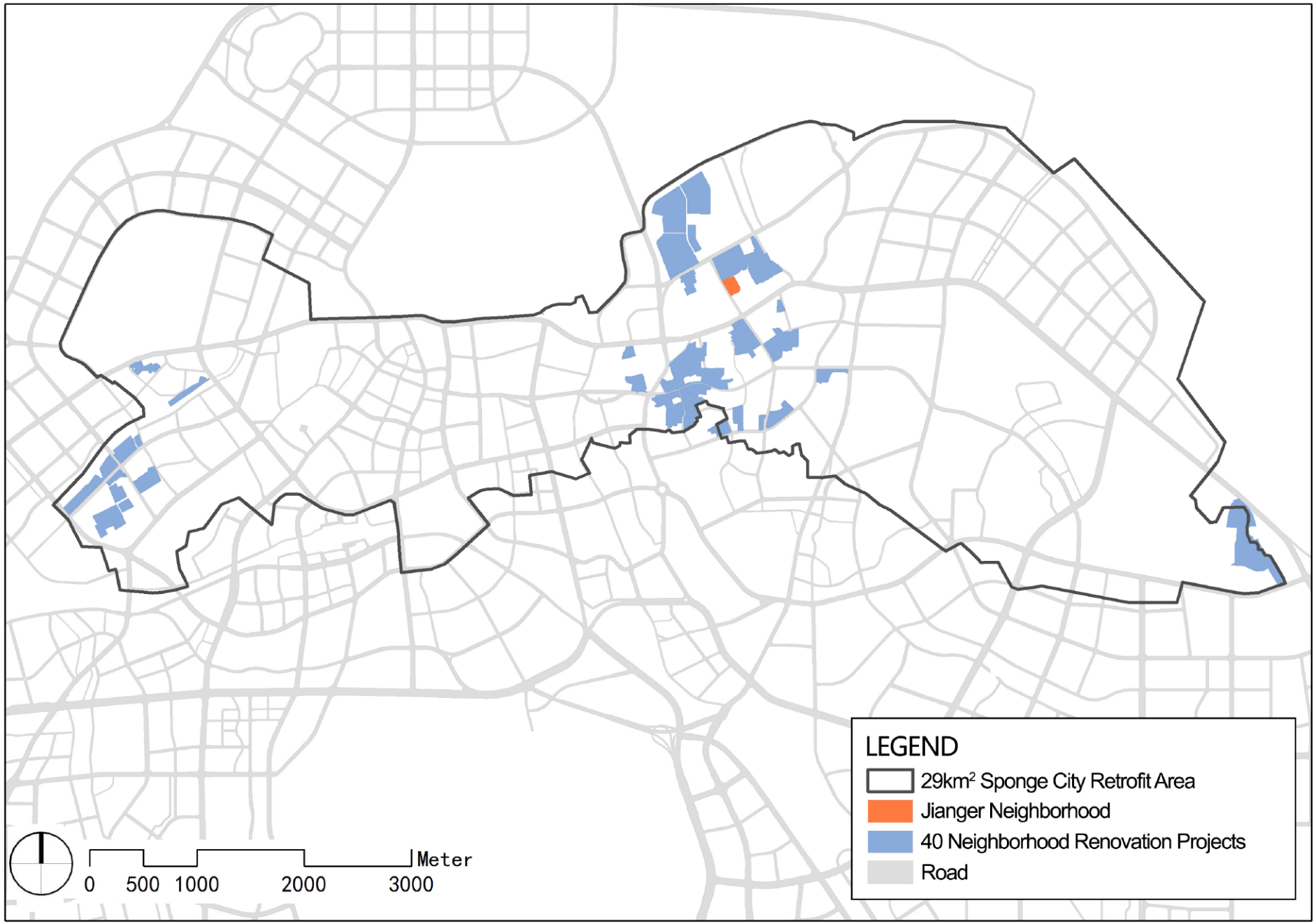
ZHENJIANG SPONGE CITY RETROFIT AREA MAP

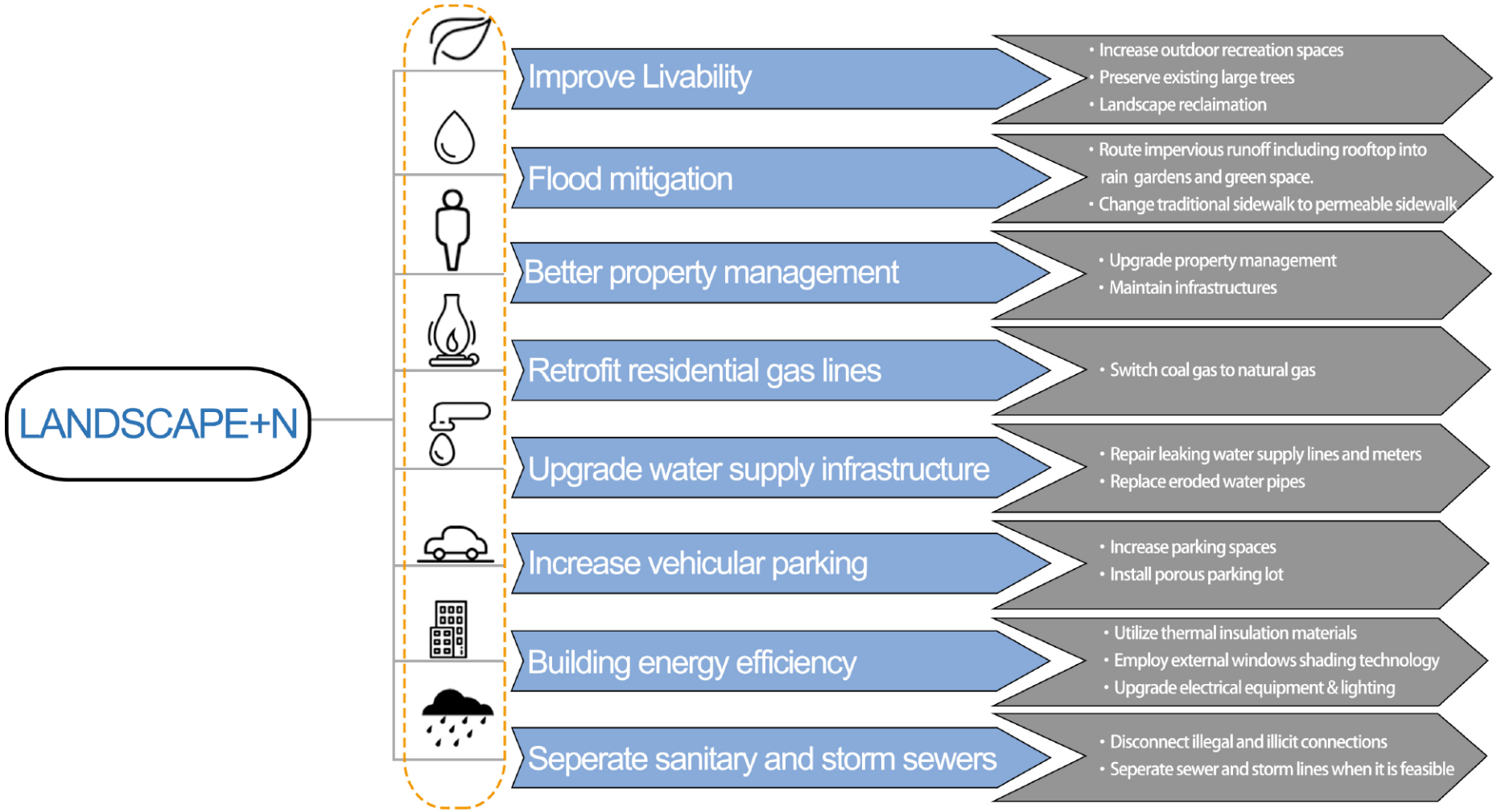


01 Jianger Neighborhood Sponge City Retrofit Project Location Map
Zhenjiang city is one of 16 pilot Sponge Cities in Southeast of China. The 29 km2 pilot area has 40 old neighborhoods that need renovation.

02 Common Problems

These 40 neighborhoods endured common problems such as annual flooding, sewer surcharge, deterioration of aging infrastructures, lack of parking space, destroyed green space and broken pavement for years.

