



Supplementary Materials

Table S1. Results of Simulated Scenarios in RECARCA for Location 1

Scenarios	Modelling results for stay on (%)				Modelling results for recharge (%)				Ponding duration results (h)				Number of overflows				Evapotranspiration (%)			
	Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period	
	2-yr	10-yr	100-yr	12.2 cm	2-yr	10-yr	100-yr	12.2 cm	2-yr	10-yr	100-yr	12.2 cm	2-yr	10-yr	100-yr	12.2 cm	2-yr	10-yr	100-yr	12.2 cm
SC 1	63.08	43.80	32.80	29.78	39.30	23.60	15.77	13.8	38.25	41.25	43.5	44.25	1	1	1	1	0.016	0.01	0.01	0.01
SC 2	64.65	44.65	33.36	30.3	41.09	24.55	16.41	14.39	95.29	64.14	46.36	41.72	1	1	1	1	0.058	0.01	0.01	0.01
SC 3	70.65	48.11	35.62	32.29	45.52	27.16	18.08	15.86	46	48.75	51	52	1	1	1	1	0.010	0.01	0.00	0.00
5% of CDA	73.01	49.45	36.45	33.03	48.33	28.65	19.02	16.89	45.5	48	50.25	51.25	1	1	1	1	0.010	0.01	0.00	0.00
SC 5	64.96	44.85	33.44	30.4	42.84	25.6	17.04	14.96	37	39.75	42.25	43	1	1	1	1	0.016	0.009	0.006	0.001
SC 6	66.53	45.7	34	30.89	44.43	26.46	17.6	15.46	36.75	39.25	41.5	42.5	1	1	1	1	0.017	0.001	0.008	0.005
SC 7	68.91	47.03	34.84	31.63	46.56	27.65	18.35	16.09	36.75	38.75	41	42	1	1	1	1	0.016	0.001	0.006	0.001
SC 8	68.06	46.6	34.56	31.38	46.08	27.44	18.18	16	37	39.25	41.5	42.25	0	1	1	1	0.016	0.009	0.001	0.005
SC 1	92.39	62.28	45.25	40.73	72.12	44.27	29.83	26.2	35.75	38.75	41.25	42	0	1	1	1	0.013	0.017	0.011	0.010
SC 2	95.29	64.14	46.36	41.72	75.53	46.38	31.08	27.31	35.75	38.25	40.25	41.25	0	1	1	1	0.032	0.015	0.011	0.009
SC 3	100	70.76	50.69	45.51	79.32	51.27	34.34	30.16	39.25	46.25	48.5	49.5	0	1	1	1	0.028	0.011	0.007	0.006
SC 4	100	73.17	52.22	46.85	82.95	54.18	36.11	31.67	35.5	45.75	47.75	48.5	0	1	1	1	0.032	0.011	0.007	0.006
10% of CDA	95.89	64.24	46.47	41.82	78.96	48.07	32.24	28.33	35.25	37.5	39.5	40.25	0	1	1	1	0.033	0.018	0.012	0.010
SC 6	98.81	68.39	49.06	44.15	83.64	51.96	34.73	30.51	34.75	37	39	39.75	0	1	1	1	0.033	0.018	0.012	0.010
SC 7	98.81	68.39	49.06	44.15	83.64	51.96	34.73	30.51	31.5	36.75	38.25	39	0	1	1	1	0.037	0.018	0.012	0.010
SC 8	86.9	67.4	48.52	43.67	74.88	51.45	34.38	30.29	24.25	37	38.5	39.25	0	0	1	1	0.047	0.018	0.002	0.011
SC 1	100	78.49	56.34	50.57	84.98	62.55	42.39	37.37	26	37.25	39.25	40.25	0	0	1	1	0.064	0.003	0.016	0.014
SC 2	100	80.72	57.91	51.86	87.01	65.14	44.18	38.85	23.25	37	38.75	39.5	0	0	1	1	0.069	0.026	0.016	0.014
SC 3	100	90.22	64.12	57.29	87.01	72.33	48.83	43	23.25	45.25	47	47.75	0	1	1	1	0.069	0.016	0.010	0.009
SC 4	100	94.84	66.36	59.24	93.27	76.68	51.46	45.19	19.75	45	46.25	46.75	0	1	1	1	0.075	0.016	0.010	0.009
15% of CDA	88.36	84.32	60.97	54.65	88.33	71.95	48.96	43.08	12.25	35.25	37.5	37.75	0	0	1	1	0.072	0.026	0.017	0.015
SC 6	98.86	83.47	59.62	53.35	92.29	70.28	47.41	41.67	12.25	35.25	37.5	37.75	0	0	1	1	0.076	0.026	0.017	0.015
SC 7	99.04	87	61.79	55.35	96.41	73.58	49.44	43.53	15.75	36	37.25	37.5	0	0	1	1	0.082	0.026	0.017	0.015
SC 8	89.36	84.32	60.97	54.65	88.33	71.95	48.96	43.08	12.25	35.25	37.5	37.75	0	0	1	1	0.089	0.027	0.017	0.014

