Merging the Gap

-Ecologic Revitalization for Public Spaces and Facilities of Baierhe River in Shiyan, China-

安田幸一研究室

15M51680

王.西 (WANG Xi)

1. Introduction

Through the history, hydraulic infrastructural technics have been developed and utilized, to take better use of the river or prevent from the disaster risk. However, the artificial infrastructures may also become or cause problems when situation changes.

1.1 General information of Shiyan City

Shiyan is a city located in Hubei Province, Mid-China (fig.1), with abundant water resources. Baierhe river is far from the biggest but with most of residents alongside.

1.2 Development of Baierhe River

a. Historic period (~1960s)

Baierhe River flows through a valley with a narrow linear flooding plain which was the initial area where people settled down with agricultural activities through history.

b. Urbanization (1960s~1990s)

With the rapid industrialization and urbanization, the main urban functions have been planned along the river and the river route was made relatively straight.

c. Flood-prevention & concrete pavement (1990s~now)

In early 1990s, the local government decided to change the river into a concrete channel as flood-discharge infrastructure(fig.2).

2. Site Analyses

2.1 Hydraulic system information

A reservoir with the capacity of 1,730,000m³ is built on the upstream area to adjust the flow. The city part of river channel itself is supposed to be built with a 50 year once level (2% flood) of flood-prevention, with other 16 discharge channels (fig.3, fig.4) joined in, to prevent the city from flood. However, based on the calculation, 15 bridges could not meet the flow allowance of 2% flood, and at least 78% of the flood flow is from the upstream reservoir area, south of the city. And because of the high run-off coefficient of concrete surface, it is hard to shift the peaks. Therefore, the potential key point of improvement is to slow down the water from upstream.

2.2 Urban context

There are two main roads along the channel, one on each side, and 21 bridges (fig.3, fig.5, A~V) are built across the channel, as the main transportation structure of the city. Along part of the bank of the channel, there are pedestrian walks, or linear green belt parks built(fig.3, fig.7, type I), which are actively used by the residents nearby. However, the spaces are with limited size and unrelated to water and most of the buildings have backfaces towards to channel(fig3, fig7, type IV&V).

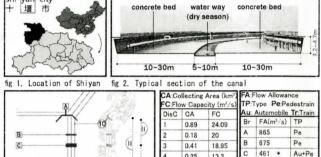
2.3 Current problems - a gap in the city

a. the channel is too wide for normal situation, becoming a gap in the city, while could not function enough for extreme

flood situation:

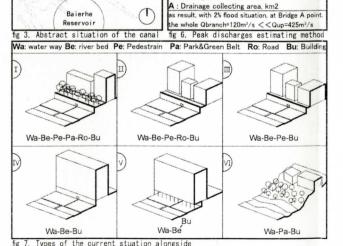
b. the destroy of natural river ecosystem has been worsening the water quality and urban environment

c. the pale concrete surface and the difficult accessibility could not provide qualified potential public spaces.



	N///			FC:Flow Capacity (m³/s)			TP:Type Pe:Pedestrain		
	I	1 20	357	DisC	CA	FC			ile Tr:Train
	/	10	in)	1	0.89	24.09	Br	FA(m ³ /	s) TP
B -		1	ir	2	0.18	20	Α	865	Pe
C-	-	-	(11:	3	0.41	18.95	В	675	Pe
		関心		4	0.25	13.3	С	461 *	Au+Pe
D		9		5	0.11	7	D	512	Pe
(D)		9		6	0.31	15.48	Е	435 *	Au+Pe
		133		7	3.06	77.58	F	438 *	Pe
E	- 1	(8)	1 1 1	8	0.24	12.7	G	447 *	Au+Pe
ren.		155		9	0.78	29	Н	605	Pe
E)	1	7,632	(D	10	0.3	15.2	I	398 *	Pe
G	16	4 (7)	UP I	11	1.12	40	J	342 *	Pe
	15)	1236		12	0.09	6.05	K	613	Au+Pe
[H]		4197		13	0.33	16.17	L	213 *	Pe
Ш-	14	6	1111	14	0.18	10.45	М	324 *	Pe
ш		185		15	0.14	8.6	N	354 *	Pe
J	-+		•	16	0.29	14.8	0	495	Au+Pe
(K)-				sum	8.68	329.4	Р	522	Pe
[C)	100	5	(V	-		am res-	Q	275 *	Tr
(Med	1		(11)			ing area	R	289 *	Au+Pe
M	V - I				km², a		S	373 *	Tr
me.	A. 18 1	F	(i iii)			w of the	Т	175 *	Pe
	1/2/4		(E 11)			25m ³ /s	U	236 *	Au+Pe
N	1	4	(V)	for 2%	flood.		٧	285 *	Au+Pe
0	WW.	(3)	()	fig 4.Discharge branch information (left) fig 5.Bridge information (right)					
	100/100		111)	Note	: * mea	ns FA<0	cana	I (2% fl	ood)

