Supplementary materials

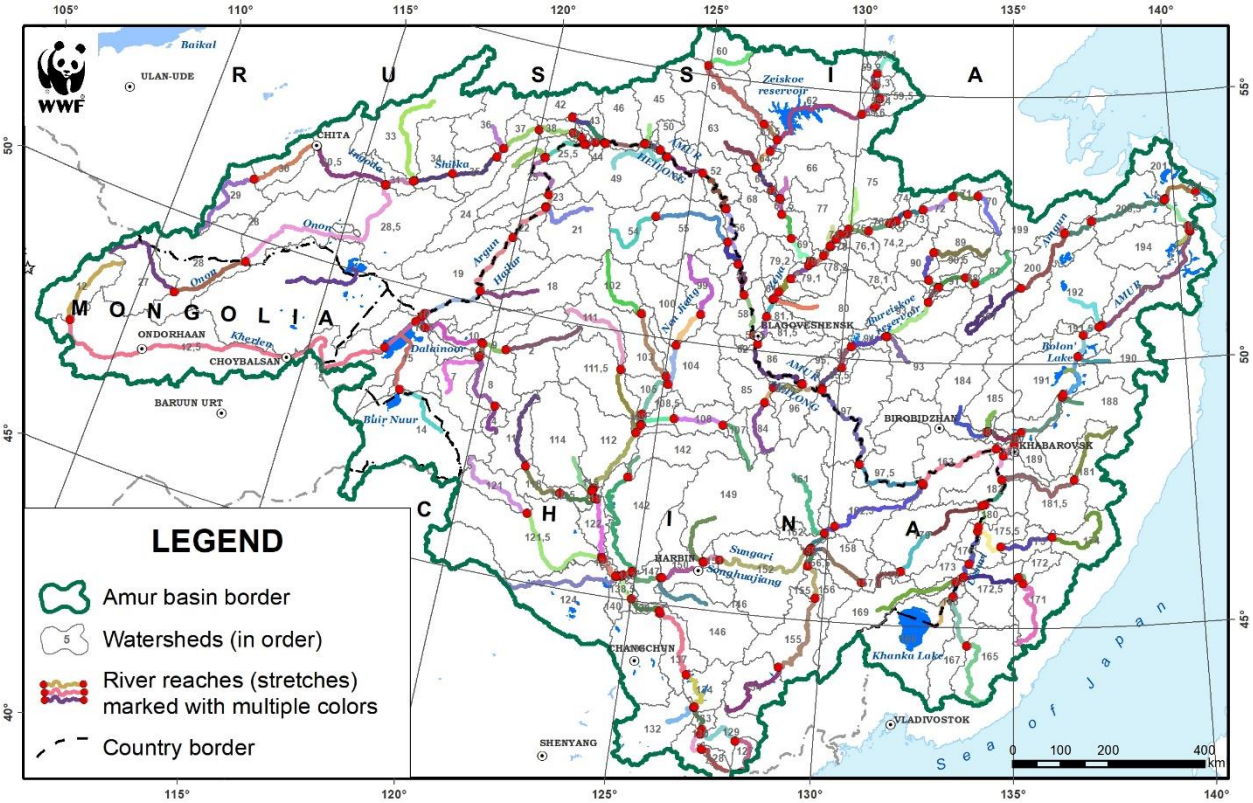

Figure 1. Delineated 214 units / stretches with attributed characteristic of respective elementary sub-basins. © WWF-Russia

Table 1. Calculation of the main factors of dam impact by river sections.

Indicator	Index	Units	The formula for the site and scenario, or source of information	Data source
1. Indicators of flow regime alteration *(ALT_mean)*				
Reservoir storage capacity	*LV*	cub. km	-	From reservoir documents, GIS modeling
Total reservoir storage capacity of all reservoirs above the river stretch in the scenario	*LV_acc_n*	cub. km	∑LV	Calculation
Mean flow (probability 50%) at the river stretch (*x*)	W_x^{50}	cub. km	-	Stream gauges, hydrologic catalogues
The degree of regulation (change) of runoff at the river stretch *(x)*	Alt_x	relative %	$\frac{LV}{W^{50}} * 100\%$	Calculation
Floodplain area at the river stretch (*x*)	S_fl_x	sq. km	Calculation using GIS	Topographic maps, space image interpretation
Changes of floodplain area at the river stretch (*x*)	*IMP_fl_x*	sq. km	$\frac{Sfl * Lv_acc}{W^{50}}$	Calculation
Total change in floodplain ecosystems in the	ALT_{mean}	% sq. km	$\frac{(\sum IMP_fl)_{xn}}{\sum S_fl_{xn}} * 100$	Calculation