Table S2. Results of Simulated Scenarios in RECARGA for Location 2

Scenarios	Modelling results for stay on (%)				Modelling results for recharge (%)				Ponding duration results (h)				Number of overflows				Evapotranspiration (%)			
	Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period			
	2-yr	10-yr	100-yr	12.2 cm	2-yr	10-yr	100-yr	12.2 cm	2-yr	10-yr	100-yr	12.2 cm	2-yr	10-yr	100-yr	12.2 cm	2-yr	10-yr	100-yr	12.2 cm
SC 1	63.23	42.55	30.48	27.36	50.71	32.38	22.12	19.55	24.5	28.5	30.75	31.5	0	1	1	1	0.026	0.014	0.009	0.008
SC 2	64.5	43.32	31.11	27.89	64.5	43.32	31.11	27.89	24	27.75	30	31	0	0	1	1	0.026	0.014	0.009	0.008
SC 3	70.5	46.79	33.38	29.87	58.35	36.81	25.14	22.17	28	31.75	34	35	0	0	1	1	0.023	0.013	0.008	0.007
5% of CDA	72.36	47.72	33.87	30.41	27.64	38.74	26.29	23.29	27.5	31.25	33.5	34.5	0	1	1	1	0.023	0.013	0.008	0.007
SC 5	64.63	48.47	31.08	27.93	54.17	34.47	23.48	20.79	23.5	27.5	30	30.75	0	1	1	1	0.026	0.014	0.009	0.008
SC 6	66.02	44.11	31.51	28.35	56.11	35.41	24.11	21.38	23.5	27	29.5	30.25	0	1	1	1	0.026	0.014	0.009	0.008
SC 7	68.14	45.25	32.25	28.96	59.34	37.17	25.26	22.34	23.5	26.5	29	29.75	0	1	1	1	0.026	0.014	0.009	0.008
SC 8	67.25	45.54	32.5	29.17	58.54	37.44	25.47	22.53	23.25	27	29.75	30.5	0	0	1	1	0.026	0.014	0.009	0.008
SC 1	92.75	64.94	47.89	47.8	84.72	57.35	41.24	36.51	20.5	24.5	27.75	29	0	0	0	1	0.053	0.028	0.018	0.014
SC 2	95.18	66.53	48.61	43.57	88.59	59.73	42.45	37.72	20.25	23.75	27	28.25	0	0	0	1	0.053	0.028	0.018	0.023
SC 3	100	73.15	52.94	47.36	93.17	65.69	46.53	41.28	21.75	27.75	31	32.25	0	0	0	1	0.051	0.025	0.016	0.002
SC 4	100	74.59	53.95	48.22	97.07	69.4	48.8	43.24	20.5	27.5	30.5	31.5	0	0	0	1	0.052	0.025	0.016	0.020
10% of CDA	78.87	56.22	42.77	38.97	75.7	51.43	37.89	34.21	14.5	18	21.75	23	0	0	0	0	0.060	0.033	0.020	0.018
SC 6	79.39	57.29	43.41	39.47	77.66	53.24	38.99	35.1	14	17.5	21.25	22.5	0	0	0	0	0.061	0.033	0.020	0.018
SC 7	81.24	59.07	44.64	40.52	82.38	56.47	41.13	36.94	13	17.5	20.75	22	0	0	0	0	0.062	0.033	0.020	0.018
SC 8	83.68	66.96	49.69	44.85	86.97	63.74	45.75	40.9	14.5	22.25	25.25	26.5	0	0	0	0	0.060	0.029	0.018	0.016
SC 1	100	81.2	61.18	55.44	96.66	76.09	56.16	50.57	14.5	21.75	25	26.5	0	0	0	0	0.086	0.043	0.026	0.023
SC 2	100	82.85	62.06	56.54	99.17	78.92	57.76	52.29	13.25	21.5	24.5	25.5	0	0	0	0	0.009	0.025	0.026	0.002
SC 3	100	92.35	68.27	61.97	99.17	87.92	63.63	57.42	13.25	25.5	28.5	29.5	0	0	0	0	0.009	0.038	0.024	0.020
SC 4	100	94.72	69.92	63.07	105.2	93.19	67.17	60.11	11.75	25.5	28	29	0	0	0	0	0.090	0.038	0.024	0.020
15% of CDA	83.01	69.91	53.04	48.55	86.71	69.91	53.04	48.55	8.25	15.75	18.5	19.75	0	0	0	0	0.090	0.049	0.031	0.026
SC 6	83.84	69.97	53.77	49.16	89.78	69.97	53.77	49.16	7.5	15.75	18.25	19.25	0	0	0	0	0.090	0.049	0.031	0.026
SC 7	86.89	73.26	55.27	50.55	97.11	73.26	55.27	50.55	5.25	15.75	18	19	0	0	0	0	0.090	0.049	0.031	0.026
SC 8	90.01	83.92	62.65	56.99	100.1	83.92	62.65	56.99	6.25	20	22.5	23.5	0	0	0	0	0.090	0.004	0.027	0.023

