Methodological approach for climate simulations selection for climate change impact studies

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Supplementary Information

Online Resource 1. Euclidean distance between simulations and Dry-Cold, Dry-Warm, Wet-Cold and Wet-Warm corners (RCP4.5)

Simulations	ΔP (%)	ΔT (°C)	Distance to corners			
			Dry-Cold	Dry-Warm	Wet-Cold	Wet-Warm
CanESM2	-14.9	3.1	18.0	18.0	14.9	14.9
CCLM_CNRM	-26.3	2.0	6.6	6.7	26.3	26.3
CCLM_ICHEC	-2.2	2.2	30.6	30.7	2.2	2.4
CCLM_MPI	-22.4	2.2	10.5	10.6	22.3	22.4
CMCC.CM	-32.4	3.1	1.2	0.5	32.4	32.4
CMCC.CMS	0.0	2.7	32.9	32.9	0.8	0.5
CNRM.CM5	-16.4	2.1	16.5	16.6	16.3	16.4
CSIRO.MK3.6	-17.4	2.9	15.5	15.4	17.4	17.4
FGOALS.S2.0	-22.5	1.8	10.4	10.5	22.5	22.5
GFDL.ESM2G	1.0	1.8	33.8	33.9	1.0	1.8
GFDL.ESM2M	-23.0	2.1	9.9	10.0	22.9	23.0
HADGEM2.AO	-19.0	2.7	13.9	13.9	19.0	19.0
HADGEM2.CC	-37.7	2.8	4.9	4.8	37.7	37.7
HADGEM2.ES	-38.3	3.0	5.5	5.4	38.3	38.2
INMCM4	-32.6	1.3	0.7	1.9	32.5	32.6
IPSL.CM5A.LR	-52.5	2.6	19.7	19.6	52.5	52.5
IPSL.CM5A.MR	-33.6	2.8	1.1	0.9	33.6	33.6
IPSL.CM5B.LR	-16.8	2.0	16.1	16.2	16.7	16.8
RACMO22T_ICHEC	-1.8	2.1	31.1	31.1	1.7	2.0
RACMO22T_HADGEM2	-18.8	3.7	14.2	14.1	18.8	18.8
MIROC.ESM	9.0	3.2	41.9	41.9	9.1	9.0
MIROC.ESM.CHEM	9.0	3.2	41.9	41.9	9.1	9.0
MIROC5	-15.5	2.8	17.4	17.4	15.5	15.5
MPI.ESM.LR	-18.3	1.9	14.5	14.6	18.3	18.3
MPI.ESM.MR	-32.4	2.3	0.6	1.0	32.4	32.4
REMO2009_MPI	-18.2	2.2	14.7	14.7	18.2	18.2
MRI.CGCM3	0.0	2.0	32.8	32.9	0.0	1.3
NORESM1.M	-21.9	2.2	11.0	11.0	21.9	21.9
RCA4_CANESM2	-25.3	3.0	7.6	7.6	25.3	25.3
RCA4_CNRM	-13.9	1.9	18.9	19.0	13.9	14.0
RCA4_ICHEC	-17.1	2.2	15.8	15.8	17.1	17.1
RCA4_MPI	-11.0	2.3	21.9	21.9	11.0	11.0
RCA4_CSIRO	-1.6	3.3	31.3	31.3	2.1	1.6
RCA4_IPSL	-32.4	3.1	1.3	0.5	32.4	32.3
RCA4_MIROC	-19.3	2.7	13.6	13.6	19.3	19.3
RCA4_HADGEM2	-20.8	3.6	12.2	12.0	20.9	20.8
RCA4_NORESM1	-0.2	2.4	32.7	32.7	0.5	0.8
RCA4_GFDL	-10.9	2.4	22.0	22.0	10.9	10.9

Online Resource 2. Euclidean distance between simulations and Dry-Cold, Dry-Warm, Wet-Cold and Wet-Warm corners (RCP8.5)