SOLUTIONS



03 Innovative Solutions

“Landscape + N” solution which include green stormwater infrastructure (GSI), energy conservation, utilities upgrades, installation of parking lot, preservation of productive landscape and better management for mitigating flood and other problems of the neighborhood is implemented.

COLLABORATION & RESAERCH

04 Collaboration and Research

Stakeholder worked together in the entire design process. Numerous growing media and plants were tested and selected to ensure runoff volume reduction and pollution removal as well as satisfying residents' aesthetic perception.

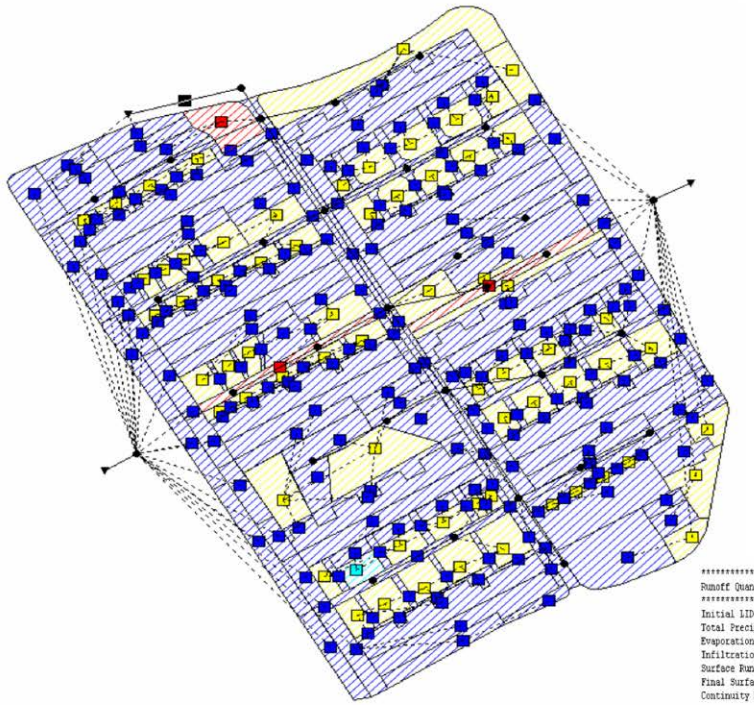
SITE PLAN

05 Analysis
Resilient landscape was proposed to stakeholders.

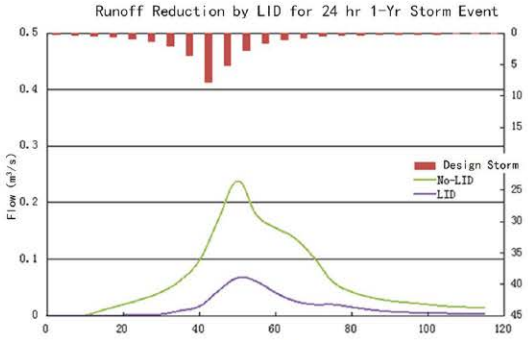
CONCEPTUAL DESIGN

06 Design
Conceptual design showed how resilient landscape works.

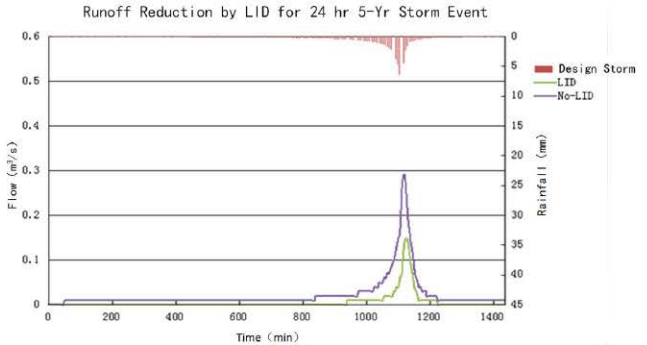
USING SWMM TO BUILD THE HYDROLOGIC MODEL