Table S3. Results of Simulated Scenarios in RECARGA for Location 3

Scenarios	Modelling results for stay on (%)				Modelling results for recharge (%)				Ponding duration results (h)				Number of overflows				Evapotranspiration (%)			
	Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period		Rainfall depth-return period	
	2-yr	10-yr	100-yr	12.2 cm	2-yr	10-yr	100-yr	12.2 cm	2-yr	10-yr	100-yr	12.2 cm	2-yr	10-yr	100-yr	12.2 cm	2-yr	10-yr	100-yr	12.2 cm
SC 1	91.1	70.76	56.61	52.55	38.4	23.31	15.65	13.79	36.75	39.25	42	42.75	0	1	1	1	0.016	0.009	0.006	0.005
SC 2	92.72	71.73	57.26	53.02	40.25	24.4	16.31	14.33	36.5	38.5	41.25	42	0	1	1	1	0.016	0.009	0.006	0.005
SC 3	98.69	75.11	59.54	54.99	40.25	26.97	18.04	15.79	44.75	47	49.25	50	0	1	1	1	0.011	0.006	0.004	0.003
5% of CDA	100	76.42	60.34	55.75	47.15	28.43	18.92	16.42	43.25	46.25	48.25	49	0	1	1	1	0.012	0.006	0.004	0.003
SC 5	92.91	71.8	57.37	53.1	41.91	25.31	16.96	14.9	36	38	40	41.25	0	1	1	1	0.017	0.009	0.006	0.005
SC 6	94.45	72.67	57.88	53.6	43.5	26.19	17.48	15.4	36	37.5	39.5	40.25	0	1	1	1	0.017	0.001	0.006	0.005
SC 7	96.89	73.97	58.72	54.29	45.89	27.4	18.22	16	36	37.25	38.75	39.5	0	1	1	1	0.017	0.009	0.006	0.005
SC 8	91.58	73.54	58.45	54.06	42.34	27.13	18.1	15.9	30	37.5	39.25	40	0	1	1	1	0.021	0.009	0.006	0.005
SC 1	100	87.49	67.76	62.23	54.04	43.51	29.43	25.97	15.5	45.25	46	46.25	0	0	1	1	0.050	0.018	0.001	0.010
SC 2	100	89.08	68.87	63.13	55.58	45.35	30.69	26.96	19.25	37	38.25	39	0	0	1	1	0.053	0.018	0.011	0.010
SC 3	100	95.7	73.2	66.92	55.59	50.39	33.99	29.84	19.25	45.25	46.5	47.25	0	0	1	1	0.053	0.001	0.007	0.006
10% of CDA	100	98.24	74.79	68.36	60.11	53.23	35.77	31.46	15.5	45.25	46	46.25	0	0	1	1	0.058	0.011	0.007	0.006
SC 5	99.33	89.37	68.99	63.32	58.08	47.23	31.86	28.09	18	36.25	37.5	38	0	0	1	1	0.055	0.018	0.002	0.010
SC 6	92.47	84.45	66.25	60.92	53.47	43.81	30.02	26.48	11.75	29.5	31.25	31.75	0	0	1	1	0.063	0.023	0.015	0.013
SC 7	99.46	93.49	71.59	65.57	62.55	51.27	34.35	30.26	11.5	36.25	37	37.25	0	0	0	1	0.062	0.018	0.012	0.010
SC 8	94.04	89.78	71.05	65.11	57.98	48.88	34.01	29.99	7.75	33	37.25	37.5	0	0	1	1	0.063	0.021	0.012	0.010
SC 1	100	100	77.51	70.76	60.44	59.46	41.66	36.77	12.75	35	37.5	38.25	0	0	1	1	0.068	0.028	0.017	0.014
SC 2	100	100	79.16	72.22	63.05	60.33	43.53	38.42	9.5	32.5	37.25	37.75	0	0	1	1	0.090	0.030	0.017	0.014
SC 3	100	100	85.31	77.63	63.05	60.35	48.10	42.49	9.25	32.5	45.4	46	0	0	1	1	0.090	0.030	0.011	0.009
15% of CDA	100	100	87.58	79.58	69.95	63.61	50.8	44.74	1	29.25	45.25	45.75	0	0	1	1	0.090	0.033	0.011	0.009
SC 5	99.44	99.08	79.28	72.32	67.04	61.98	45.14	39.83	7	31	36.75	37	0	0	1	1	0.009	0.032	0.017	0.015
SC 6	99.48	99.09	80.85	73.68	69.49	62.88	46.73	41.22	0.75	28.5	36.5	37	0	0	1	1	0.090	0.034	0.017	0.015
SC 7	99.7	99.19	80.85	75.55	74.36	64.74	48.62	42.95	0	25.25	36.5	37	0	0	1	1	0.090	0.038	0.017	0.015
SC 8	97.26	90.98	81.98	74.85	72.19	58.3	48.17	42.55	0	19.5	36.5	37.25	0	0	0	0	0.090	0.044	0.017	0.014

