

Supplementary material for

**Balancing Flood Control and Economic Development in Flood**

**Detention Areas of the Yangtze River Basin**

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**Details**

**Table S1.** The flood detention areas.

Flood Detention Areas	Area(km <sup>2</sup> )	Grade(4:key FDA, 3:important FDA, 2:general FDA, 1:reserve FDA)	Storage capacity(billion m <sup>3</sup> )	Utilizations status(activation times,from 1954 to 2020)	Inundation loss(10000CNY/km <sup>2</sup> , based on the economic level of 2020)

Jingjiang	922.1	4	54.09	5	99.53788907
Yuanshi	95.2	2	2.57	0	96.76206502
Renmindayuan	354.9	2	11.8	0	92.71483646
Huxi	88.8	2	3.81	1	84.82584915
Weidihu	34.6	3	2.22	2	89.9421844
Liujaoshan	29.6	1	0.61	0	92.04530947
Jiuyuan	56.8	2	3.82	0	86.54585479
Xiguan	73.8	3	4.76	2	90.36150455
Anli	136.5	1	9.42	0	87.34919351
Li'nan	38.3	3	2.21	2	101.7956627
Anchang	118.6	1	7.23	0	85.8450386
Anhua	87.2	1	4.72	0	87.38477034
Nanding	46.6	1	2.2	0	85.44635973
Hekang	96.6	1	6.16	0	85.47638723
Nanhan	97.7	1	6.15	0	87.7726865
Minzhu	213	3	11.96	1	92.13130895
Gongshuangcha	283.6	3	15.04	1	92.56779706
Chengxi	110	3	7.92	0	103.5121913
Beihu	24.7	1	1.91	0	97.3262915
Yihe	9.6	1	0.79	0	97.99435201
Quyuan	213.8	2	12.45	0	114.261591
Jicheng'anhe	131.3	1	6.26	0	85.85071088
Qianlianghu	506	3	23.78	1	94.37569576
Jianshe	63.7	3	3.54	0	92.42012811
Jianxin	45.8	2	1.56	0	98.4583719
Junshan	91.2	1	4.69	0	126.5245465
Datonghudong	217	3	11.67	1	88.21018468
Jiangnanlucheng	360.1	2	10.48	0	103.4198442
Honghu west	866.3	1	49.75	0	96.59955276
Honghu middle	1036.2	2	67.23	0	114.7290661
Honghu east	886.6	3	62.42	0	99.42263676
Xilianghu	1110.9	2	45.01	0	106.5910534
Dongxihu	460.5	1	21.99	0	172.9954332
Wuhu	301.7	2	14.99	0	128.1776273
Zhangduhu	435.8	2	18.17	0	106.496108
Baitanhu	231.3	2	6.88	0	178.0486157
Dujiatai	668.8	3	22.9	20	108.7272198
Kangshan	324.5	3	15.01	1	106.900452
Zhuhu	223.3	2	4.63	0	113.3855888
Huanghu	49.8	2	2.87	0	87.81020707
Fangzhouxietang	36.2	2	2.01	0	93.04095148
Huayanghe	1602.9	2	25.03	0	112.4333347

**Table S2.** The changes of proportion of impervious.

Comparsion Areas	1995	2000	2005	2010	2015	2020
UA	0.018052355	0.022281099	0.025385086	0.030903207	0.037199669	0.042681211
FDA	0.015892313	0.021097957	0.024542408	0.029734828	0.037302199	0.044451114
wuhan	0.045603025	0.061353258	0.075210942	0.100267632	0.119912076	0.137477615
wuhan_FDA	0.017710345	0.026408584	0.033767551	0.046780035	0.061298354	0.075929364
jingzhou	0.016698434	0.02153753	0.026024563	0.030168413	0.036070811	0.042947558
jingzhou_FDA	0.013225668	0.01644343	0.018756339	0.021640522	0.027441094	0.033328399
nanchang	0.046184307	0.054059141	0.064986368	0.077950858	0.091476257	0.103091545
nanchang_FDA	0.020474558	0.022024604	0.024551527	0.027841013	0.030741742	0.033926562
nation	0.013581413	0.015907381	0.017999045	0.020876499	0.023954936	0.026300827

**Table S3.** The growth rate of impervious.

Comparsion Areas	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
UA	0.234248873	0.139310322	0.217376498	0.20374784	0.147354586
FDA	0.327557381	0.163259917	0.211569308	0.254495216	0.191648599
wuhan	0.345376944	0.225867134	0.333152188	0.19592009	0.146486821
wuhan_FDA	0.491138868	0.278658152	0.385354688	0.310352885	0.238685189
jingzhou	0.289793425	0.208335574	0.159228407	0.195648279	0.19064575
jingzhou_FDA	0.243296715	0.140658558	0.153771109	0.268042109	0.214543393
nanchang	0.170508878	0.20213468	0.199495532	0.173511873	0.126975981
nanchang_FDA	0.07570594	0.11473184	0.133982948	0.104189044	0.103599222
nation	0.171261136	0.131490147	0.15986704	0.147459425	0.097929357

**Table S4.** The changes in GDP per unit area in nine comparative regions from 1995 to 2020, measured in ten thousand yuan per square kilometer.