hydropower development scenario (*n*)				
2. Indicators of riverine habitats transformation *(IMP_reservoir)*				
Maximum reservoir area	*R_A*	sq. km	-	From reservoir documents, GIS modeling
Total area of all reservoirs in the hydropower development scenario (*n*)	$R_A_acc_{xn}$	sq. km	$\sum$ R_A	Calculation
Water area (low flow) within the area of the reservoir prior to its construction	*SWO*	sq. km	Calculation using GIS	Topographic maps, space image interpretation
Total area of water bodies above the river stretch *(x) together* with reservoirs in the hydropower development scenario *(n)*	IMP_res_{xn}	sq. km	-	Topographic maps, digital elevation model (SRTM), satellite imageries
Ratio of the reservoir area to the area of all freshwater ecosystems located upstream from the aligned site in the hydropower development scenario *(n)*	$IMP_reservior_{xn}$	% sq. km	$\frac{R_A_acc_{xn}}{IMP_res_{xn}} * 100$	Calculation
3. Indicators of the basin fragmentation *(IMP_block)*				
Area of the sites located upstream from the river stretch *(x)* blocked by the dams constructed upstream according to the hydropower development scenario *(n)*	$SB_dam_up_{xn}$	sq. km	Option "Watershed" based on digital elevation model (SRTM)	GIS modeling and calculation
Catchment area located upstream from the river stretch (*x*)	IMP_bl_{x}	sq. km	Option "Watershed" based on digital elevation model (SRTM)	GIS modeling and calculation
Percentage of catchment area blocked by dams located upstream from the river stretch (*x*)	IMP_block_{n}	% sq. km	$\frac{\mathrm{SB_dam_up}_{xn}}{\mathrm{IMP_bl}_{x}} * 100$	Calculation

Table 2. Primary data on hydropower dams and rivers for the production of calculations on the analyzed sections.

The name of the river site / Dam	Number on the map	Production HPPs	Power	The height of the dam	Live volume of reservoir *(LV)*	Mean flow (probability 50%) *(W_50)*	Maximum area of reservoir *(R_A)*	Watershed area *(SB_up)*
		GWh/year	MW	m	cub. km	cub. km	sq. km	sq. km
1	2	3	4	5	6	7	8	9
Russia								
Shilka-5 / Transsibirskaya	28.2	3000	736	94	9.50	16.9	495.9	200525
Giluy-2 / Giluyskaya	54	1150	380	105	3.25	6.1	293.8	21607
Zeya-7 / Zeiskaya	56	4900	1330	99	32.10	23.1	2292	82517
Zeya-9 / Inzhanskaya	59	700	100	12	0.15	27.0	69.3	104144
Zeya-12 / Chagoyanskaya	63	720	100	15	0.30	31.5	87.4	125463
Zeya-13 / Gramatukhinskaya	64.1	1970	300	29	2.37	32.0	223.8	128358
Zeya-13 / Gramatukhinskaya (option).	64.2	915	100	12	0.15	32.0	55.2	128358
Selemdzha-2 / Ekimchanskaya	66	1050	190	81	4.00	6.0	112.9	11199
Selemdzha-3 / Rusinovskaya	67	1510	550	102	4.46	7.5	309.7	15667
Selemdzha-4 / Stoibinskaya	68	980	180	48	4.00	9.1	139.2	18367
Selemdzha-6 / Ikindinskaya	70	760	140	36	4.00	9.5	157.3	20810
Burea-2 / Umaltinskaya	91	800	150	74	4.00	6.5	40.4	7001
Ниман-2 / Nizhne-Nimanskaya	93	2230	450	145	8.30	6.8	472.1	13888

