

Supplementary Information

Sensitivity of subregional distribution of socioeconomic conditions to the global assessment of water scarcity

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Supplementary Note 1 - Physical Water Scarcity

We have calculated the mean annual precipitation (mm/year) (Supplementary Figure 8) the mean annual discharge (i.e. available freshwater, mm/year) defined by the sum of surface and subsurface runoff after routing (Supplementary Figure 9) over the globe for different climate scenarios (historical, RCP2.6, RCP7.0 and RCP8.5). We found that the mean annual discharge is lower than the precipitation for most of the earth, confirming that actual water available for use is lesser than the actual precipitation.

The spatial distribution of the population worldwide relative to water availability is the leading cause of water scarcity¹. We have calculated the availability per capita for freshwater at 0.5° grid and found 88.9% (89.5%) at the beginning considering GPWv4² (HYDE3.2³) population datasets, and $89.8^{+0.4}_{-0.3}$ ($89.7^{+0.3}_{-0.5}$), $93.8^{+0.6}_{-0.5}$ ($94.2^{+0.7}_{-0.4}$), and $90.5^{+1.2}_{-0.7}$ ($90.2^{+1.4}_{-1.4}$) (+/- values show the maximum variation in the global population facing water scarcity, calculated considering discharge using single GCM and the ensemble mean discharge) of the world's population lives under 5000 m³/cap/yr of water availability at the end of the century for SSP1-RCP2.6, SSP3-RCP7.0 and SSP5-RCP8.5 scenarios, respectively, considering Murakami and Yamagata (2019)⁴ (Jones and O'Neill (2016)⁵) population datasets (Supplementary Table 8, Supplementary Table 9, Supplementary Table 10, Supplementary Table 11, Supplementary Figure 10, and Supplementary Figure 11). The analysis shows that the population facing acute water stress having access to freshwater less than 500 m³/cap/year will increase from 44.6% (45.1%) to $54.9^{+1.1}_{-1.7}$ ($47.6^{+2.1}_{-2.5}$), $66.6^{+2.8}_{-3.3}$ ($59.8^{+5.6}_{-6.1}$), and $55.6^{+4.2}_{-1.8}$ ($47.0^{+5.7}_{-2.6}$) for SSP1-RCP2.6, SSP3-RCP7.0, and SSP5-RCP8.5 scenarios, respectively comprising about half of the world's population. These values were obtained using the threshold value defined for availability per capita (APC) as a water stress indicator^{6,7}, also known as the Falkenmark Indicator. This indicator is based on the availability of water per person in a spatial domain, with values below 1700 m³/cap/year treated as the threshold for the water scarcity, below 1000 m³/cap/year as high water scarcity and below 500 m³/capita/year as absolute scarcity⁸.

The spatial distribution of APC for different scenarios (Supplementary Figure 12 and Supplementary Figure 13) suggests a reduction in the per capita freshwater availability in western, central, and southern Africa, eastern USA, and a few places in the west and south-east Asia. In contrast, Asia, the middle east and south America will be more freshwater availability per capita in the future compared to the past. The

increment in freshwater availability per capita is not significant, and people in northern and eastern Africa, the Middle East, West Asia and some parts of South and East Asia will face water scarcity. The percentage of people facing overall water stress (based on APC) will be approximately the same in the future compared to the past, but the future population at the end of the 21st century will vary from 6.9 billion (SSP1) to 12.6 billion (SSP3)⁹ with different spatial distribution (Supplementary Figure 14 and Supplementary Figure 15). This population growth makes the total number of affected people due to water stress vary from 5.4 billion in the past to 6.2 – 11.8 billion in the future. These values will also be affected by the uneven distribution of population within the country due to many climatic-socioeconomic factors for each SSPs scenario along with the population growth. The results show that approximately 61.2% (62.7%) of the world population should have been faced high and acute water stress at the beginning of the century, defined using the threshold of 1000 m³/capita/year available freshwater (Supplementary Table 8, Supplementary Table 9, Supplementary Table 10, and Supplementary Table 11.). The value has discrepancies with a previously suggested value of 35%¹⁰ (calculated using APC) and 28%¹¹ (calculated using APC and WWR). Even though the number of people affected due to water scarcity varies for various studies, we found that the spatial distribution of physical water-scarce regions at the beginning of the century for our analysis is consistent with the previous studies^{8,10–13}.

Supplementary Tables

Supplementary Table 1: Base scenario experimental settings and data used for analysis

Experiment/ Scenario	Discharge	Population	GDP	Group Name
Historical-GPW	H08 ISIMIP3a	GPWv4	TG18	-
Historical-HYDE	H08 ISIMIP3a	HYDE3.2	TG18	-
Future126-MY19	H08 ISIMIP3b SSP1-RCP2.6	MY19 SSP1	MY19 SSP1	Future-MY
Future370-MY19	H08 ISIMIP3b SSP3-RCP7.0	MY19 SSP3	MY19 SSP3	
Future585-MY19	H08 ISIMIP3b SSP5-RCP8.5	MY19 SSP1 & OECD*	MY19 SSP1 & OECD*	
Future126-JO16	H08 ISIMIP3b SSP1-RCP2.6	JO16 SSP1	MY19 SSP1	Future-JO
Future370-JO16	H08 ISIMIP3b SSP3-RCP7.0	JO16 SSP3	MY19 SSP3	
Future585-JO16	H08 ISIMIP3b SSP5-RCP8.5	JO16 SSP5	MY19 SSP1 & OECD*	

*denotes the data were not provided by the original source hence prepared by the authors

Supplementary Table 2: Comparison of APC for the exceptional counties (lies below threshold line) for this study (considering ISIMIP 3a protocol) and using other climate forcings (considering ISIMIP 2a protocol) for Historical scenario (i.e., the year 2000)

				Yemen	Somalia	Western Sahara	Niger
	GDPPC-PPP (USD2005)			1177.75	56.47	148.6	658.27
	Population (million)			17.41	8.87	0.31	11.33
Study	Climate Data	Model	ISIMIP Protocol	APC (m ³ /capita/year)			
This Study	GSWP3–W5E5	H08	ISIMIP 3a	28.103	133.32	87.62	200.89
Additional Experiment	GSWP3	H08	ISIMIP 2a	63.80	1290.81	352.15	777.98
	PGMFD v2.1 (Princeton)			35.30	857.88	167.92	1071.18
	WATCH (WFD)			115.34	1799.00	323.60	1210.48
	WATCH-WFDEI			93.90	1383.28	326.62	899.52

Supplementary Table 3: Statistical analysis (Welch's t-test and Mood's Median test) using country scale data

Scenario/ Experiment setting		APC				GPC			
Future	Historical	Welch's t-test	p-value	Mood's Median test	p-value	Welch's t-test	p-value	Mood's Median test	p-value
Future126-MY19	Historical-GPW	-0.69	0.49	1.28	0.26	26.16	1.02e-77	324.27	1.70e-72
Future370-MY19	Historical-GPW	-0.62	0.54	0.18	0.67	10.35	1.75e-21	112.61	2.62e-26
Future585-MY19	Historical-GPW	-1.78	0.08	0.02	0.89	37.33	1.55e-11	342.35	1.96e-76
Future126-JO16	Historical-HYDE	-0.51	0.61	0.46	0.50	14.45	1.01e-34	283.46	1.32e-63
Future370-JO16	Historical-HYDE	-1.00	0.32	1.58	0.21	7.04	1.58e-11	92.09	8.26e-22
Future585-JO16	Historical-HYDE	-0.20	0.84	0.45	0.50	17.90	9.30e-46	323.48	2.53e-72

Supplementary Table 4: Statistical analysis (Welch's t-test and Mood's Median test) using grid-scale data

Scenario/ Experiment setting		APC				GPC			
Future	Historical	Welch's t-test	p-value	Mood's Median test	p-value	Welch's t-test	p-value	Mood's Median test	p-value
Future126-MY19	Historical-GPW	14.41	5.44e-47	864.56	4.97e-190	170.47	0.00	26152.82	0.00
Future370-MY19	Historical-GPW	-2.93	3.30e-03	66.41	3.66e-16	87.56	0.00	10153.98	0.00
Future585-MY19	Historical-GPW	13.86	1.21e-43	643.55	5.64e-142	203.71	0.00	29888.31	0.00
Future126-JO16	Historical-HYDE	-3.46	5.31e-04	37.35	9.87e-10	78.46	0.00	4162.38	0.00
Future370-JO16	Historical-HYDE	-5.92	3.32e-09	345.88	3.35e-77	50.34	0.00	1022.82	0.00
Future585-JO16	Historical-HYDE	-4.24	2.18e-05	81.46	1.79e-19	92.55	0.00	6162.66	0.00

Supplementary Table 5: Physical and Economic water scarce population and uncertainties considering GCMs, SSP-RCP scenarios and gridded distribution of population for all considered scenarios

Scenario/ Experiment t	Physical and Economical Water Scarce Population										
	GFDL-ESM4	MRI-ESM2-0	MPI-ESM1-2-HR	IPSL-CM6A-LR	UKES M1-0-LL	Difference between GCMs		Ensemble Mean	Difference between two population data	Difference between SSP-RCP scenarios	
						Max	Min			Max	Min
Historical-GPW*	-	-	-	-	-	-	-	327	-	-	-
Historical-HYDE*	-	-	-	-	-	-	-	358	-	-	-
Future126-MY19	0.8	0.32	1	0.35	0.44	0.68	0.03	0.32	-	-	-
Future370-MY19	407	479	362	529	390	167	28	327	-	-	-
Future585-MY19	7.3	8.1	7.6	7.8	5.8	2.3	1.5	6.9	-	326.68	6.58
Future126-JO16	258	249	243	249	224	34	19	234	233.68	-	-
Future370-JO16	846	817	679	737	598	248	81	665	338	-	-
Future585-JO16	202	212	173	182	175	39	2	176	169.1	489	58

* Historical scenario considers observed climate only

Values in bold characters show the maximum and minimum uncertainties.