Comparsion Areas	1995	2000	2005	2010	2015	2020
UA	389.5606764	490.0389008	747.3780943	1093.867027	1430.276184	1558.435297
FDA	434.2527665	548.8627368	804.0514428	1200.032459	1584.831486	1733.926511
wuhan	2361.960971	2988.316924	4483.272828	6658.566498	8621.338251	9421.313395
wuhan_FDA	1146.182431	1457.11322	2139.538696	3285.247212	4314.977915	4735.214436
jingzhou	315.2761946	392.3518289	548.762573	779.9398973	1024.638574	1115.163594
jingzhou_FDA	211.8649872	259.3962782	370.5915879	530.0771293	633.0395603	689.897411
nanchang	969.0874887	1203.556942	2118.478485	3065.029919	3857.399056	4217.442276
nanchang_FDA	78.09670989	92.15602723	122.553109	165.7242725	200.4540075	216.1054329
nation	337.5663183	420.9723539	610.809514	891.0005813	1122.985709	1219.223172

**Table S5.** The changes in GDP growth rate in nine comparative regions from 1995 to 2020

Comparsion Areas	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
UA	0.25792702	0.525140337	0.463605952	0.30754118	0.089604451
FDA	0.26392456	0.464940848	0.492482191	0.320657182	0.094076264
wuhan	0.265184718	0.500266853	0.485202162	0.294773921	0.092790135

wuhan_FDA	0.27127513	0.468340735	0.535493244	0.313440858	0.09739019
jingzhou	0.2444702	0.398649203	0.42127021	0.313740428	0.088348245
jingzhou_FDA	0.224347079	0.428669642	0.430353917	0.19424047	0.089817216
nanchang	0.241948695	0.760181352	0.446807197	0.258519218	0.093338339
nanchang_FDA	0.180024451	0.329843665	0.352264939	0.209563358	0.078079882
nation	0.247080443	0.450949233	0.458720863	0.260364732	0.085697852

**Table S6.** The comparison of flood control value distribution of FDA in YRB.

FDA_NO	1995yr.	2000yr.	2005yr.	2010yr.	2015yr.	2020yr.	change rate(1995-2020)
1	0.061679384	0.061651985	0.061615773	0.061614106	0.061559294	0.061517142	-0.002630412
2	0.012649908	0.012582972	0.012421819	0.012392716	0.012214324	0.012060192	-0.046618201
3	0.013942034	0.013868538	0.013801736	0.013794843	0.013640101	0.013532675	-0.029361488
4	0.024310487	0.024275866	0.02425444	0.024245113	0.024232319	0.024226326	-0.003461942
5	0.043891963	0.04396043	0.043955505	0.043916905	0.04387124	0.043854847	-0.000845624
6	0.011899986	0.011759153	0.01169549	0.011699866	0.011601434	0.011687271	-0.017875254
7	0.018920027	0.018747658	0.018633939	0.018649955	0.018634848	0.018804279	-0.006117742
8	0.044118032	0.044052996	0.043929372	0.043913024	0.043897241	0.043907588	-0.004770012
9	0.0174793	0.017329883	0.017259391	0.017221826	0.017190311	0.017228359	-0.014356467
10	0.04358129	0.043434921	0.043296648	0.043286886	0.043262508	0.043254266	-0.007503786
11	0.016358021	0.016206606	0.016139849	0.016098994	0.016078372	0.016140281	-0.013310862
12	0.015295711	0.015098677	0.0149965	0.014969678	0.014988607	0.015107291	-0.012318484
13	0.014465804	0.014364295	0.014334108	0.014319001	0.0143165	0.014381747	-0.005810766
14	0.016706361	0.016645773	0.016624832	0.016611923	0.016584882	0.016622882	-0.004996786
15	0.0164261	0.016360397	0.016318076	0.0163343	0.016299478	0.016302097	-0.007549096
16	0.029781003	0.029712283	0.029716911	0.029762189	0.029724963	0.029713718	-0.00225932
17	0.03227546	0.03224433	0.032249532	0.032243318	0.032235516	0.03224216	-0.001031733
18	0.024269055	0.024151393	0.024119436	0.024162621	0.023995747	0.023927645	-0.014067717
19	0.019020683	0.018854896	0.018836707	0.019062688	0.01879769	0.018867286	-0.008064742
20	0.019838791	0.019705967	0.019687815	0.019626774	0.019596996	0.019613561	-0.011353018
21	0.018107287	0.017873632	0.017808047	0.01765602	0.017541487	0.017351759	-0.041725084
22	0.014677042	0.014586868	0.014587174	0.014638027	0.014584594	0.014562521	-0.007802668
23	0.032141771	0.032104614	0.032100769	0.032089711	0.032068798	0.032048363	-0.002906141
24	0.023052692	0.022949843	0.022933861	0.022924052	0.022910279	0.022884213	-0.007308461
25	0.015920161	0.015851917	0.015866725	0.015838628	0.015769232	0.015718299	-0.012679663
26	0.015507003	0.015152469	0.015069967	0.014898096	0.014556234	0.014242179	-0.081564742
27	0.032612821	0.032605005	0.032613697	0.032613382	0.032589994	0.032582663	-0.00092473
28	0.017316156	0.017079932	0.01703692	0.016994161	0.016919872	0.016953294	-0.020955075
29	0.015629427	0.015495785	0.01531856	0.015141292	0.015094425	0.015086703	-0.034724483
30	0.018425068	0.018286196	0.018181551	0.018013	0.017987576	0.018039479	-0.020927404
31	0.026453102	0.026303563	0.026298242	0.026119177	0.02610731	0.026120522	-0.012572418
32	0.020427664	0.020330291	0.020307575	0.02019173	0.020104443	0.020080685	-0.016985755
33	0.018407267	0.017971325	0.017582905	0.0171117146	0.016853467	0.016719587	-0.091685499
34	0.021779975	0.021549275	0.021440461	0.021196292	0.020928518	0.020770881	-0.046331279