Table S4. Results of Simulated Scenarios in RECARCA for Location 4

Scenarios	Modelling results for stay on (%)			Modelling results for recharge (%)			Ponding duration results (h)			Number of overflows			Evapotranspiration (%)								
	Rainfall depth-return period			Rainfall depth-return period			Rainfall depth-return period			Rainfall depth-return period			Rainfall depth-return period								
	2-yr	10-yr	100-yr	12.2 cm	2-yr	10-yr	100-yr	12.2 cm	2-yr	10-yr	100-yr	12.2 cm	2-yr	10-yr	100-yr	12.2 cm					
SC 1	100	82.58	65.24	59.66	63.8	48.65	35.49	31.48	16.5	23	26.25	27.5	0	0	0	1	0.051	0.025	0.016	0.014	
SC 2	100	83.6	65.75	60.2	65.27	50.36	36.42	32.4	15.25	22.75	25.75	26.75	0	0	0	1	0.052	0.025	0.016	0.014	
SC 3	100	89.39	69.54	63.51	65.27	55.84	39.4	35.52	15.25	26.5	29.75	30.75	0	0	0	1	0.052	0.023	0.014	0.012	
5% of CDA	SC 4	100	90.77	70.55	64.37	68.92	42.11	37.34	14	26.5	29.25	30	0	0	0	1	0.053	0.023	0.014	0.012	
	SC 5	87.66	74.68	60.62	56.2	55.8	43.2	32.42	29.36	9.75	16.75	20.5	21.75	0	0	0	1	0.055	0.029	0.018	0.015
	SC 6	88.07	75.53	61.2	56.66	57.58	44.71	33.4	30.17	9	16.75	20	21.25	0	0	0	0	0.055	0.029	0.018	0.015
	SC 7	90.35	77.23	35.16	57.55	52.46	47.7	35.16	31.74	7	16.75	19.5	20.75	0	0	0	0	0.055	0.029	0.018	0.015
	SC 8	92.65	84.1	39.23	61.34	64.65	54.03	39.23	35.2	8	21.25	24	25.25	0	0	0	0	0.055	0.026	0.016	0.014
	SC 1	100	100	83.73	77.3	73.98	72.44	58.48	53.19	5.5	17.5	22.25	23.25	0	0	0	0	0.102	0.053	0.031	0.027
	SC 2	100	100	22.25	23	77.03	74	60.41	55.07	3.5	16.25	22.25	23	0	0	0	0	0.010	0.054	0.031	0.003
	SC 3	100	100	91.84	84.6	77.03	74	67.06	60.88	3.5	16.25	26.25	27	0	0	0	0	0.010	0.054	0.028	0.024
10% of CDA	SC 4	100	100	93.55	85.89	84.11	77.85	70.9	64	0.75	15	26	27	0	0	0	0	0.102	0.056	0.028	0.024
	SC 5	93.73	85.3	74.04	69.03	75.19	62.43	51.76	47.5	1.75	10.75	16.5	17.25	0	0	0	0	0.102	0.059	0.036	0.031
	SC 6	95.12	86.01	75.1	69.8	79.28	64.58	53.63	48.96	0.25	9.75	16.25	17.25	0	0	0	0	0.102	0.059	0.036	0.031