Supplementary Table 6: Statistical analysis (Welch's t-test and Mood's Median test) for new water scarce grids of the future (i.e., the year 2099)

Scenario/ Experiment setting	Future	Future126-MY19	Future370-MY19	Future585-MY19		Future126-JO16	Future370-JO16	Future585-JO16
	Historical	Historical-GPW	Historical-GPW	Historical-GPW		Historical-HYDE	Historical-HYDE	Historical-HYDE
APC (mm/year)	Welch's t-test	0.35	-1.04	-0.17		-1.66	-2.93	-2.05
	p-value	0.73	0.30	0.86		0.096	0.003	0.041
	Mood's Median test	0.20	0.0	0.17		16.94	38.55	59.71
	p-value	0.65	1.0	0.68		3.85e-05	5.326e-10	1.09e-14
P o p u l a t	Welch's t-test	-0.89	-5.00	-2.12		-17.03	-13.06	-17.04

GDP-PPP (USD/year)	p-value	0.38	1.6	0.06	1.11e-63	8.80e-38	1.52e-63
	Mood's Median test	9.8	96.0	1.5	942.84	1528.650	1015.15
	p-value	0.002	1.15	0.22	4.7e-207	0.0	9.16e-223
	Welch's t-test	-2.44	-4.97	-1.35	10.40	-4.36	6.09
	p-value	0.04	1.82	0.20	3.95e-25	1.35e-05	1.23e-09
	Mood's Median test	16.2	96.0	0.0	2313.09	s119.15	2058.17
	p-value	5.70e-05	1.15e-22	1.0	0.00	9.70e-28	0.00

Supplementary Table 7: Sensitivity analysis experimental setting, and data used for analysis

Experiment/ Scenario	Discharge	Population	GDP	Group Name
Historical-MY126	H08 ISIMIP3a	MY19 SSP1	MY19 SSP1	Historical-MY
Historical-MY370	H08 ISIMIP3a	MY19 SSP3	MY19 SSP3	
Historical-MY585	H08 ISIMIP3a	MY19 SSP1 & OECD*	MY19 SSP1 & OECD*	
Future126-GPW	H08 ISIMIP3b SSP1-RCP2.6	GPWv4	MY19 SSP1	Future-GPW
Future370-GPW	H08 ISIMIP3b SSP3-RCP7.0	GPWv4	MY19 SSP3	
Future585-GPW	H08 ISIMIP3b SSP5-RCP8.5	GPWv4	MY19 SSP1 & OECD*	
Future126-MY-TG	H08 ISIMIP3b SSP1-RCP2.6	MY19 SSP1	TG18	Future-MY-TG
Future370-MY-TG	H08 ISIMIP3b SSP3-RCP7.0	MY19 SSP3	TG18	
Future585-MY-TG	H08 ISIMIP3b SSP5-RCP8.5	MY19 SSP1 & OECD*	TG18	
Historical-JO126	H08 ISIMIP3a	JO16 SSP1	MY19 SSP1	Historical-JO
Historical-JO370	H08 ISIMIP3a	JO16 SSP3	MY19 SSP3	
Historical-JO585	H08 ISIMIP3a	JO16 SSP5	MY19 SSP1 & OECD*	
Future126-HYDE	H08 ISIMIP3b SSP1-RCP2.6	HYDE3.2	MY19 SSP1	Future-HYDE
Future370-HYDE	H08 ISIMIP3b SSP3-RCP7.0	HYDE3.2	MY19 SSP3	
Future585-HYDE	H08 ISIMIP3b SSP5-RCP8.5	HYDE3.2	MY19 SSP1 & OECD*	
Future126-JO-TG	H08 ISIMIP3b SSP1-RCP2.6	JO16 SSP1	TG18	Future-JO-TG
Future370-JO-TG	H08 ISIMIP3b SSP3-RCP7.0	JO16 SSP3	TG18	
Future585-JO-TG	H08 ISIMIP3b SSP5-RCP8.5	JO16 SSP5	TG18	

*denotes the data were not provided by the original source hence prepared by the authors

Supplementary Table 8: Percentage of the global population affected due to physical water stress for all considered scenarios

Description /Remarks	Very High Water Stress	High Water Stress	Moderate Water stress	Low Water Stress	No Water Stress
Availability (m ³ /cap/year)	<500	500-1000	1000-1700	1700-5000	5000<

Method of Consideration of Mean for different GCM		*	**	*	**	*	**	*	**	*	**
Population Distribution (%) (Historical, 2000) ***	APC	44.6	45.1	16.6	17.6	11.8	11.3	15.9	15.5	11.1	10.5
Population Distribution (%) SSP1-RCP2.6 (Future ,2099)	APC	54.9	47.6	13.5	15.9	9.0	11.9	12.4	14.3	10.1	10.4
Population Distribution (%) SSP3-RCP7.0 (Future, 2099)	APC	66.6	59.8	11.5	16.0	7.1	8.8	8.6	9.6	6.3	5.7
Population Distribution (%) SSP5-RCP8.5 (Future, 2099)	APC	55.6	47.0	13.5	16.3	8.9	11.2	12.5	15.7	9.5	9.9

* Calculated Using analysis of Ensemble Mean of H08 output for different GCMs considering GPWv4 database for historical and Murakami and Yamagata (2019) for Future Gridded Population

** Calculated using Ensemble Mean of H08 output for different GCMs considering HYDE3.2 database for historical and Jones and O'Neill (2016) for Future Gridded Population

*** Historical scenario considers observed climate only

Supplementary Table 9: Percentage of the global population affected due to physical water stress for SSP1-RCP2.6 scenario

Description /Remarks		Very High Water Stress		High Water Stress		Moderate Water stress		Low Water Stress		No Water Stress	
Availability per capita (APC) (m ³ /cap/year)		<500		500-1000		1000-1700		1700-5000		5000<	
		*	**	*	**	*	**	*	**	*	**
Population Distribution (%) for various GCM	GFDL-ESM4	55.8	49.7	13.4	15.1	8.5	11.3	12.4	13.9	10.0	10.0
	MRI-ESM2-0	55.9	48.4	13.3	16.3	8.8	10.9	12.1	13.9	10.0	10.5
	MPI-ESM1-2-HR	56.0	48.8	13.1	15.9	8.9	11.0	12.2	14.2	9.8	10.1
	IPSL-CM6A-LR	55.5	48.0	13.0	15.9	9.0	11.2	12.5	14.7	10.0	10.2
	UKESM1-0-LL	53.2	45.1	14.4	16.5	8.9	11.8	13.0	15.8	10.5	10.9
	Ensemble Mean	54.9	47.6	13.5	15.9	9.0	11.9	12.4	14.3	10.1	10.4

* Calculated using Murakami and Yamagata (2019) population data

* Calculated using Jones and O'Neil (2016) population data

Supplementary Table 10: Percentage of the global population affected due to physical water stress for SSP3-RCP7.0 scenario

Description /Remarks		Very High Water Stress		High Water Stress		Moderate Water stress		Low Water Stress		No Water Stress	
Availability per capita (APC) (m ³ /cap/year)		<500		500-1000		1000-1700		1700-5000		5000<	
		*	**	*	**	*	**	*	**	*	**
Population Distribution (%) for various GCM	GFDL-ESM4	69.4	65.4	11.0	14.1	6.3	7.3	7.7	8.1	5.7	5.2
	MRI-ESM2-0	67.8	62.6	11.2	14.8	6.6	7.8	8.3	9.2	6.1	5.7
	MPI-ESM1-2-HR	66.9	59.8	10.9	15.9	7.2	8.6	8.8	10.1	6.1	5.7
	IPSL-CM6A-LR	66.6	61.4	11.7	14.4	7.0	8.4	8.3	9.6	6.5	6.2
	UKESM1-0-LL	63.3	53.7	12.3	18.9	7.8	10.1	9.9	11.2	6.7	6.1
	Ensemble Mean	66.6	59.8	11.5	16.0	7.1	8.8	8.6	9.6	6.3	5.7