35	0.022250186	0.02207182	0.022010202	0.021874313	0.021784826	0.021769603	-0.02159904
36	0.020733903	0.02035295	0.020229352	0.019998723	0.019756595	0.019733603	-0.048244655
37	0.087194985	0.08716303	0.087159341	0.087116494	0.087067546	0.087027686	-0.001918671
38	0.038488452	0.038537986	0.0385084	0.038501102	0.038455006	0.038431536	-0.001478784
39	0.029668046	0.029660193	0.029651267	0.029566134	0.029464284	0.029432524	-0.007938571
40	0.029377265	0.029379137	0.02930265	0.029227625	0.02922909	0.029230342	-0.005001259
41	0.028900559	0.028871339	0.028824657	0.028812864	0.028824557	0.028789025	-0.00385923
42	0.028632786	0.028614897	0.028665404	0.028637881	0.02856319	0.028537113	-0.003341404

**Table S7.** The change of economic value per unit area in FDA of YRB from 1995 to 2020.

FDA_NO	1995yr.	2000yr.	2005yr.	2010yr.	2015yr.	2020yr.	change rate(1995-2020)
1	0.289516526	0.289864164	0.290078551	0.302214909	0.307159918	0.327087706	0.129772141
2	0.394275948	0.391900093	0.394051687	0.408474223	0.421175375	0.436048462	0.105947406
3	0.133732029	0.133909413	0.133994765	0.145228008	0.148899527	0.178887436	0.337655888
4	0.171553611	0.171749864	0.171882308	0.172521803	0.176407326	0.211910311	0.235242497
5	0.324716294	0.325025329	0.325638718	0.356927546	0.360844075	0.364781791	0.123386163
6	0.35395654	0.354296393	0.354959794	0.380808688	0.385331227	0.390521976	0.103304875
7	0.142564485	0.142835911	0.143232151	0.154573132	0.15894242	0.16569153	0.162221638
8	0.110249994	0.110483011	0.110985671	0.121268615	0.126665976	0.146618041	0.329868927
9	0.088080699	0.088229367	0.089081609	0.09995849	0.104489381	0.141857733	0.610542777
10	0.181547014	0.181887334	0.182325094	0.1855516	0.188671953	0.194317704	0.070343705
11	0.057754924	0.057908372	0.058933861	0.076759361	0.08257169	0.155657479	1.695137802
12	0.041157891	0.041341514	0.042544525	0.057098468	0.064852917	0.149654814	2.636114767
13	0.026985364	0.027146007	0.027988019	0.047450278	0.064084609	0.152268272	4.642624309
14	0.080552878	0.080646454	0.081042213	0.094500173	0.103516446	0.160583271	0.993513757
15	0.146937759	0.147055625	0.147469112	0.163304507	0.169293723	0.197354334	0.343115169
16	0.37493645	0.375839622	0.375409488	0.394506981	0.404075368	0.416384459	0.11054676
17	0.238653559	0.238931755	0.239521151	0.242969014	0.246539535	0.252591844	0.058403845
18	0.254232925	0.254626343	0.255682625	0.26229452	0.270163456	0.278473934	0.095349604
19	0.212224913	0.212543235	0.213599006	0.217578338	0.224831531	0.236533401	0.114541162
20	0.243367379	0.243727715	0.244592555	0.253295514	0.262586101	0.271758884	0.116661094
21	0.21581965	0.216304224	0.216921438	0.222610932	0.236853384	0.253713716	0.175582094
22	0.080948227	0.081175796	0.081815382	0.086564388	0.097198518	0.18094928	1.235370531
23	0.281959984	0.282406502	0.283271314	0.287048459	0.293560097	0.322381762	0.143359983
24	0.343860385	0.344342383	0.344526082	0.347367962	0.359187018	0.384531909	0.118279178
25	0.368257434	0.368952001	0.368840638	0.372271019	0.382716817	0.408321088	0.108792522
26	0.437276031	0.444507388	0.437857366	0.456209863	0.448498922	0.463417314	0.05978211
27	0.272296639	0.272676555	0.273513185	0.276801151	0.283456911	0.296761341	0.089845776
28	0.248975117	0.249984081	0.249689256	0.254590161	0.266564232	0.277946998	0.116364564
29	0.31540505	0.315681651	0.31601866	0.316398043	0.319829039	0.327452939	0.03819815
30	0.166031573	0.166058034	0.166138526	0.166293517	0.168580386	0.178277633	0.073757417
31	0.19153213	0.191534178	0.191613995	0.193957596	0.196709396	0.204296134	0.066641584
32	0.379411895	0.381600934	0.383404465	0.383096235	0.397768849	0.411216275	0.083825469