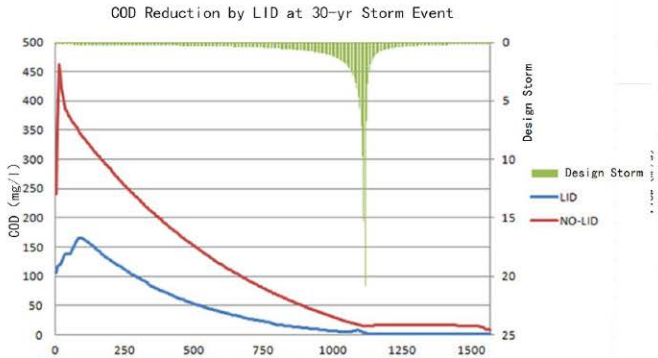
Runoff Quantity Continuity	Volume hectare-m	Depth mm
Initial LID Storage	0.022	11.521
Total Precipitation	0.413	219.979
Evaporation Loss	0.000	0.000
Infiltration Loss	0.052	27.927
Surface Runoff	0.189	100.574
Final Surface Storage	0.193	102.629
Continuity Error (%)	0.160	



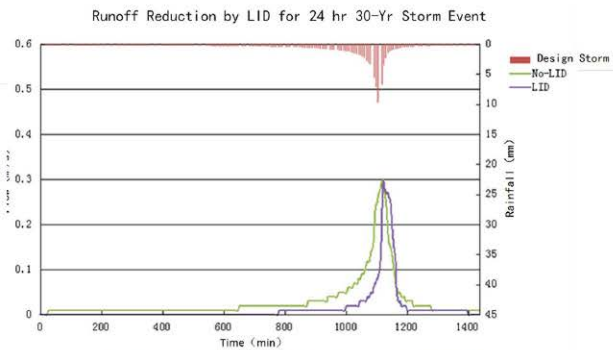
1-Yr	Rainfall (mm)	Rainfall Peak Time (min)	Runoff Peak Time (min)	Runoff Volume (m³)	Peak Flow (m³/s)	Composite Runoff Coefficient
Before	34.5	40	50	550	0.24	0.85
After	34.5	40	50	180	0.07	0.28



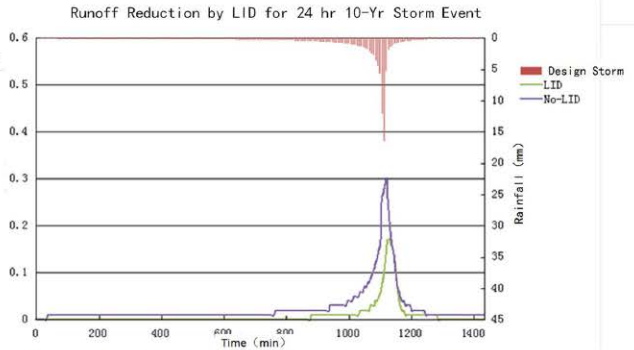
5-Yr	Rainfall (mm)	Rainfall Peak Time (min)	Runoff Peak Time (min)	Runoff Volume (m³)	Peak Flow (m³/s)	Composite Runoff Coefficient
Before	146.6	1115	1120	2330	0.29	0.85
After	146.6	1115	1125	970	0.15	0.35



30-Yr	Rainfall (mm)	Rainfall Peak Time (min)	Runoff Peak Time (min)	COD Load (Kg)	COD Concentration (MG/L)	Composite Runoff Coefficient
Before	220	1115	1120	179.66	461.47	0.87
After	220	1115	1125	20.3	165.79	0.46



30-Yr	Rainfall (mm)	Rainfall Peak Time (min)	Runoff Peak Time (min)	Runoff Volume (m³)	Peak Flow (m³/s)	Composite Runoff Coefficient
Before	220	1115	1120	3600	0.3	0.87
After	220	1115	1125	1890	0.29	0.46



10-Yr	Rainfall (mm)	Rainfall Peak Time (min)	Runoff Peak Time (min)	Runoff Volume (m³)	Peak Flow (m³/s)	Composite Runoff Coefficient
Before	175	1115	1120	2810	0.3	0.85
After	175	1115	1125	1290	0.17	0.4

07 Hydrology Modeling

Using SWMM model to simulate proposed resilient landscape design for various return period of storms.

PROCESS

08 Construction Process

Designers were involved in the entire construction process from pre-construction training to construction observation to site problem solving.

09 Project Construction Completion

“Landscape + N” solution helped to lower the construction cost compared to traditional solutions by at least 30%. It also lowers the operational and maintenance cost significantly for future.