	SC 7	99.97	87.94	77.29	71.59	89.08	69.27	57.39	52.11	0	8.5	16.25	17.25	0	0	0	0	0.102	0.059	0.036	0.031
	SC 8	99.97	90.8	85.62	78.9	89.08	71.97	65.07	58.84	0	10	20.75	21.75	0	0	0	0	0.102	0.059	0.032	0.027
	SC 1	100	100	96.61	89.26	85.55	78.39	75.32	68.72	1.5	11.25	20.5	21.5	0	0	0	0	0.142	0.082	0.045	0.039
	SC 2	100	100	98.39	90.8	86.91	80.74	78.32	71.32	0	9.75	20.5	21.25	0	0	0	0	0.142	0.082	0.045	0.039
	SC 3	100	100	100	99.37	86.91	80.74	79.86	79.45	0	9.75	21	25.25	0	0	0	0	0.142	0.082	0.045	0.035
15% of CDA	SC 4	100	100	100	100	96.86	86.39	83.24	82.83	0	7.5	19.5	24.25	0	0	0	0	0.142	0.082	0.046	0.035
	SC 5	99	88.8	82.68	77.63	91.99	73.4	65.62	60.73	0	5.75	14.25	15.5	0	0	0	0	0.142	0.082	0.052	0.082
	SC 6	100	89.48	83	79.3	96.8	76.18	67.2	63.41	0	4.5	13.25	15.5	0	0	0	0	0.142	0.082	0.053	0.044
	SC 7	100	92.43	84.39	81.93	103.8	83.06	71.04	73.34	0	3	12.5	15.5	0	0	0	0	0.142	0.082	0.054	0.044
	SC 8	100	94.15	88.5	87.21	103.8	84.73	74.86	72.87	0	3.5	14	17.75	0	0	0	0	0.142	0.082	0.082	0.042

Table S5. Average Increase of Stay-on, Recharge and ET for Larger Sized Simulated Bioretention Systems in RECARGA (10% and 15% of CDA relative to 5% of CDA*)

Location	Stay-on (%)			Recharge (%)			Evapotranspiration -ET (%)		
	Without an underdrain			Without an underdrain			Without an underdrain		
	5% of CDA	10% of CDA	15% of CDA	5% of CDA	10% of CDA	15% of CDA	5% of CDA	10% of CDA	15% of CDA
L1	45.06	> 42.50	< 45.06	25.51	> 84.42	> 140.14	0.010	> 43.19	> 174.60
L2	43.46	> 52.08	< 43.46	32.043	> 85.97	> 134.34	0.013	> 104.94	> 133.22
L3	70.41	> 16.79	< 70.41	24.90	> 66.14	> 112.53	0.008	> 165.82	> 379.45
L4	79.072	> 16.99	< 79.072	47.95	> 43.42	> 69.66	0.026	> 53.21	> 195.80
	With an underdrain			With an underdrain			With an underdrain		
L1	44.61	> 41.54	> 65.03	26.29	> 83.95	> 140.47	0.007	> 157.86	> 372.67
L2	43.20	> 31.23	> 54.91	34.87	> 53.89	> 97.28	0.014	> 126.79	> 219.61
L3	69.70	> 14.35	> 25.85	25.79	> 61.96	> 114.77	0.009	> 180.27	> 281.09
L4	68.64	> 22.03	> 30.07	42.92	> 50.89	> 83.88	0.029	> 92.04	> 191.49