* Calculated using Murakami and Yamagata (2019) population data

** Calculated using Jones and O'Neil (2016) population data

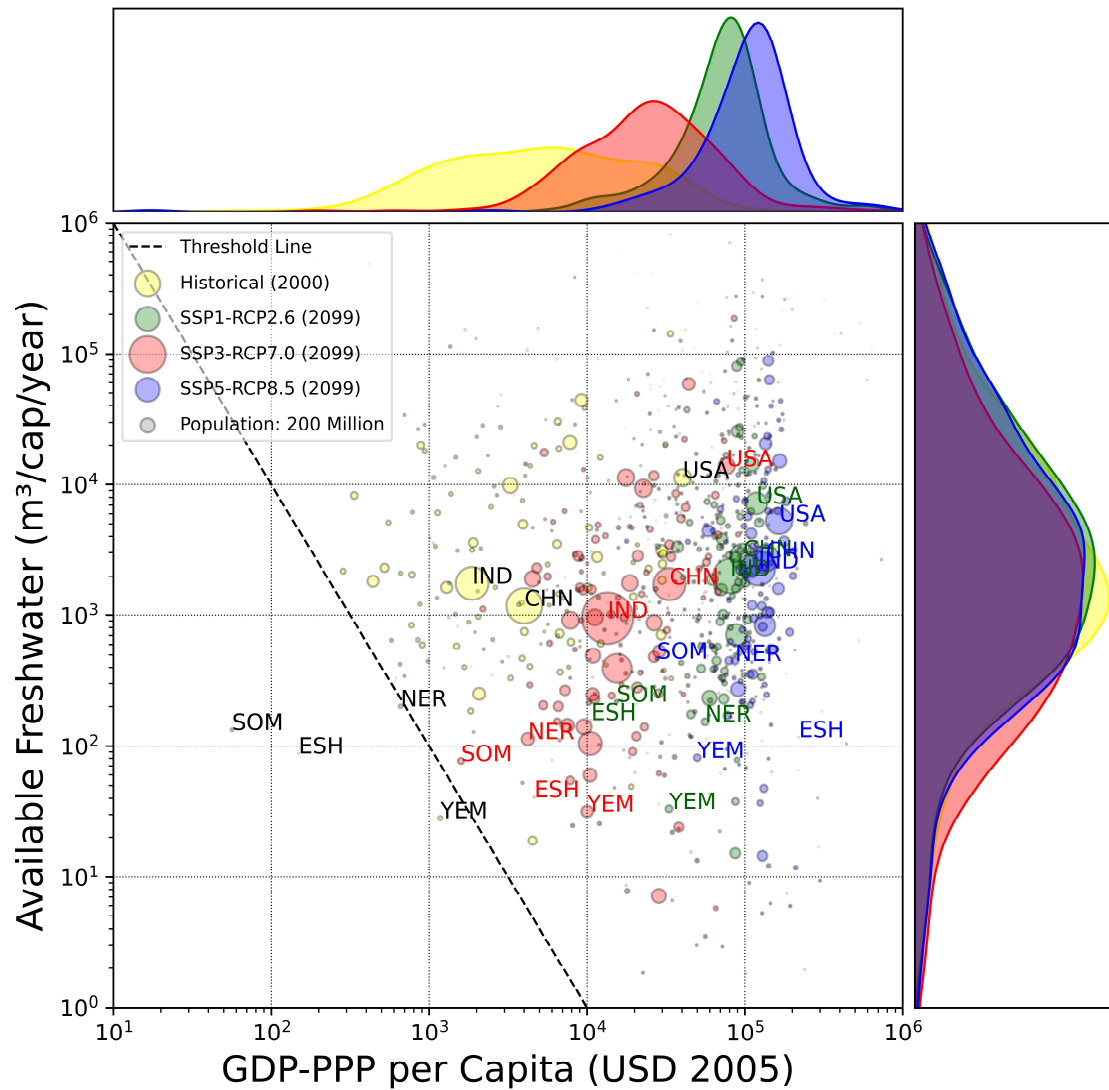
Supplementary Table 11: Percentage of the global population affected due to physical water stress for SSP5-RCP8.5 scenario

Description /Remarks		Very High Water Stress		High Water Stress		Moderate Water stress		Low Water Stress		No Water Stress	
Availability per capita (APC) (m ³ /cap/year)		<500		500-1000		1000-1700		1700-5000		5000<	
		*	**	*	**	*	**	*	**	*	**
Population Distribution (%) for various GCM	GFDL-ESM4	59.8	52.7	11.7	15.2	8.8	9.9	11.4	13.8	8.4	8.4
	MRI-ESM2-0	58.5	51.6	12.9	15.2	8.2	10.4	11.5	13.3	9.0	9.5
	MPI-ESM1-2-HR	54.6	45.2	13.0	15.8	9.1	11.5	13.1	16.3	10.2	11.2
	IPSL-CM6A-LR	56.3	50.4	13.5	13.9	8.1	10.2	12.6	15.1	9.5	10.4
	UKESM1-0-LL	53.8	44.4	14.2	16.1	9.3	12.7	12.9	16.7	9.9	10.2
	Ensemble Mean	55.6	47.0	13.5	16.3	8.9	11.2	12.5	15.7	9.5	9.9

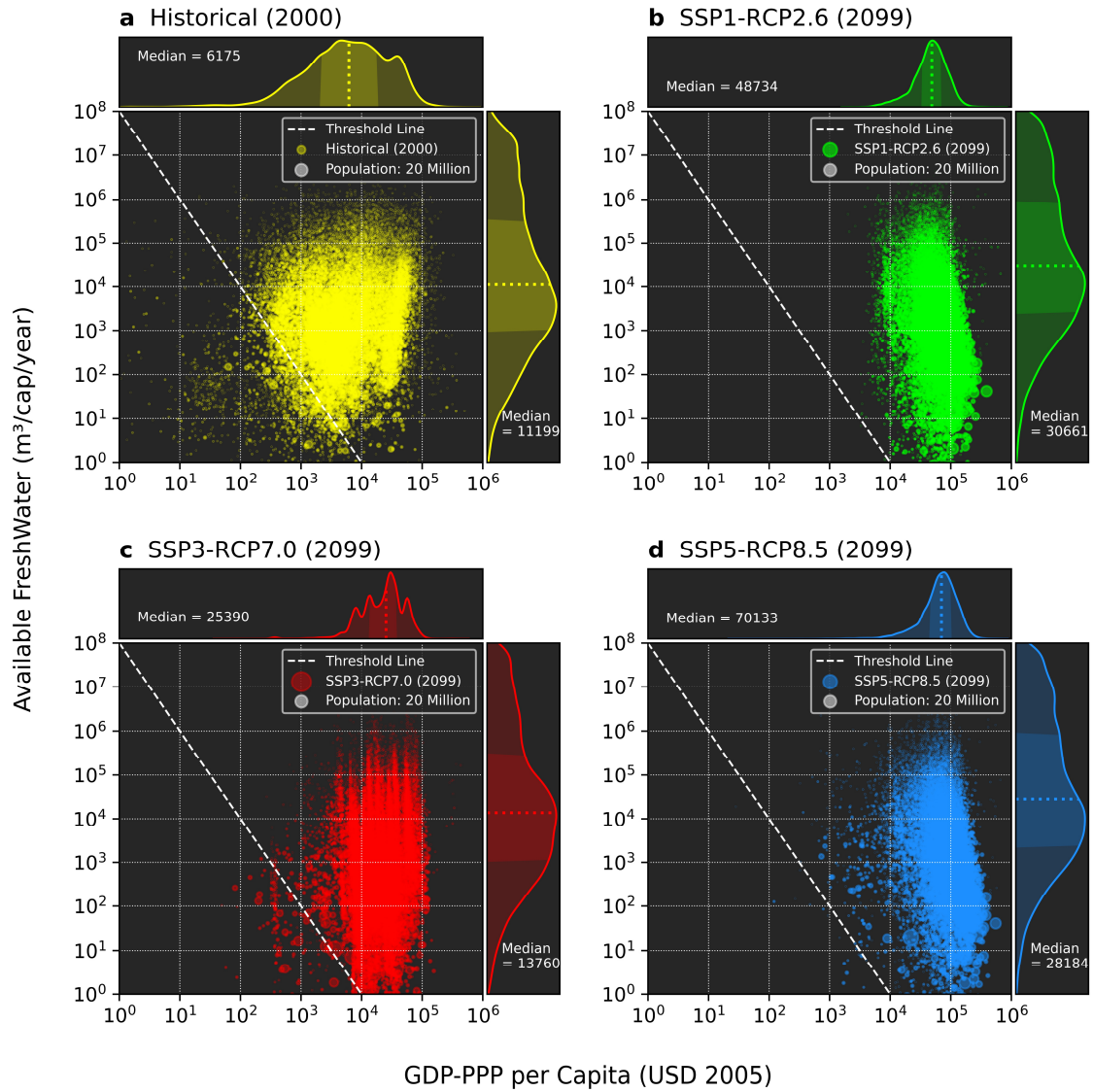
* Calculated using Murakami and Yamagata (2019) population data