Simulations	ΔP (%)	ΔT (°C)	Distance to corners			
			Dry-Cold	Dry-Warm	Wet-Cold	Wet-Warm
CanESM2	-13.4	5.4	41.4	41.4	7.6	7.4
CCLM_CNRM	-36.1	3.7	18.7	18.8	30.1	30.1
CCLM_ICHEC	-33.4	3.7	21.4	21.5	27.3	27.4
CCLM_MPI	-54.1	4.2	0.9	1.7	48.1	48.1
CMCC.CM	-39.3	5.7	15.6	15.5	33.3	33.2
CMCC.CMS	-33.1	5.0	21.8	21.7	27.1	27.0
CNRM.CM5	-24.7	3.9	30.1	30.1	18.7	18.8
CSIRO.MK3.6	-24.4	4.6	30.4	30.4	18.4	18.4
FGOALS.S2.0	-45.1	4.8	9.7	9.7	39.1	39.1
GFDL.ESM2G	16.0	3.7	70.8	70.8	22.0	22.1
GFDL.ESM2M	-13.2	3.8	41.6	41.6	7.2	7.4
HADGEM2.AO	-42.6	4.2	12.2	12.3	36.6	36.6
HADGEM2.CC	-42.6	5.1	12.3	12.2	36.6	36.6
HADGEM2.ES	-46.5	5.1	8.4	8.3	40.5	40.5
INMCM4	-38.0	3.0	16.8	17.0	32.0	32.1
IPSL.CM5A.LR	-74.9	5.4	20.2	20.1	68.9	68.8
IPSL.CM5A.MR	-62.7	5.3	8.1	8.0	56.7	56.7
IPSL.CM5B.LR	-59.7	3.6	5.0	5.4	53.7	53.8
RACMO22T_ICHEC	-23.3	4.3	31.5	31.5	17.3	17.4
RACMO22T_HADGEM2	-23.5	5.9	31.4	31.3	17.6	17.5
MIROC.ESM	32.4	5.9	87.2	87.2	38.5	38.4
MIROC.ESM.CHEM	32.4	5.9	87.2	87.2	38.5	38.4
MIROC5	-16.0	4.7	38.8	38.8	10.0	10.0
MPI.ESM.LR	-52.2	3.7	2.6	3.3	46.1	46.2
MPI.ESM.MR	-48.9	4.5	5.9	6.0	42.9	42.9
REMO2009_MPI	-50.4	4.5	4.5	4.6	44.3	44.3
MRI.CGCM3	1.6	3.7	56.4	56.5	7.7	7.9
NORESM1.M	-41.5	4.0	13.3	13.4	35.4	35.5
RCA4_CANESM2	-38.0	5.2	16.9	16.8	32.0	31.9
RCA4_CNRM	-17.9	3.9	36.9	37.0	11.8	12.0
RCA4_ICHEC	-24.4	4.1	30.4	30.5	18.3	18.4
RCA4_MPI	-29.3	4.5	25.6	25.6	23.2	23.3
RCA4_CSIRO	-9.3	5.2	45.5	45.5	3.6	3.3
RCA4_IPSL	-56.4	5.7	2.6	1.6	50.4	50.4
RCA4_MIROC	-31.4	4.8	23.5	23.5	25.3	25.3
RCA4_HADGEM2	-29.9	5.8	25.0	24.9	23.9	23.8
RCA4_NORESM1	-16.8	4.1	38.0	38.1	10.7	10.9
RCA4_GFDL	-23.7	4.3	31.1	31.2	17.6	17.7

Online Resource 3. Simulations ranking based on the ability of the models to simulate the reference period climate (RCP4.5)

