Pu'er, China

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Background

Pu'er is situated in the southwest of Yunnan Province with an estimated population of 200,000. The city covers a floodplain of about 45,000 sq km surrounded by hills and mountains where the famous Pu'er tea is grown. Traversing the whole city is the 15 km long Simao River whose function as a natural drainage channel has been significantly affected by increasing urbanization. Large portions of the river have been channelized with water flow impeded by solid waste and aquatic plants and some parts of the riverbanks inhabited by informal settlers thereby exposing the city to the risks of flooding. The city's drainage system is inadequate with large amount of untreated wastewater directly discharged into Simao River resulting in the deterioration of water quality of the river.

Recognizing these issues, the Pu'er Municipal Government prepared a feasibility study of the Simao River rehabilitation project aimed at developing the watercourse into an attractive landmark of Pu'er while coping with floods to the highest possible flood protection standard. Specifically, the river rehabilitation project was to be funded and implemented under the Sino-German Financial Cooperation Promotional Loan Programme.

In March 2011, the Pu'er Municipal Government requested for CDIA's assistance in carrying out a review of the feasibility study and preparation of a preliminary design of the "Flood Control, Environmental Improvement and Water Reclamation Works in Pu'er." The review aimed to guide the city in incorporating important elements of Simao

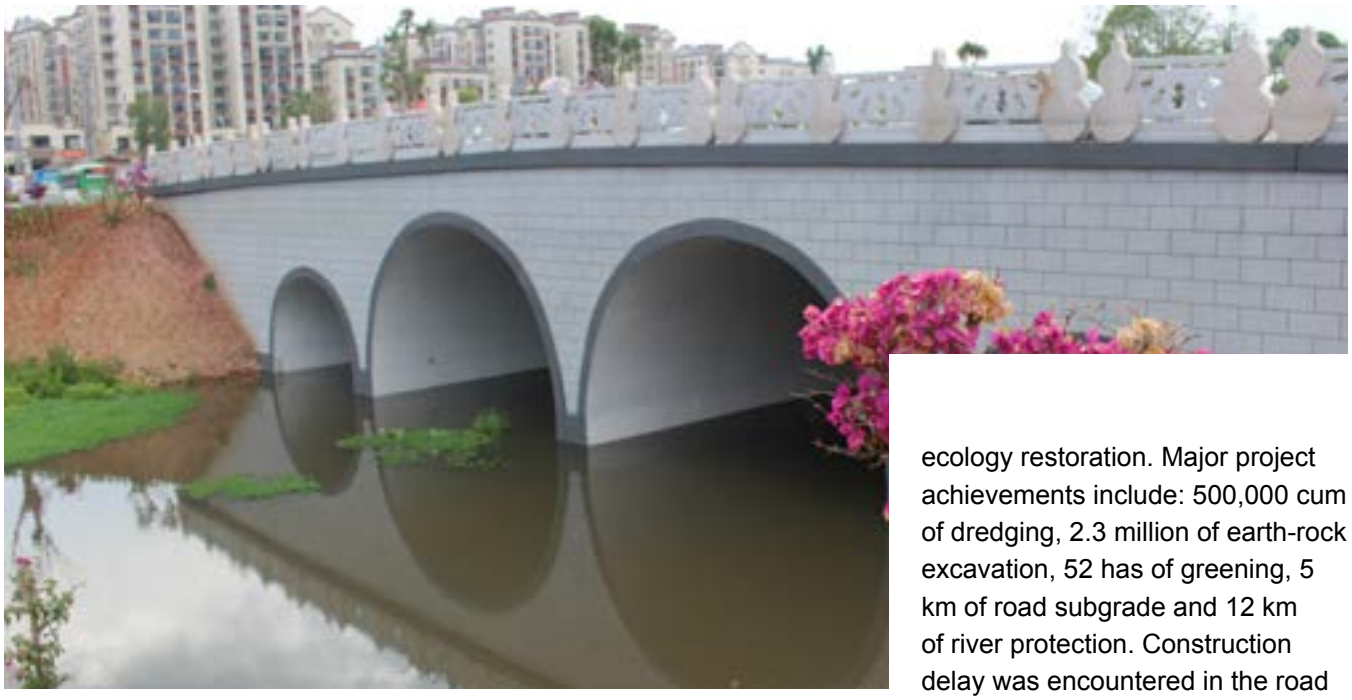
river development into the overall city development strategy and support a coordinated development of Pu'er.