** Calculated using Jones and O'Neil (2016) population data

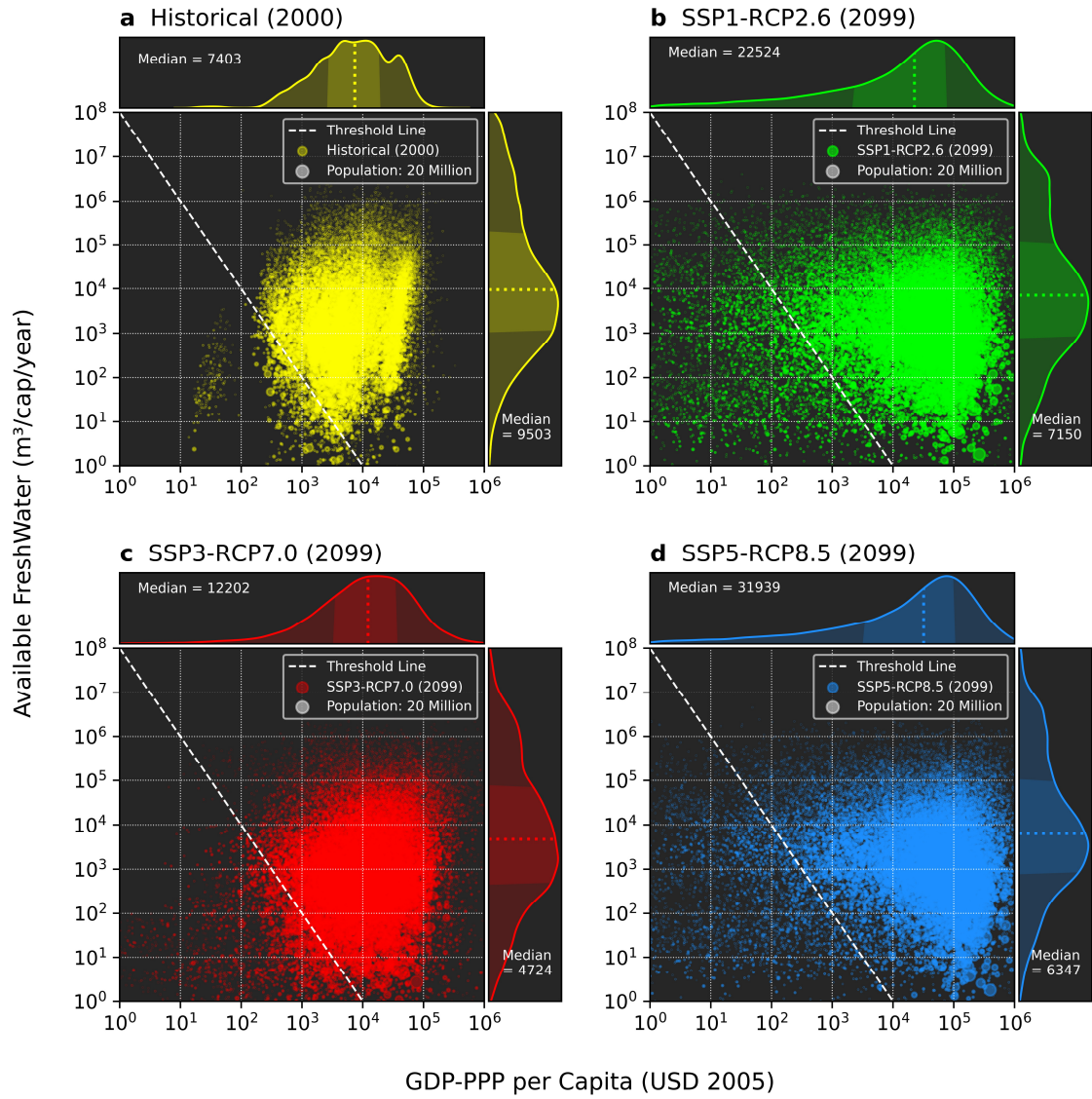
Supplementary Figures



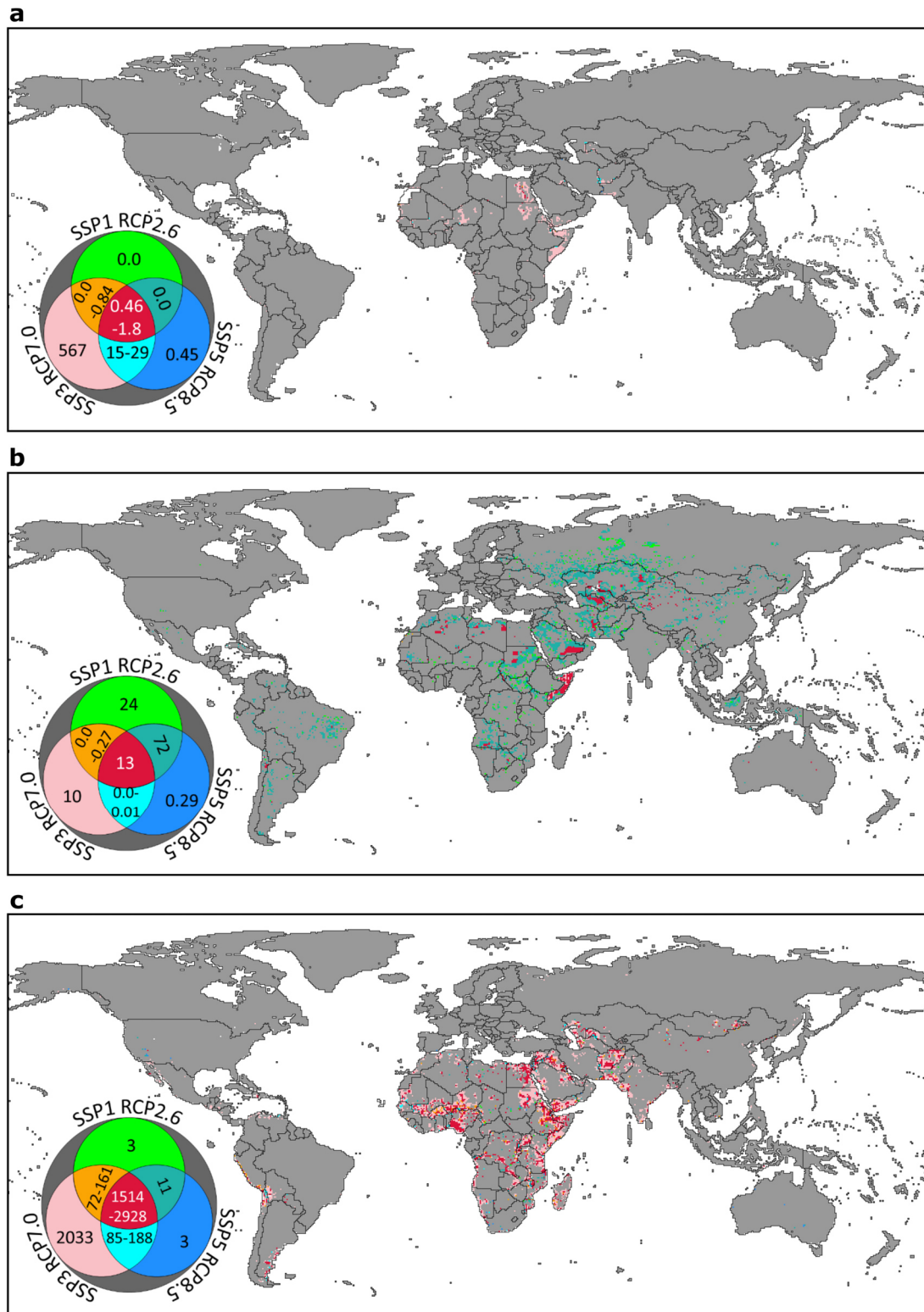
Supplementary Figure 1: Country-level scatter plot for APC vs GDP-PPP per Capita and density plot considering the number of countries for various socioeconomic and climate scenarios with each circle corresponding to a country and the size of the circle corresponding to the population of the country. Yellow, Green, Red and Blue colours represent historical, SSP1-RCP2.6, SSP3-RCP7.0 and SSP5-RCP8.5 scenarios, respectively, and the dashed line represents threshold value for physical and economic water scarcity. The analysis was performed considering the HYDE3.2 dataset for the historical year 2000 population and Jones and O'Neill (2016) for the future year 2099 population.



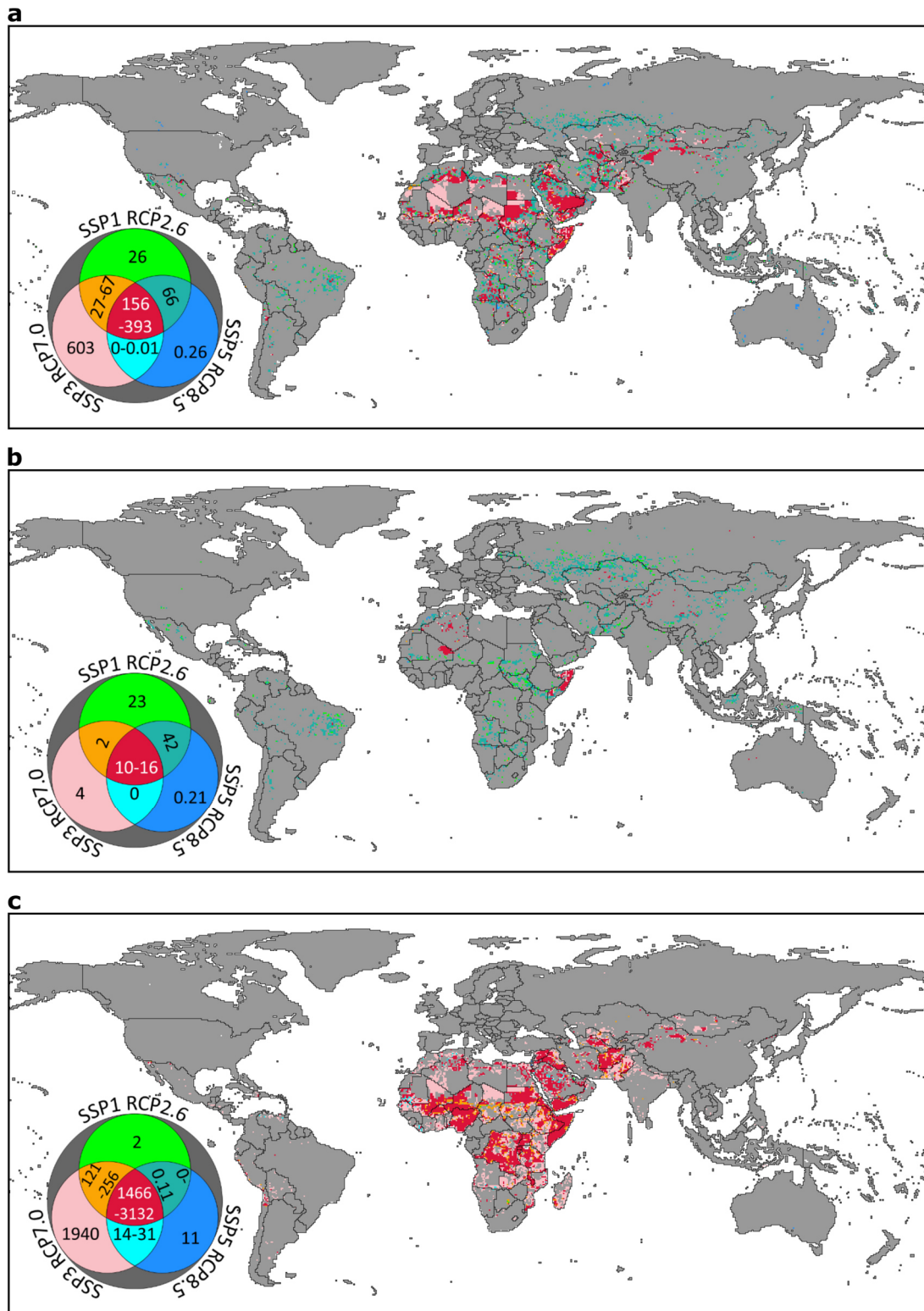
Supplementary Figure 2: Grid level scatter plot for APC vs GDP-PPP per Capita and density plot considering the number of grids for various socioeconomic and climate scenarios for (a) Historical (2000), (b) SSP1-RCP2.6 (2099), (c) SSP3-RCP7.0 (2099) and, (d) SSP5-RCP8.5 (2099), grid values represented as circles and dashed line represents threshold value for physical and economical water scarcity, density plot showing dotted colour lines (yellow, lime, red, and blue) as the median, dark shaded as the interquartile range (first and third quartiles), white circle legend represent the grid size of 20 million population. The analysis was performed considering the GPWv4 dataset for the historical year 2000 population and Murakami and Yamagata (2019) for the future year 2099 population.