33	0.392335253	0.398375926	0.403982025	0.468833799	0.663042647	0.663850799	0.692049832
34	0.353650757	0.359130627	0.355752481	0.361529449	0.382302652	0.432904443	0.224101559
35	0.322926626	0.33335428	0.32473721	0.327238633	0.356842032	0.403784978	0.250392336
36	0.425251119	0.426505835	0.427722397	0.429226344	0.460730559	0.47331326	0.113020611
37	0.222260221	0.225213868	0.229053809	0.229436676	0.259579188	0.570181319	1.565377266
38	0.135774533	0.135692507	0.135935804	0.144990243	0.145917126	0.165357214	0.217880929
39	0.249872975	0.249744539	0.249975432	0.254032326	0.255279657	0.270827798	0.083861901
40	0.30948122	0.309816253	0.315111615	0.329906295	0.342940392	0.372336501	0.203098855
41	0.282178656	0.28304481	0.288743392	0.291246696	0.295200213	0.296546615	0.050917953
42	0.230756935	0.230962005	0.23124421	0.24439296	0.246275746	0.253678859	0.099333632

**Table S8.** The validation accuracy of FCV.

FDA_NO	2010	2015	2020
1	0.097560976	0.195121951	0.341463415
2	0.975609756	0.975609756	1
3	0.975609756	0.829268293	0.829268293
4	0.902439024	0.512195122	0.804878049
5	0.853658537	0.365853659	0.853658537
6	0	0.390243902	0.12195122
7	0.634146341	0.951219512	0.731707317
8	0.829268293	0.43902439	0.756097561
9	0.853658537	0.926829268	0.731707317
10	0.292682927	0.292682927	0.609756098
11	0.853658537	0.951219512	0.682926829
12	0.707317073	0.829268293	0.707317073
13	0.975609756	0.975609756	0.975609756
14	0.951219512	0.804878049	0.829268293
15	0.951219512	0.87804878	1
16	0.682926829	0.731707317	0.634146341
17	0.804878049	0.536585366	0.56097561
18	0.951219512	0.926829268	0.756097561
19	0.731707317	0.902439024	0.707317073
20	0.731707317	0.731707317	0.87804878
21	0.853658537	0.804878049	0.804878049
22	0.853658537	0.902439024	0.853658537
23	0.804878049	0.682926829	0.487804878
24	0.536585366	0.512195122	0.414634146
25	0.902439024	0.853658537	0.87804878
26	0.975609756	0.658536585	0.87804878
27	0.414634146	0.390243902	0.195121951
28	0.365853659	0.365853659	0.414634146
29	0.463414634	0.512195122	0.658536585
30	0.43902439	0.414634146	0.463414634

31	0.804878049	0.853658537	0.829268293
32	0.609756098	0.585365854	0.56097561
33	0.731707317	0.658536585	0.707317073
34	0.853658537	0.682926829	0.804878049
35	0.780487805	0.731707317	0.902439024
36	0.829268293	0.609756098	0.853658537
37	0.87804878	0.902439024	0.975609756
38	0.804878049	0.829268293	0.87804878
39	0.926829268	1	0.951219512
40	0.682926829	0.853658537	0.829268293
41	0.512195122	0.926829268	0.853658537
42	0.707317073	0.682926829	0.682926829

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