*Contributing drainage area

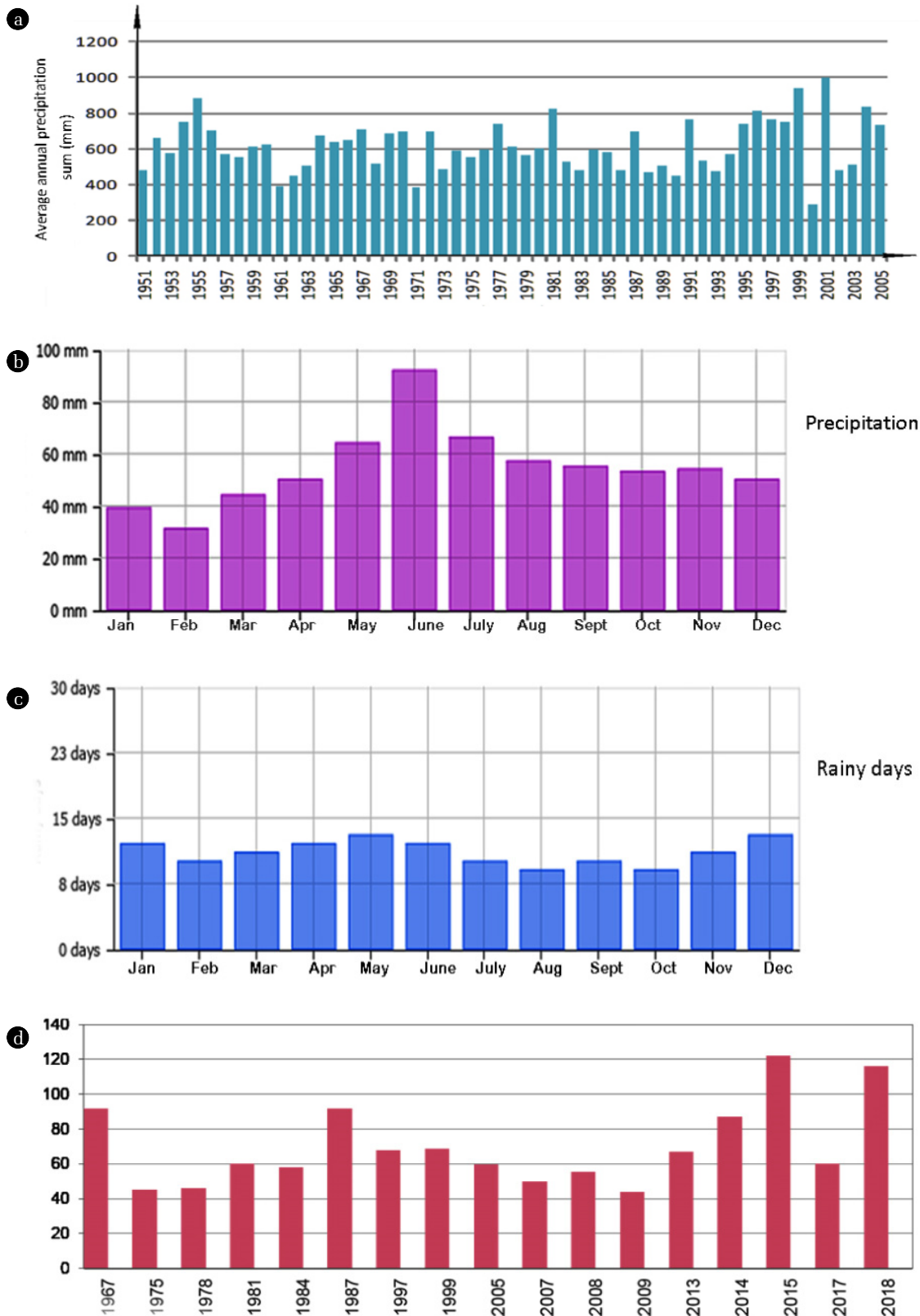


Fig. S1. Data about precipitation. (a) Annual precipitation for the period 1951-2005 year (b) Average precipitation (rain/snow) (c) Average rainy days (rain/snow) (d) The highest recorded 24-h rainfall depths (period of 1967-2018).