Supplementary Figure 3: Grid level scatter plot for APC vs GDP-PPP per Capita and density plot considering the number of grids for various socioeconomic and climate scenarios for (a) Historical (2000), (b) SSP1 RCP2.6 (2099), (c) SSP3 RCP7.0 (2099) and, (d) SSP5 RCP8.5 (2099), grid values represented as circles and dashed line represents threshold value for physical and economical water scarcity, density plot showing dotted colour lines (yellow, lime, red, and blue) as the median, dark shaded as the interquartile range (first and third quartiles), white circle legend represent the grid size of 20 million population. The analysis was performed considering the HYDE3.2 dataset for the historical year 2000 population and Jones and O'Neill (2016) for the future year 2099 population.

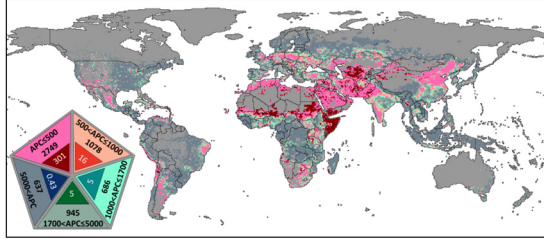


Supplementary Figure 4: Water Scarce (Physical and Economically Challenged) Regions in future (2099) with possible combinations, the values inside the circular legend shows the number of people (in millions) facing scarcity problem considering (a) Historical freshwater availability, (b) Historical population, and (c) Historical GDP for GPWv4 historical population dataset and Murakami and Yamagata (2019) future population dataset.

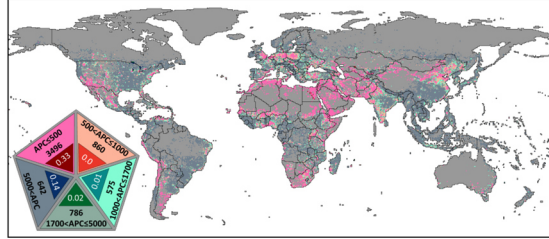


Supplementary Figure 5: Water Scarce (Physical and Economically Challenged) Regions in future (2099) with possible combinations, the values inside the circular legend shows the number of people (in millions) facing scarcity problem considering (a) Historical freshwater availability, (b) Historical population, and (c) Historical GDP for HYDE3.2 historical population dataset and Jones and O'Neill (2016) future population dataset.

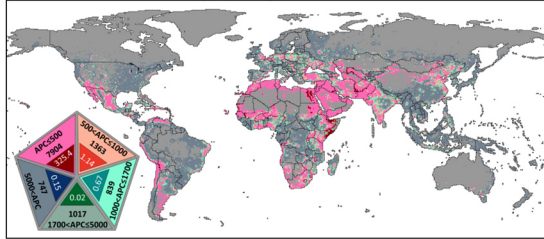
a Historical (2000)



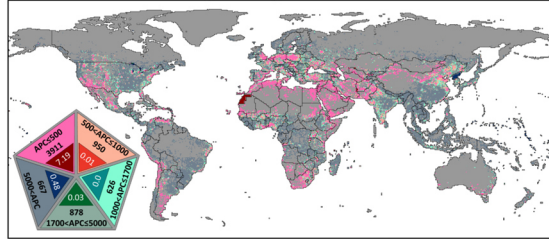
b SSP1-RCP2.6 (2099)



c SSP3-RCP7.0 (2099)

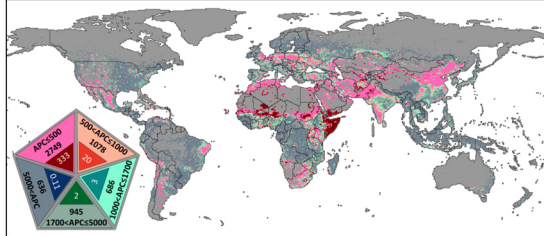


d SSP5-RCP8.5 (2099)

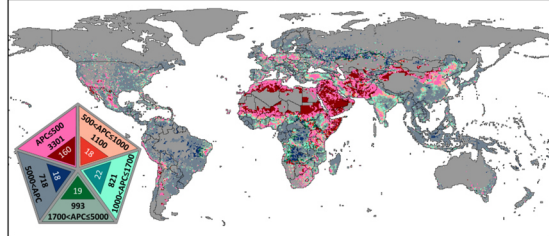


Supplementary Figure 6: Water Limited but economically mitigable denoted using light shade colours and non-mitigable regions represented using dark shades of colour with numbers in big triangles in legends showing the population facing physical scarcity with different threshold and small triangle within big triangles showing population facing both physical and economical water scarcity for (a) Historical (2000), (b) SSP1-RCP2.6 (2099), (c) SSP3-RCP7.0 (2099), and (d) SSP5-RCP8.5 (2099), calculated considering gridded population by GPWv4 for historical and Murakami and Yamagata (2019) for future scenarios.

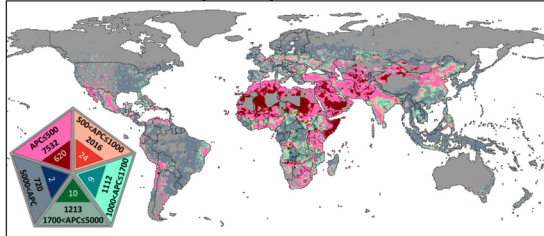
a Historical (2000)



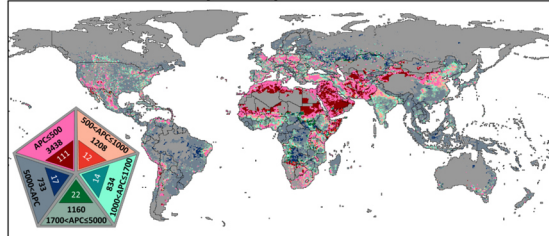
b SSP1-RCP2.6 (2099)



