai 4 re 4 zong 1
Warenda	哇仁达	wa 1 ren 2 da 2
Gyajongjung	加贡涌	jia 1 gong 4 yong 3
Gyira Angka	吉日昂卡	ji 2 ri 4 ang 2 ka 3
Longmu Kyenda	龙毛涌达	long 2 mao 2 yong 3 da 2
Chyo Nyiba	曲聂巴	qu 1 nie 4 ba 1
Dzasi	扎赛	zha 1 sai 4
Longmu Kyenda	龙毛艾达	long 2 mao 2 ai 4 da 2
Wordamsamdo Bridge	吾当桑多桥	wu 3 dang 1 sang 1 duo 1 qiao 2
C. Dzachen Xiang	扎青乡	zha 1 qing 1 xiang 1
Lamichyo	拉米曲	la 1 mi 3 qu 1
Zunggyechyo	从根曲	cong 2 geng 1 qu 1
D. Sulu Xiang	苏鲁乡	su 1 lu 3 xiang 1
Magonda	马高达	ma 3 gao 1 da 2
Nalung Panko	拿龙怕卡	na 2 long 2 pa 4 ka 3
Menama	马拿马	ma 3 na 2 ma 3
E. Jieduo Xiang	结多乡	jie 2 duo 1 xiang 1
Buchyo	布曲	bu 4 qu 1
Gangching	嘎曲	ga 3 qu 1
Buyong	布涌	bu 4 yong 3
F. Aduo Xiang	阿多乡	a 1 duo 1 xiang 1
Trapoyung	才普涌	cai 2 pu 3 yong 3
Tsewang	才旺	cai 2 wang 4
Long	龙	long 2

G. Moyun Xiang Mego jyong	莫云乡 麦高涌	mo 4 yun 2 xiang 1 mai 4 gao 1 yong 3
H. Sahuteng Zhen Hongchi / Nuocun Dona Saching Ziyong Dzachen Bridge	萨呼腾镇 红旗 多南 萨青（沙青） 子涌 扎青大桥	sa 4 hu 1 teng 2 zhen 4 hong 2 qi 2 duo 1 nan 2 sa 4 qing 1 (sha 1 qing 1) zi 3 yong 3 zha 1 qing 1 da 4 qiao 2
I. Rivers		
Dzachyo (Mekong River or Lancanjiang)	扎曲 澜沧江	zha 1 qu 1 lan 2 cang 1 jiang 1
Zhichyo (Yangtze River or Changjiang)	治曲 长江	zhi 4 qu 1 chang 2 jiang 1
Zichyo	子曲	zi 3 qu 1
Sachyo	萨曲	sa 4 qu 1
Trachyo	查曲	cha 2 qu 1
Damchyo	当曲	dang 1 qu 1
Warchyo	哇曲	wa 1 qu 1
Warenda Chyo	哇仁达曲	wa 1 ren 2 da 2 qu 1
Yetre Chyo	亚池曲	ya 3 chi 2 qu 1
Magochyo	马高曲	ma 3 gao 1 qu 1
Yamchyo	亚曲	ya 3 qu 1
Jechyo	吉曲 (or 结曲?)	ji 2 qu 1 (or jie 2 qu 1 ?)