10 Mini Playground

Mini playground as well as the resilient landscape created by the designers provide an enjoyable naturalistic oasis for both children and elderly to improve their quality of life.

11 Environmental and Social Benefits

One of the many environmental and social benefits generated by resilient landscape design is that mosquitos are reduced dramatically in the neighborhood. As the result people are more likely to go outside for various social activities.

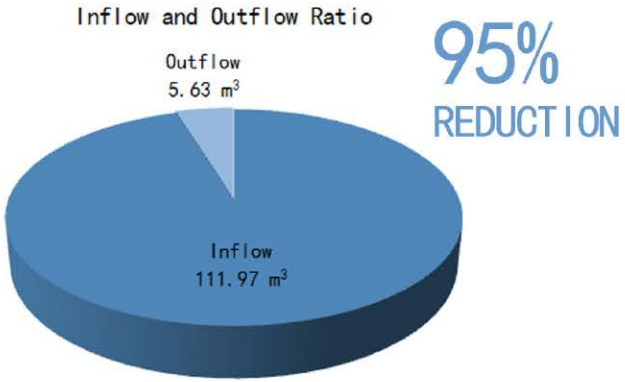
12 Aesthetics
Resilient landscape changed people's general stereotypes that GSI does not look pretty.

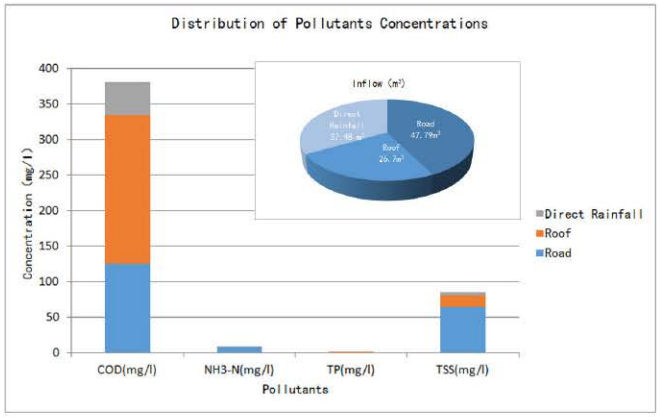
13 Climate Resilient
Plants selected for GSI are not only tolerate for humid and dry warm weather, but also for cold weather.

ACHIEVEMENT

14 Resilient for Extreme Weather Conditions
After the construction completion in 2015 the neighborhood was hit twice by large storms. One storm was 138 mm, another was 125 mm. But no standing water was found in the neighborhood.

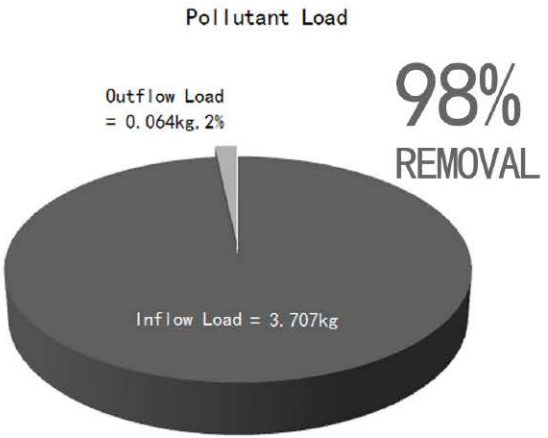
PERFORMANCE EVALUATION





Land Use Type	COD(mg/l)	NH_3-N(mg/l)	TP(mg/l)	TSS(mg/l)	Inflow (m^3)
Road	125.09	7.57	0.21	64.73	47.79
Roof	209.45	0.26	0.07	16.36	26.7
Direct Rainfall	46.27	0.25	0	4.73	37.48
Concentration	118.82	3.37	0.11	33.11	111.97

		Loading (kg)	Removal (%)
Concentration(mg/l)	33.11		
Inflow (m^3)	111.97	3.7073	0.9827
Outflow Concentration(mg/l)	11.36		
Outflow (m^3)	5.63	0.064	



15 Performance Evaluation

More than two years of continuous monitoring data showed that 95% of rainfall were detained onsite, and 98% of total pollutant load were removed by GSI.