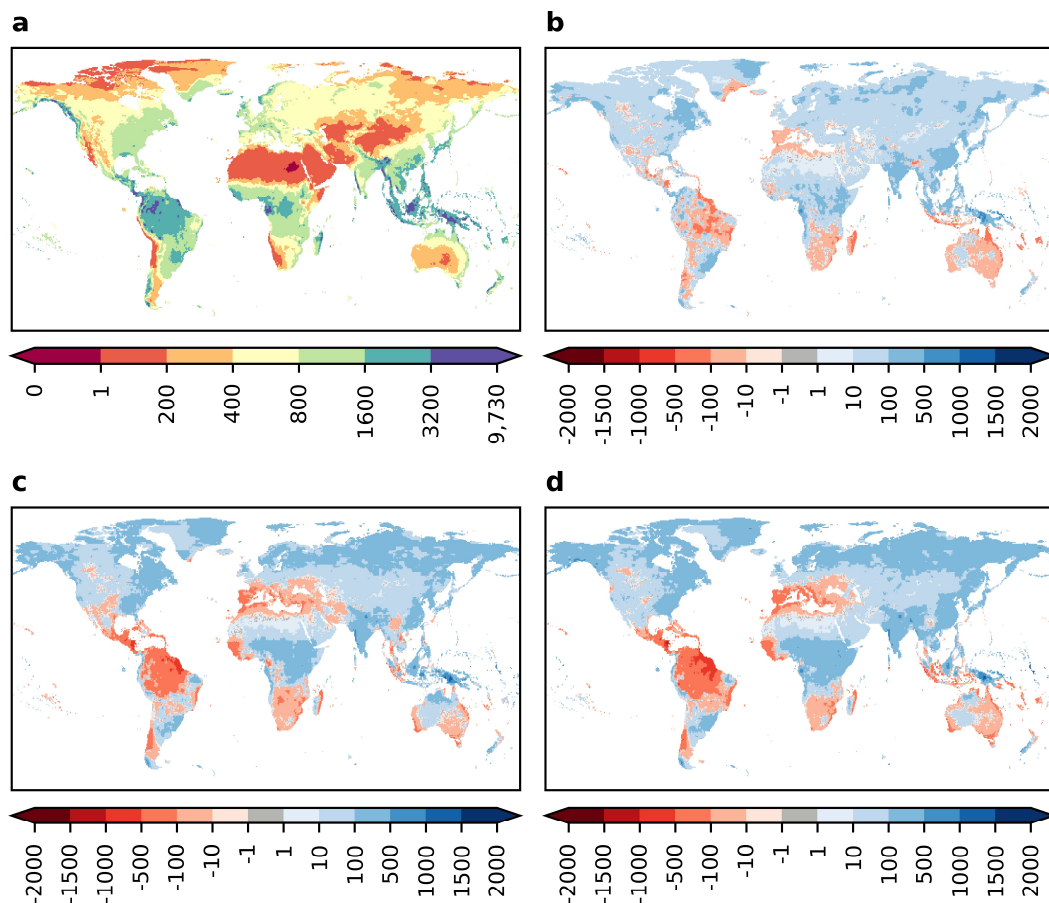
c SSP3-RCP7.0 (2099)



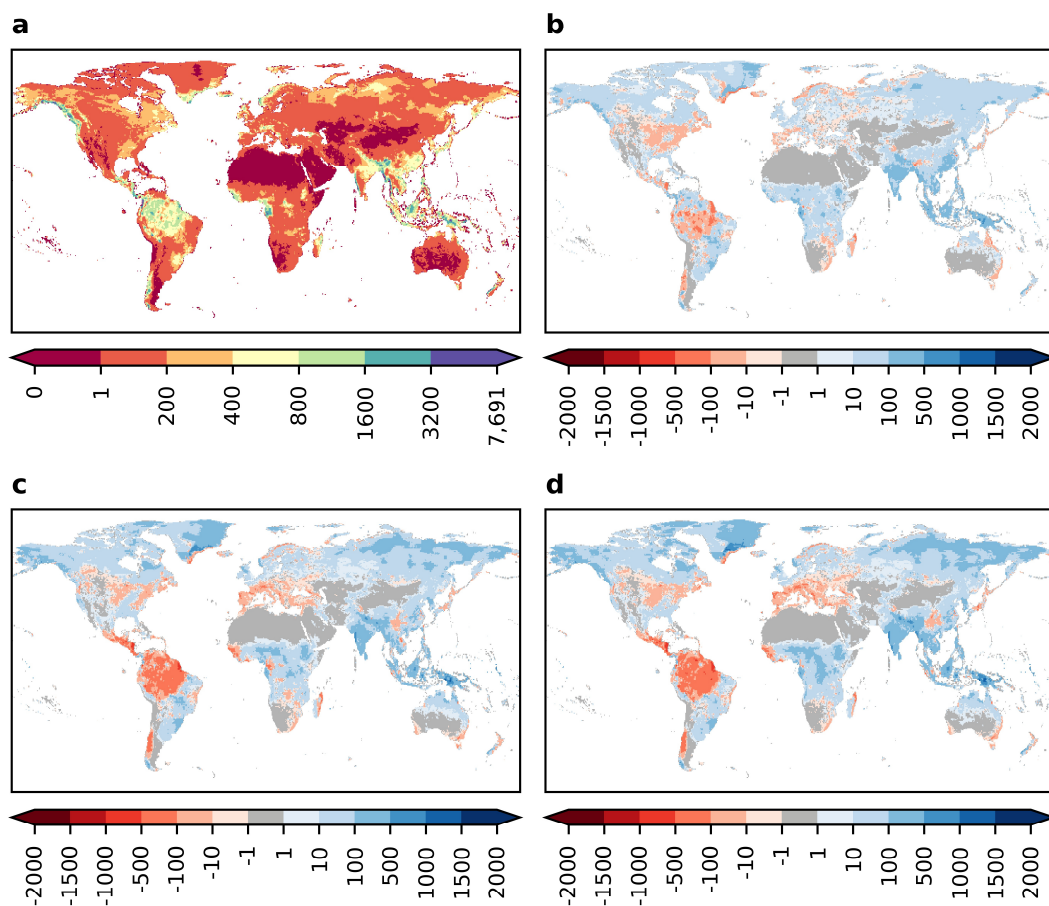
d SSP5-RCP8.5 (2099)



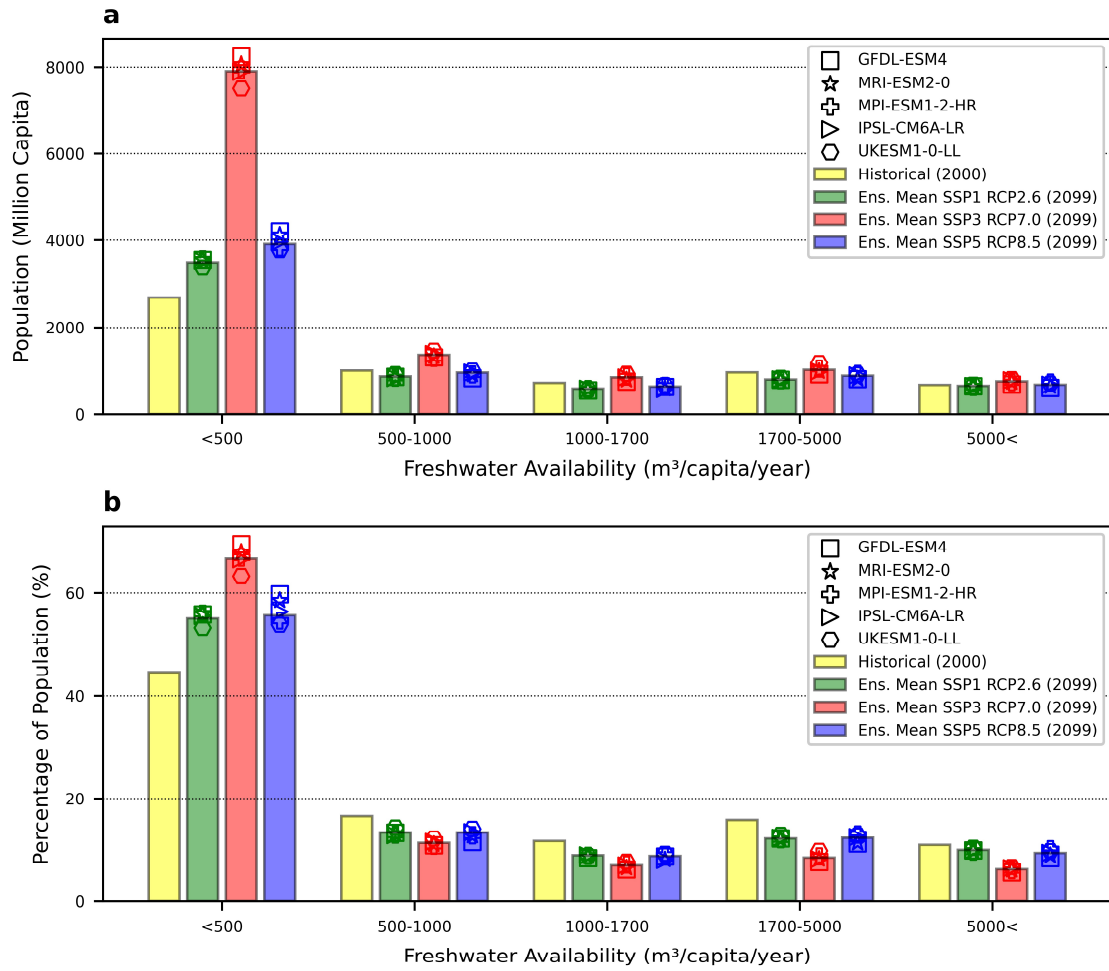
Supplementary Figure 7: Water Limited but economically mitigable denoted using light shade colours and non-mitigable regions represented using dark shades of colour with numbers in big triangles in legends showing the population facing physical scarcity with different threshold and small triangle within big triangles showing population facing both physical and economical water scarcity for (a) Historical (2000), (b) SSP1-RCP2.6 (2099), (c) SSP3-RCP7.0 (2099), and (d) SSP5-RCP8.5 (2099), calculated considering gridded population by HYDE3.2 database for Historical and Jones and O'Neill (2016) for future scenarios.