Q canal=Qup+Qbranch
Qup: outflow from reservoir
Qbranch: discharge branch flow
Since CA of branches are <2km², the rational
method could be used to estimate the flood pe
Q = 0.278 C*1*A
Q: Quantity of storm water, m3/s
C: Ceefficient of runoff (by surface type)
I: intensity of rainfall, mm/h



3. Design Strategy

The aim of the project is to merge the gap. The concept is to turn the gap into a new river system stretching through the city, and the systematic proposal would be realized case by case based on each situation with the combinations of strategies from 3 aspects (fig.8):

- **X.** to ensure a responsive flood-prevention system;
- Y. to bring back a more ecologic system to the river;
- **Z.** to revitalize the negative pure infrastructure into more positive public space.

3.1 Flood control

The main idea to strengthen the flood control function through a responsive way. 4 types of strategies could fit to different scales and site conditions. X1&X2 are mainly for upstream area with big capacity but need more space, while X3&X4 would be appreciated for more urban situation.

3.2 Ecosystem

fig 8. Design proposal strategy types

The ecosystem construction focuses on the relationship between vegetation and the water. Proper species would be selected according to different water conditions(fig.8 Y). Y1 shows the vegetation selection based on different flooding line; Y2 shows the filtration system for discharge branches(fig.3). And, Y3&Y4 are for the larger water space in upstream area, as wetland or agricultural system which could be associated with X1&X2.

3.3 Urban spaces and facilities intervention

With safe flood control and better ecosystem, efforts to recreate the urban spaces are in need, to make the continuous river system with pedestrian & bicycle-way system(Z1), easily accessible(Z2), and also enjoyable and flexible with necessary supporting facilities for various activities(Z3). The reform of the building-channel interface (figure.7 type IV&V) would turn the backfaces into attractive urban spaces(Z4).

4. Design Proposal

Based on the general situation of the two edges (fig.3& fig.7), 8 prototypes are proposed for the 8 types of cross sections(S1~S8, fig.9, fig.10), to show the potentials of the different combinations of the strategy types. And 3 projects (P1~P3, fig.11, fig.12) are proposed as examples to indicate how the facilities and citizen activities could actively interact with the revitalized river system.

4.1 Flea market revival under the bridge (P1)

With the under-bridge pedestrian walk and bicycle way, people could cross the 60m wide road much more conveniently. To further activate the under-bridge abandoned space, a vertical vegetation covered light frame-structure facility is proposed as additional roofed space for the current street flea market.

4.2 A shared community center (P2)

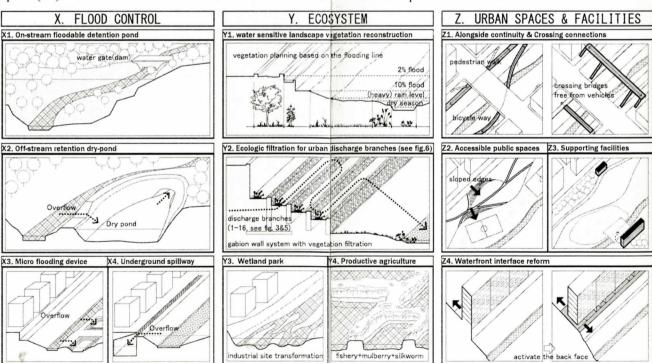
3 separated neighborhoods are again connected with a crossing foot-bridge, and a shared community center. Extended decks are added to turn the ground floor restaurants back-faces of the linear block actively connected to riverfront landscape. Meanwhile, gate-like volume creates a new welcoming interface between the city and the river.