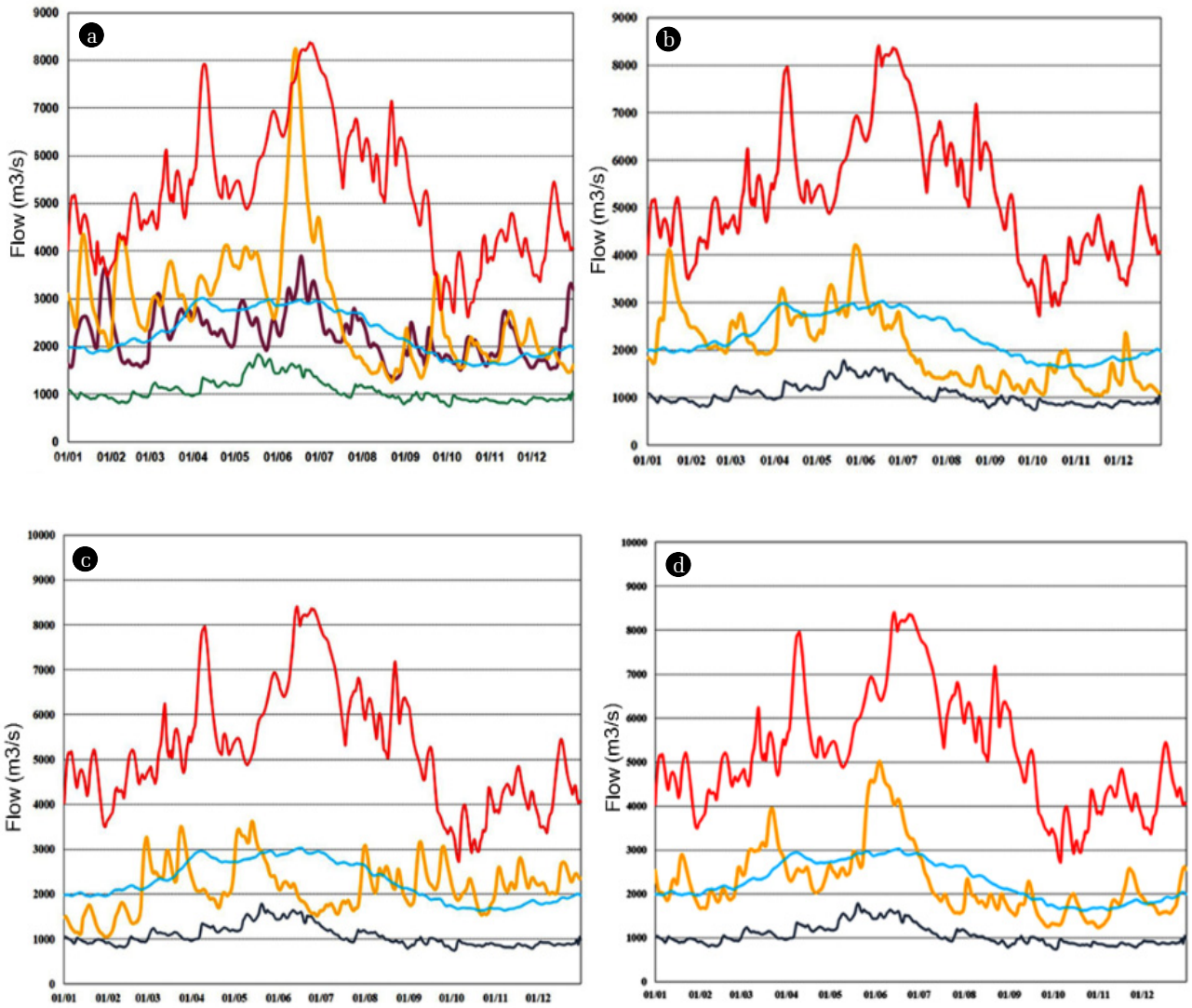


Fig. S2. Annual standard hydrograph. (a) 2012/2013 year (b) 2015 year (c) 2017 year (d) 2019 year.