



Figure S1. Return period and duration for rainstorm intensity frequency curves.

(From: Luohe city rainstorm intensity formula, Luohe City Municipal Engineering Design Institute 2014)

Table S1. Moran’s I spatial autocorrelation analysis of spatial metrics for 25 flooding circles.

Field	Number Observed	Morans I Index	Expected Index	Variance	z Score	p Value
PLAND_I1	25	-0.041104	-0.041667	0.003135	0.010056	0.991976
LSI_I1	25	-0.061030	-0.041667	0.002731	-0.370503	0.711008
CONNECT_I1	25	-0.033027	-0.041667	0.002788	0.163616	0.870034
MPS_I1	25	0.031355	-0.041667	0.002740	1.394982	0.163021
PLAND_I2	25	0.058073	-0.041667	0.002715	1.914151	0.055601
LSI_I2	25	0.042933	-0.041667	0.002761	1.610032	0.107391
CONNECT_I2	25	0.101679	-0.041667	0.002586	2.818938	0.004818
MPS_I2	25	0.042609	-0.041667	0.002036	1.867589	0.061819
PLAND_I3	14	-0.086460	-0.076923	0.003575	-0.159513	0.873265
LSI_I3	14	-0.029504	-0.076923	0.006263	0.599193	0.549044
CONNECT_I3	14	-0.093033	-0.076923	0.005389	-0.219453	0.826297
MPS_I3	14	-0.107747	-0.076923	0.001612	-0.767804	0.442603
PLAND_P1	25	0.027941	-0.041667	0.002420	1.414855	0.157111
LSI_P1	25	-0.042898	-0.041667	0.001925	-0.028054	0.977619
CONNECT_P1	25	-0.065771	-0.041667	0.002559	-0.476456	0.633749
MPS_P1	25	-0.000160	-0.041667	0.002507	0.828942	0.407137
PLAND_P2	6	-0.418868	-0.200000	0.051568	-0.963814	0.335139
LSI_P2	6	-0.422587	-0.200000	0.045204	-1.046920	0.295136
CONNECT_P2	6	-0.223308	-0.200000	0.028205	-0.138787	0.889619
MPS_P2	6	-0.387862	-0.200000	0.039631	-0.943672	0.345337
PLAND_P3	2	NA	NA	NA	NA	NA
LSI_P3	2	NA	NA	NA	NA	NA
CONNECT_P3	2	NA	NA	NA	NA	NA
MPS_P3	2	NA	NA	NA	NA	NA
PLAND_P4	13	-0.063596	-0.083333	0.007667	0.225416	0.821656
LSI_P4	13	0.042646	-0.083333	0.007900	1.417370	0.156375
CONNECT_P4	13	-0.077556	-0.083333	0.004828	0.083146	0.933735
MPS_P4	13	-0.099572	-0.083333	0.00678	-0.19721	0.843665

**Table S2.** Moran's I spatial autocorrelation analysis of spatial metrics for 25 dry circles.

Field	Number Observ	Morans I Index	Expected Index	Variance	z Score	p Value
PLAND_I1	24.00	-0.039702	-0.043478	0.0031	0.06786	0.9459
LSI_I1	24.00	-0.053397	-0.043478	0.00283	-0.1865	0.85209
CONNECT_I1	24.00	-0.006751	-0.043478	0.00299	0.67213	0.5015
MPS_I1	24.00	-0.022203	-0.043478	0.00282	0.40061	0.68871
PLAND_I2	23.00	-0.072253	-0.045455	0.00295	-0.4937	0.62154
LSI_I2	23.00	-0.043982	-0.045455	0.00286	0.02751	0.97805
CONNECT_I2	23.00	-0.015026	-0.045455	0.00297	0.55863	0.57641
MPS_I2	23.00	-0.01958	-0.045455	0.00213	0.56055	0.5751
PLAND_I3	10.00	-0.124753	-0.111111	0.00556	-0.183	0.85482
LSI_I3	10.00	-0.099544	-0.111111	0.01288	0.10194	0.9188
CONNECT_I3	10.00	-0.18617	-0.111111	0.01218	-0.6801	0.49644
MPS_I3	10.00	0.083655	-0.111111	0.01054	1.89708	0.05782
PLAND_P1	22.00	-0.078035	-0.047619	0.00339	-0.5226	0.60126
LSI_P1	22.00	-0.103132	-0.047619	0.00286	-1.0374	0.29954
CONNECT_P1	22.00	-0.06381	-0.047619	0.0023	-0.3375	0.73575
MPS_P1	22.00	-0.069279	-0.047619	0.00299	-0.3958	0.69223
PLAND_P2	6.00	-0.178439	-0.2	0.05964	0.08829	0.92965
LSI_P2	6.00	-0.345659	-0.2	0.06273	-0.5816	0.56084
CONNECT_P2	6.00	-0.094864	-0.2	0.01026	1.0379	0.29932
MPS_P2	6.00	-0.120479	-0.2	0.05957	0.32581	0.74457
PLAND_P3	6.00	0.024308	-0.2	0.05917	0.9221	0.35647
LSI_P3	6.00	-0.455792	-0.2	0.0768	-0.923	0.356
CONNECT_P3	6.00	-0.455046	-0.2	0.06638	-0.9899	0.3222
MPS_P3	6.00	-0.269821	-0.2	0.06516	-0.2735	0.78445
PLAND_P4	12.00	-0.135553	-0.090909	0.01274	-0.3955	0.69248
LSI_P4	12.00	-0.17126	-0.090909	0.01276	-0.7112	0.47695
CONNECT_P4	12.00	-0.092585	-0.090909	0.01145	-0.0157	0.98751
MPS_P4	12.00	-0.185364	-0.090909	0.01261	-0.8412	0.40022

**Table S3.** Composite curve number metrics for flooded and dry circles.

Rainfall event return interval (years)	Rainfall (mm)	Curve Number	Retention term (as 0.2S)	Retention term (as 0.05S)	Runoff depth (cm)	Runoff ratio	Land use
20	65	49	10.41	19.67	0.30	0.05	open space
50	75	49	10.41	19.67	0.46	0.06	
100	82	49	10.41	19.67	0.58	0.07	
max	93	49	10.41	19.67	0.81	0.09	
20	65	68	4.71	7.90	1.18	0.18	cultivated land
50	75	68	4.71	7.90	1.59	0.21	
100	82	68	4.71	7.90	1.90	0.23	
max	93	68	4.71	7.90	2.43	0.26	
20	65	77	2.99	4.68	1.96	0.30	Bare soil, construction site
50	75	77	2.99	4.68	2.54	0.34	
100	82	77	2.99	4.68	2.97	0.36	
max	93	77	2.99	4.68	3.68	0.40	
20	65	70	4.29	7.09	1.33	0.20	Composite CN representing "green space"
50	75	70	4.29	7.09	1.77	0.24	
100	82	70	4.29	7.09	2.11	0.26	
max	93	70	4.29	7.09	2.67	0.29	
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DRY CIRCLES	AWCN=74						
20	65	74	3.51	5.64	1.66	0.26	
50	75	74	3.51	5.64	2.18	0.29	
100	82	74	3.51	5.64	2.57	0.31	
max	93	74	3.51	5.64	3.22	0.35	

FLOODED CIRCLES	AWCN=87						
20	65	87	1.49	2.11	3.35	0.52	
50	75	87	1.49	2.11	4.15	0.55	
100	82	87	1.49	2.11	4.73	0.58	
max	93	87	1.49	2.11	5.67	0.61	