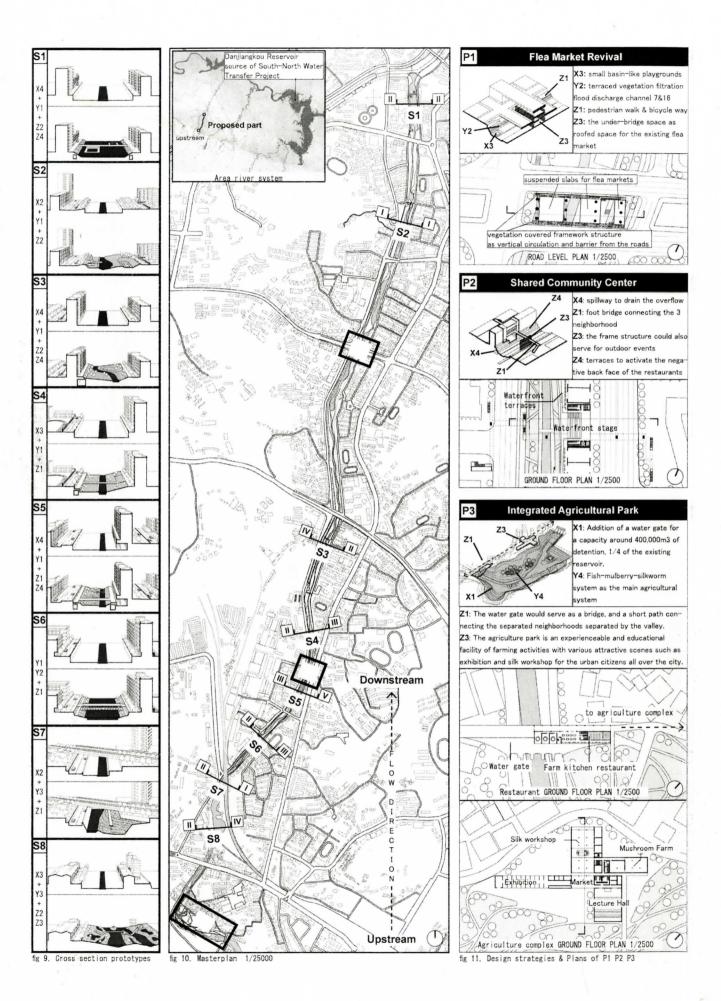
4.3 Integrated agriculture park (P3)

A new water-gate is proposed to turn the rural site into a detention pond, the spaces below would be changed into a integrated agriculture park based on a eco-circulation (fig.8, Y4). Along the safe line, the restaurant, renovated houses as Airbnb, and the experienceable factory are proposed as supporting facilities to fulfill the activities of the park.

5. Conclusion

This proposal could revitalize the channel, which could ensure the flood control in an ecological way, and shows the possibilities to provide varied and characterized water-related urban spaces to the citizens.





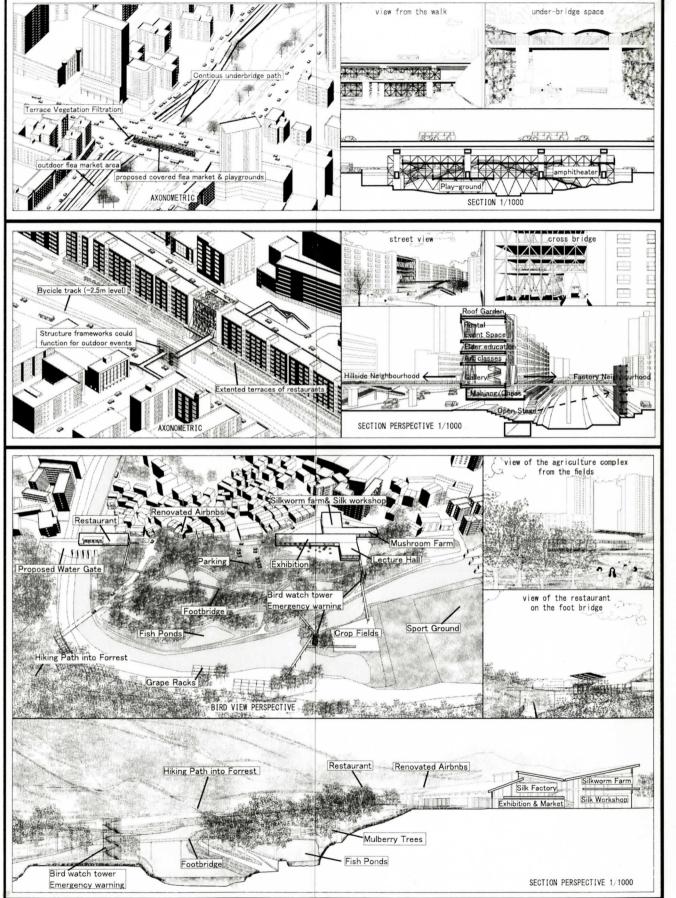


fig 12. Proposal images of P1 P2 P3