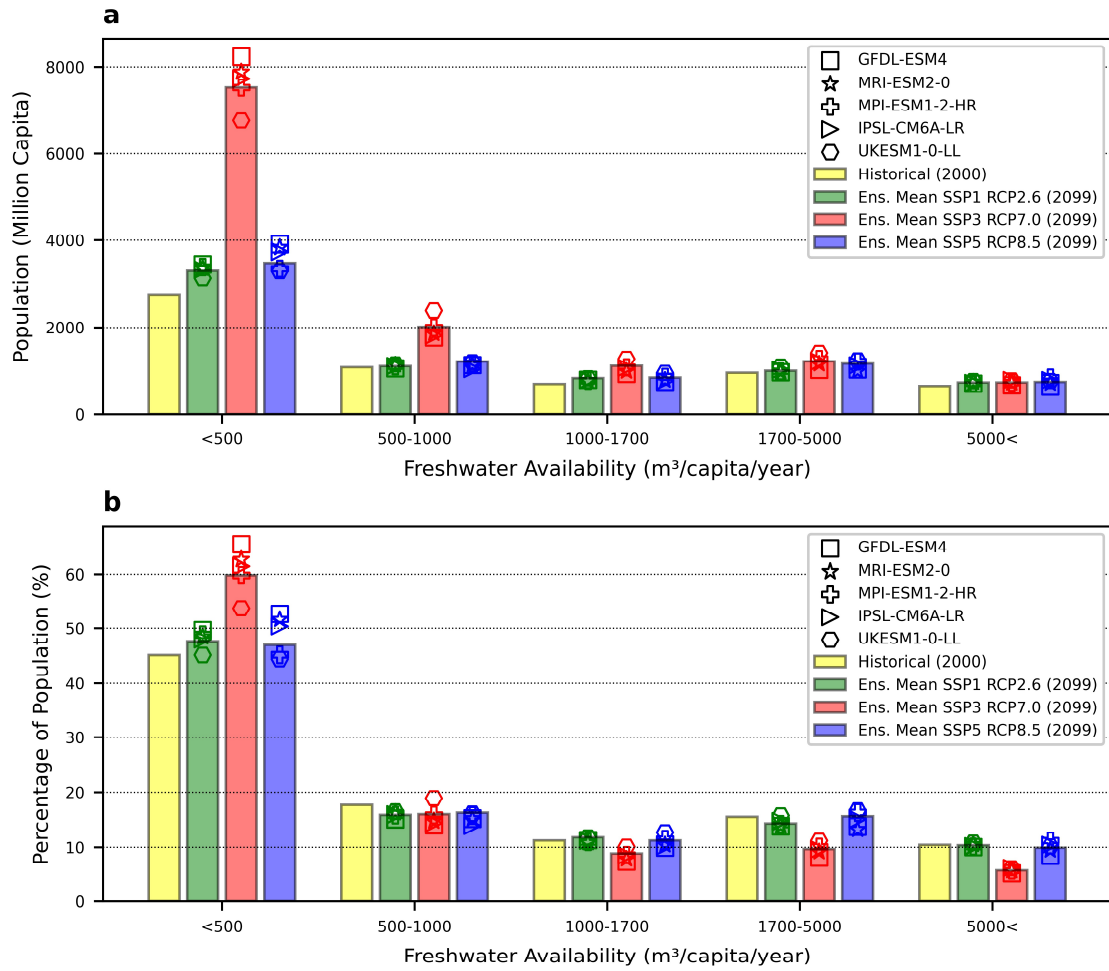
Supplementary Figure 8: Distribution of mean annual precipitation (mm/year) (a) Historical (2000), and the difference between (b) SSP1-RCP2.6(2099) and Historical (2000), (c) SSP3-RCP7.0 (2099) and Historical (2000), and (d) SSP5-RCP8.5 (2099) and Historical (2000).



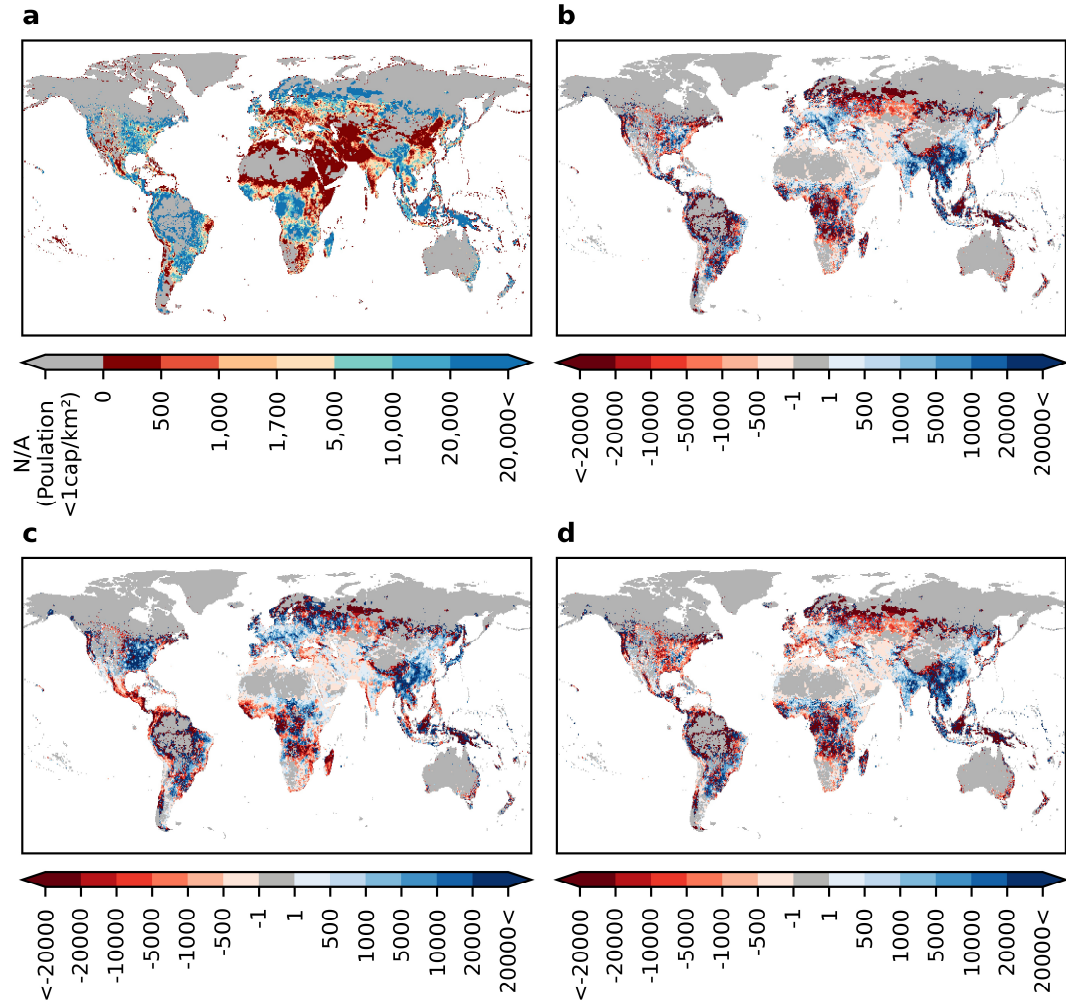
Supplementary Figure 9: Distribution of mean annual discharge (mm/year) (a) Historical (2000), and the difference between (b) SSP1-RCP2.6(2099) and Historical (2000), (c) SSP3-RCP7.0 (2099) and Historical (2000), and (d) SSP5-RCP8.5 (2099) and Historical (2000).



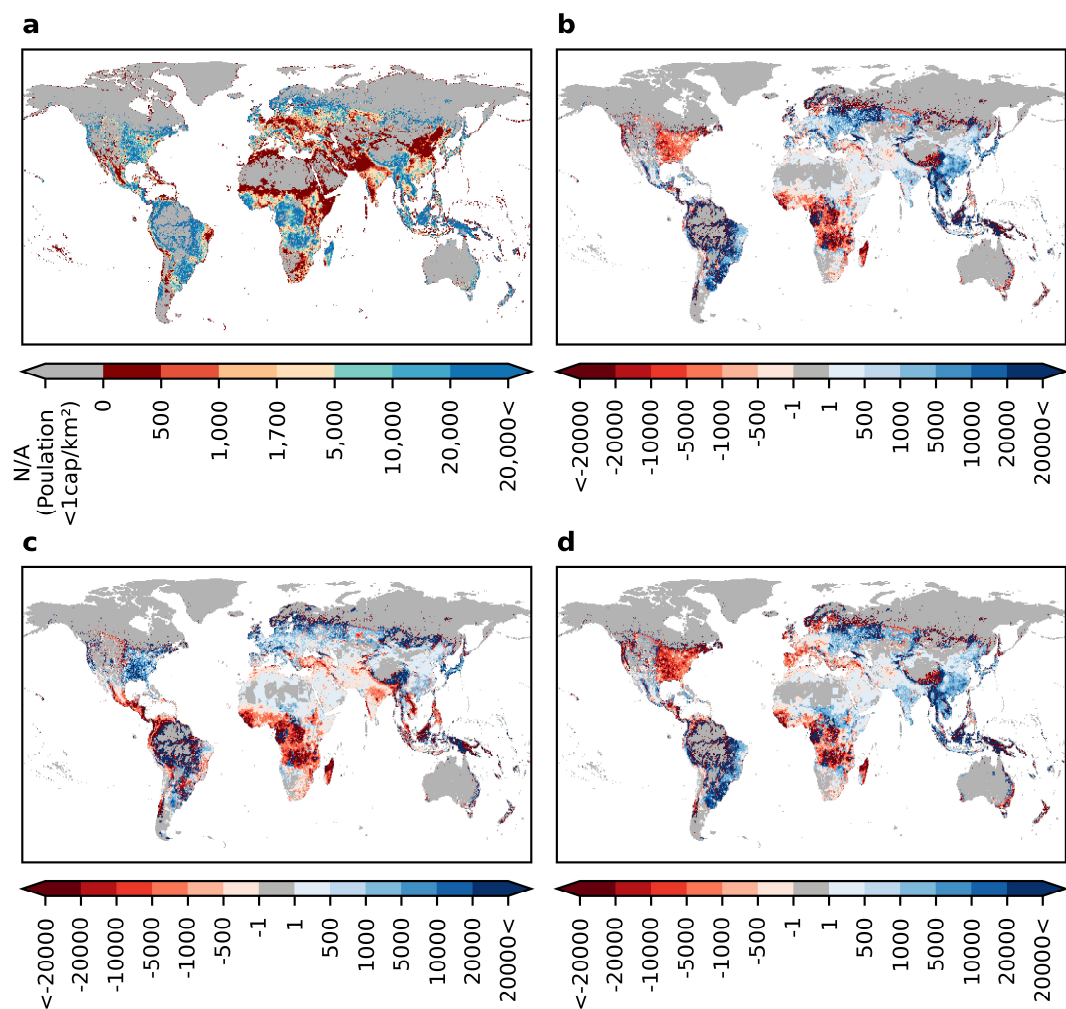
Supplementary Figure 10: Histogram of the (a) Million Population and (b) Percentage of Population in terms of freshwater availability ($\text{m}^3/\text{cap}/\text{year}$) calculated considering gridded population by GPWv4 for historical and Murakami and Yamagata (2019) for future scenarios.