Burea-3 / Ust-Nimanskaya	94	2040	600	74	4.00	13.4	385.8	26295
Burea-6 / Bureiskaya	98	7100	2000	124	10.70	28.3	694.3	64922
Burea-7 / Nizhne-Bureiskaya	99	1650	321	38	0.07	29.0	179.3	66844
Ussuri-1 / Shetukhinskaya	150	1000	300	50	3.30	8.8	218.6	15426
B. Ussurka-1 / Dalnerechenskaya-1	155	1280	660	85	4.30	7.1	212.8	14461
B. Ussurka--2 / Dalnerechenskaya-2	156	540	250	27	0.03	8.9	44.1	17880
Bikin-2 / Shandegamskaya	159	710	180	55	7.80	6.0	558.4	15269
Khor-1 / Khorsky cascade	164	530	133	55	0.50	2.7	87.9	11402
Amgun-1 / Nizhne-Amgunskaya	179	3200	650	85	10.00	9.6	231.7	11183
Russia – China: the Argun river and main stream of the Amur								
Argun-4 / Ust-Urovskaya	15	1788	360	100	18.40	9.5	866.6	266730
Amur-2 / Amazarskaya-Mohe	31	5800	2000	94	18.70	29.4	766.6	496813
Amur-05 / Dzhalindinskaya-Lianyin	37	3100	1000	41	1.80	34.7	414	528978
Amur-07 / Tolbuzinskaya	40	1500	600	56	7.80	39.4	467.4	558088
Amur-08 / Kuznetsovskaya-Oupu	41.1	1000	300	53	1.79	39.5	475.6	566826
Amur-08 / Kuznetsovskaya-Huma (option)	41.2	8900	1800	105	75.50	39.5	3555.9	566826
Amur-08 / Kuznetsovskaya (option)	41.3	5074	1600	86	15.40	39.5	1332.8	566826
Amur-10 / Sukhotinskaya	45	1310	450	36	3.60	48.0	637.9	610705
Amur-11 / Heihe (Blagoveshchenskaya)	46	4100	1400	43	3.60	50.6	672.2	618549
Amur-15 / Khingansky-Taipinggou	101	6900	1800	20	0.49	150.1	365.5	986873

China								
Hailar-1 / Zhaluomude	1	40	15	25	0.30	1.7	221.6	15757
Yimin-0 / Honghuaerji	2	30	8	45	0.15	0.8	23.8	2322
Huma-2 / Lanhe	43	1200	400	35	3.50	6.6	160.5	27427
Zhanhe-1 / Xihe	87	251	100	30	0.80	3.2	39.1	5886
Naoli-0 / Longtouqiao	161	4	3	-	0.30	1.0	44.2	1731
Nen-2 / Guguhe	103	1400	525	37	0.45	3.8	190.8	23623
Ganhe-2 / Liujiatun	105	331	125	36	0.50	3.9	146.2	19670
Nen-4 / Nierji	107	630	250	41	5.86	11.0	399.4	66216
Nemoerhe-0 / Shankouhu	108	42	25	20	0.50	1.1	80.4	3751
Numinhe-1 / Bilahekou	111	500	250	45	1.50	4.8	107	8809
Chaoerhe-2 / Wendegen	116	153	50	30	0.82	2.2	24.8	15191
Taoerhe-1 / Chaersen	118	27	13	20	0.65	1.4	61	7663
Erdao jiang-0 / Sihugou	122	747	240	50	0.75	3.9	12.7	2971
Songjiang-0 / Shilong (Songjaing cascade)	123	1230	660	50	0.40	0.9	7.7	1909
Second Songhua-2 / Bai Shan	125	2440	1700	150	4.96	8.0	118.2	18799
Second Songhua-4 / Fenman	128	2030	1004	91	5.35	13.4	318.6	42977
Second Songhua-6 / Hadashan	131	167	90	16	3.35	16.1	662.3	72623
Songhua-4 / Dadingzishan	139	332	66	10	0.50	48.4	317.5	436675
Songhua-5 / Yilan	140	700	120	10	0.50	54.5	215.5	463951

Mudanjiang-1 / Jinbohu	141	313	96	20	0.50	3.2	136	12040
Mudanjiang-2 / Lianhuahu	142	800	550	72	2.09	7.4	121.9	29683
Mudanjiang-3 / Changjiang	143	560	230	30	0.25	8.3	98.4	35964
Mongolia								
Onon-1 / Onon- cascade	18	500	200	50	0.80	0.9	186.5	16622