Following the approval of the city application, CDIA deployed a consulting team in Pu'er from January to June 2012. Taking off from the conceptual design approved by the municipal government, the CDIA consultants prepared a final design for Simao river rehabilitation with the following key recommendations: a) improvement of water quality through a series of treatment wetlands at the confluences of Simao river tributaries and storm water channels; b) provision of river layout that can protect the city from 50-year flood events; c) allowing the river water to flow through a combination of free-flowing stream and still water sections; d) provision of open main flood channel with vegetation situated alongside riverbanks; and e) division of project construction into three sections and three contract packages within the entire length of the river.

As part of its internal monitoring and evaluation processes, CDIA conducted the tracer study in Pu'er in May 2018 to track progress, effectiveness and results of its completed interventions. Following are the main findings of the tracer study.

The CDIA PPS aimed to rehabilitate the Simao River and keep Pu'er City protected from flooding.

PROJECT OVERVIEW	
PPS period	January 2012 – June 2012
Focus sectors	Flood and drainage
CDIA supported activities	(i) Review of existing FS and preliminary design for the rehabilitation of Simao River and eight tributaries (ii) Preparation of a final design for integration into the Pu'er City Master Plan (2005-2022)
Linking to finance status	Funded by KfW and Local Government of Pu'er



One of the completed bridges at midstream of Simao river

Implementation Progress as of May 2018

Soon after the CDIA completed the feasibility study review, the Pu'er Municipal Government applied the project for financing with KfW. Subsequently, the loan agreement was signed in December 2012. A Project Steering Committee headed by the Mayor of Pu'er and composed of heads of relevant bureaus was formed to oversee the implementation of the project. Guided by the CDIA recommendations, the project's detailed engineering design was prepared by a local design institute in 2013. Project bidding and procurement processes were completed in October 2014. Considering the large number of households affected by the project, a special body to manage the land acquisition and relocation activities was set up by the municipal government. The stakeholder consultations facilitated by this special body proved to be very useful in identifying and addressing the needs of the 6,000 households affected by the project. Following the completion of land acquisition and relocation activities in the upstream section of the river, project construction work commenced in early 2015.

As of April 2018, the Project Executing Agency (PEA) reported that 85% of the project work has been completed covering the major components of the project, namely: a) flood control; b) sewage interception; and c) river ecology restoration. Major project achievements include: 500,000 cum of dredging, 2.3 million of earth-rock excavation, 52 has of greening, 5 km of road subgrade and 12 km of river protection. Construction delay was encountered in the road construction near the airport when the government failed to reach an agreement with two property owners. However, this issue has been settled and the PEA expects completion of all remaining works and project hand-over to the Pu'er municipal government in December 2018.

By December 2017, the whole amount of USD 80 million KfW loan has been disbursed for flood control and channel improvement works in Simao River. The cost of other project components such as land acquisition, relocation of affected residents, wastewater management and wetland rehabilitation was borne by the city using internal and external resources. Construction of relocation sites is about 80% completed. By December 2018, a total of 1,600 households will have been resettled in better dwellings and well-planned communities.

Project Accomplishments as of April 2018

Contract section	Key Components Completed	Cost (RMB)
A1 contract	250,000 cum of dredging; 1,020,000 cum of earth-rock excavation; 3.1 km road subgrade; 240 bridge pile foundation; 146 pieces of precast beam panel; 146 pieces of board roof hoisting; 4 bridges have been cast in arch bridge; 9.22 km of blow-off pipe inbuilt; 200,000 m2 of greening	168 million
A2 contract	52,000 cum of dredging; 327,000 cum of excavation; 12.6 km slope protection of river self-locking piece; 17.22 km of sewage pipe buried; 2.44KM of road embankment; 174 bridge pile foundation; 7th, 8th and 10th of the bridge deck have been completed; 76,000 m2 of greening	190 million
A2 contract	930,000m3 of earth-rock excavation; 180,000 m3 of dredging; 12 km of river protection; 11.76 km of sewage pipe; 58 bridge pile foundation of No.13 ; 4 bridge pier stud; 4 pier platform; 129 pieces of precast beam panel hoisting; buried 12 pipe and 800m of electric power network with 160 diameter; 245,000 m2 of greening	160 million