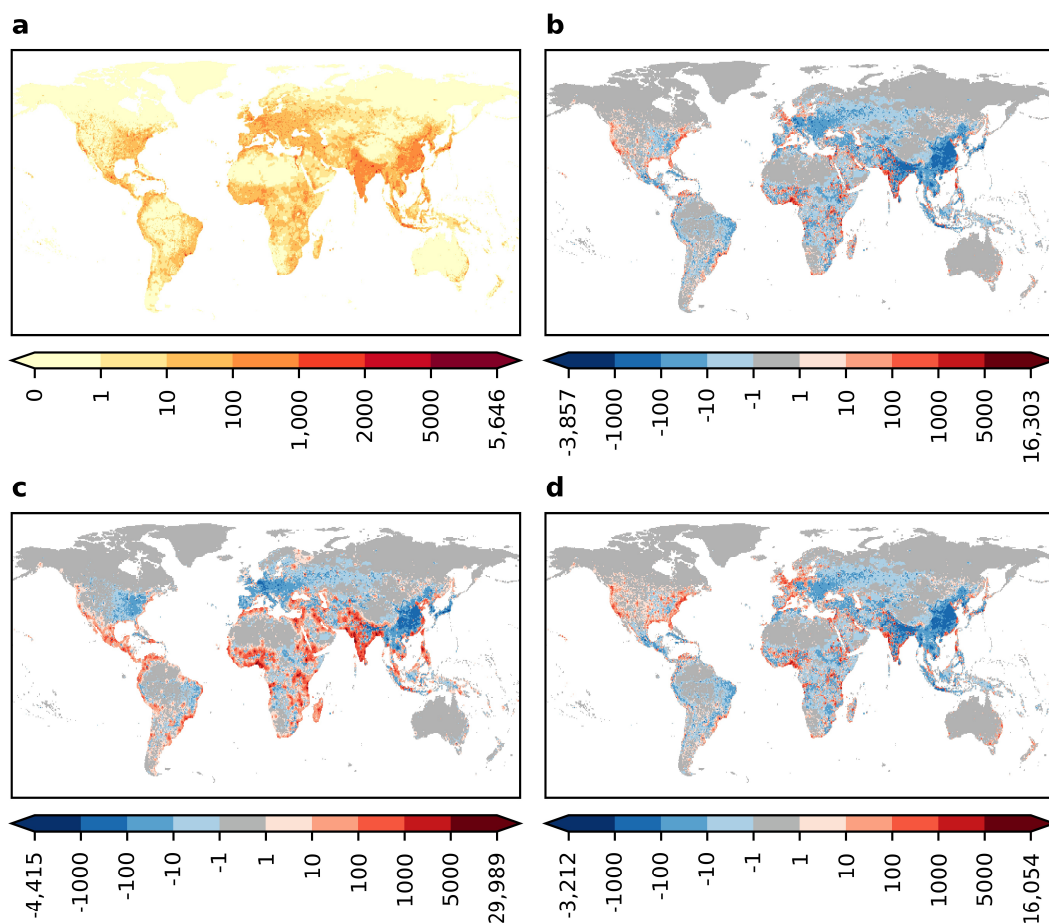
Supplementary Figure 11: Histogram of the (a) Million Population and (b) Percentage of Population in terms of freshwater availability ($\text{m}^3/\text{cap}/\text{year}$) calculated considering gridded population by HYDE 3.2 for historical and Jones and O'Neill (2016) for future scenarios.



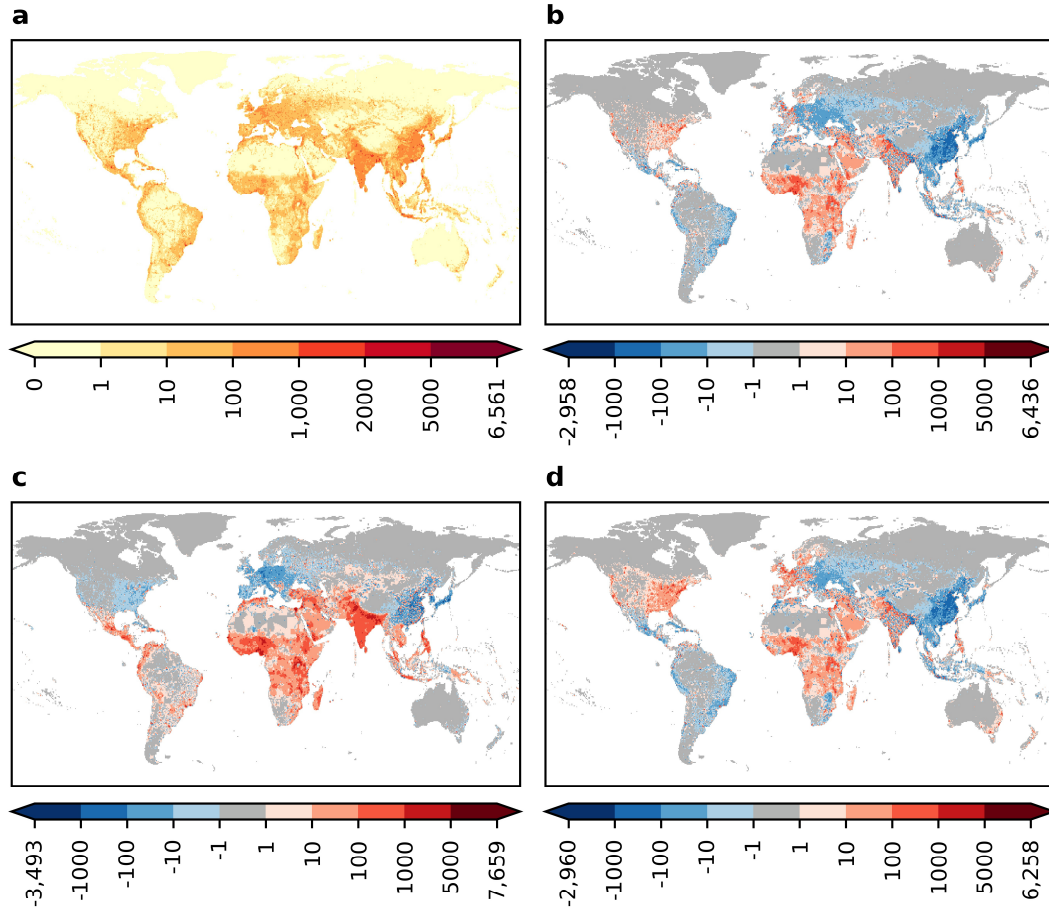
Supplementary Figure 12: Distribution of freshwater availability in ($m^3/cap/year$) (a) Historical (2000), and the difference between (b) SSP1-RCP2.6(2099) and Historical (2000), (c) SSP3-RCP7.0 (2099) and Historical (2000), and (d) SSP5-RCP8.5 (2099) and Historical (2000), calculated considering gridded population by GPWv4 for historical and Murakami and Yamagata (2019) for future scenarios.



Supplementary Figure 13: Distribution of freshwater availability in ($m^3/cap/year$) (a) Historical (2000), and the difference between (b) SSP1-RCP2.6(2099) and Historical (2000), (c) SSP3-RCP7.0 (2099) and Historical (2000), and (d) SSP5-RCP8.5 (2099) and Historical (2000), calculated considering gridded population by HYDE3.2 database for Historical and Jones and O'Neill (2016) for future scenarios.



Supplementary Figure 14: Population Distribution over the globe (capita/km²) (a) Historical (2000), and the difference between (b) SSP1 (2099) and Historical (2000), (c) SSP3 (2099) and Historical (2000), and (d) SSP5 (2099) and Historical (2000)), calculated considering gridded population by GPWv4 for historical and Murakami and Yamagata (2019) for future scenarios.



Supplementary Figure 15: Population Distribution over the globe (capita/km²) (a) Historical (2000), and the difference between (b) SSP1 (2099) and Historical (2000), (c) SSP3 (2099) and Historical (2000), and (d) SSP5 (2099) and Historical (2000)), calculated considering gridded population by HYDE3.2 database for Historical and Jones and O'Neill (2016) for future scenarios.

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