Source: PEA Progress Report as of April 2018

Intervention Results

City officials view the project to be consistent with the long-term development plan of Pu'er. The ecological and green development approach recommended by CDIA in 2012 has been recognized as a key strategy towards achieving sustainable river rehabilitation and creating a healthy and livable environment for the 60,000 people directly affected by the project.

Flood control and river management. Key city officials noted that flooding has been controlled in flood-prone sections of the city after river dredging and excavation works were completed in those sections in 2016. When the project is fully completed by end of 2018, Simao River is expected to achieve the 50-year flood prevention standard while the eight river tributaries will attain a 20-year flood control standard. To ensure project sustainability, the city established a governance structure headed by the Mayor to manage the river and its eight tributaries.

Water quality improvement. Water quality has been improved to the acceptable national standard with the completion of wastewater management component of the project. Residents interviewed observe that the foul smell coming from the river has been eliminated and fish population has increased in the still water sections of the river.

Restoration of river ecology. Apart from restoring the flood control function of Simao River, the river landscape has been significantly improved by the re-vegetation and ecological restoration works along the riverbanks. When the river ecology is fully restored, Simao River and its riverbanks will become the backbone of the green space system of Pu'er as envisioned in the 2014 CDIA study. Presently, local residents are utilizing these pockets of green spaces along the riverbanks and surrounding the treatment wetlands as places for quiet recreation and social interaction.

Adoption of a sustainable approach to river rehabilitation. The project adopted the ecological and green approach to river rehabilitation recommended by CDIA. This approach made use of natural and indigenous materials and processes that resulted in low construction and maintenance costs. Apart from flood prevention, city officials are fully convinced that this approach will improve biodiversity and promote the sustainable development of the river. In the immediate term, city officials are hoping that Pu'er will serve as a model to other Chinese cities on how to integrate river rehabilitation, flood control and environmental improvement into the overall city planning in a sustainable manner.

Improved living conditions. Relocated residents claim that their living conditions are much better than before in terms of amenities provided in relocation sites and quality of housing units. After relocation, people who previously lived in the riverbanks will no longer be exposed to risks of flooding. Upon completion, the roads and bridges constructed under the project are expected to significantly improve mobility and access to social services by local residents.

Conclusion and Lessons Learned

Based on the above findings, it is very likely that the Simao River rehabilitation project in Pu'er will achieve the city's primary objective of developing the watercourse into an attractive ecological landmark while eliminating flood risks and improving water quality of the river. Key contributing factors to the project's success include: i) integration of the project with the other components of the Pu'er City Master Plan including wetland park development, wastewater management, road network development, etc.; ii) active participation of city officials and the affected communities in project planning and implementation; iii) establishment of a governance structure for management of the river and its eight tributaries; and iv) ability of the city to link various project components to internal and external funding resources.

A key lesson learned from the CDIA intervention in Pu'er is the importance of incorporating significant elements of Simao river rehabilitation into the overall city development strategy including coordinated implementation of relevant urban infrastructure projects such as wetland park development, wastewater management, urban renewal, among others. When fully implemented, key officials of the Pu'er municipal government are optimistic that Pu'er will serve as a model to other cities in China on how to approach the problem of flood management and how to integrate flood management measures into the city master plan in a more sustainable manner.

KEYS TO INTERVENTION RESULTS:

- Integration of the project with the city's master plan
- Active participation of city officials and communities in project planning and implementation
- Establishment of governance structure for river management
- Ability to link project components to internal and external funding sources

The ecological and green development approach recommended by CDIA in 2012 has been recognized as a key strategy towards achieving sustainable river rehabilitation and creating a healthy and livable environment for the 60,000 people directly affected by the project.