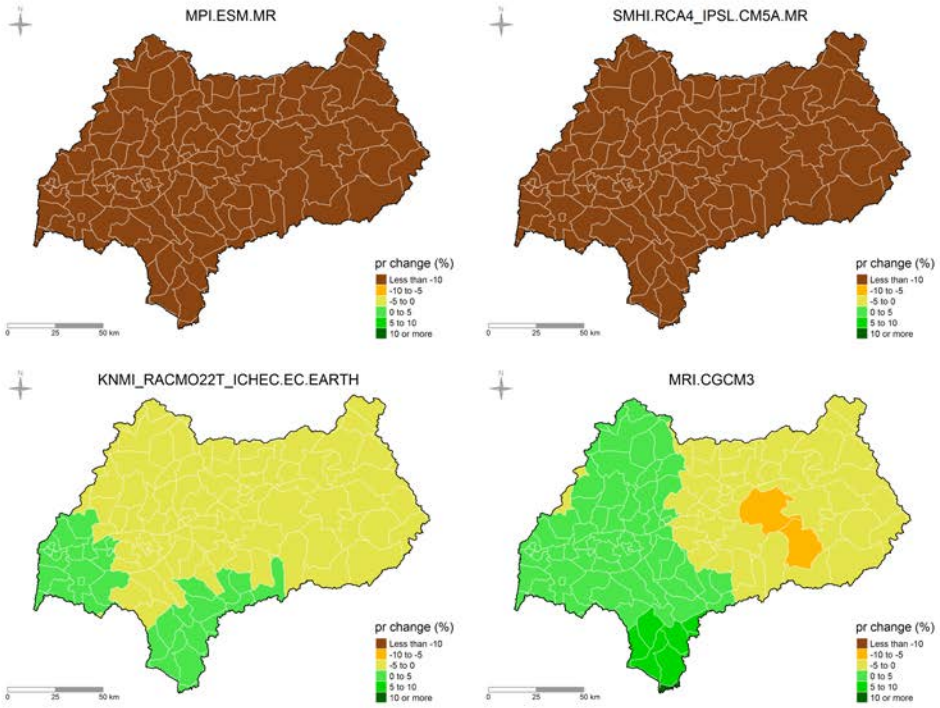
Models	ScP	ScT	Sc	Rank
SMHI-RCA4_NOAA-GFDL-ESM2M	1.000	0.936	0.968	1
SMHI_RCA4_MPI-ESM-LR	0.877	0.996	0.936	2
SMHI-RCA4_MIROC-MIROC5	0.771	0.951	0.861	3
SMHI-RCA4_MOHC-HADGEM2-ES	0.691	0.996	0.843	4
SMHI_RCA4_CNRM-CM5	0.701	0.955	0.828	5
SMHI-RCA4_CSIRO-QCCCE-CSIRO-MK3-6-0	0.686	0.959	0.823	6
SMHI_RCA4_ICHEC-EC-EARTH	0.591	0.992	0.791	7
SMHI-RCA4_NCC-NORESM1-M	0.430	0.944	0.687	8
KNMI-RACMO22T_MOHC-HADGEM2-ES	0.246	0.972	0.609	9
CNRM.CM5	0.213	0.998	0.605	10
SMHI_RCA4_CCCMA-CANESM2	0.231	0.973	0.602	11
CLMCOM_CCLM4-8-17_CNRM-CM5	0.192	0.997	0.594	12
CMCC.CM	0.179	0.998	0.589	13
SMHI-RCA4_IPSL-CM5A-MR	0.212	0.947	0.579	14
CLMCOM_CCLM4-8-17_MPI-ESM-LR	0.116	0.997	0.556	15
KNMI_RACMO22T_ICHEC-EC-EARTH	0.097	0.997	0.547	16
MPI.ESM.LR	0.134	0.950	0.542	17
IPSL.CM5B.LR	0.094	0.968	0.531	18
MIROC5	0.112	0.946	0.529	19
GFDL.ESM2M	0.092	0.956	0.524	20
HADGEM2.CC	0.052	0.995	0.523	21
MPI-CSC_REMO2009_MPI-ESM-LR	0.088	0.955	0.522	22
MRI.CGCM3	0.085	0.955	0.520	23
HADGEM2.ES	0.042	0.990	0.516	24
HADGEM2.AO	0.022	0.996	0.509	25
IPSL.CM5A.LR	0.029	0.988	0.509	26
CSIRO.MK3.6	0.018	0.995	0.507	27
MPI.ESM.MR	0.019	0.992	0.505	28
FGOALS.S2.0	0.011	0.998	0.505	29
CLMCOM_CCLM4-8-17_ICHEC-EC-EARTH	0.016	0.991	0.503	30
IPSL.CM5A.MR	0.022	0.984	0.503	31
INMCM4	0.005	0.998	0.502	32
NORESM1.M	0.004	0.998	0.501	33
GFDL.ESM2G	0.025	0.950	0.488	34
CMCC.CMS	0.010	0.947	0.479	35
MIROC.ESM	0.004	0.949	0.476	36
CanESM2	0.002	0.950	0.476	37
MIROC.ESM.CHEM	0.004	0.938	0.471	38

Online Resource 4. Simulations ranking based on the ability of the models to simulate the reference period climate (RCP8.5)

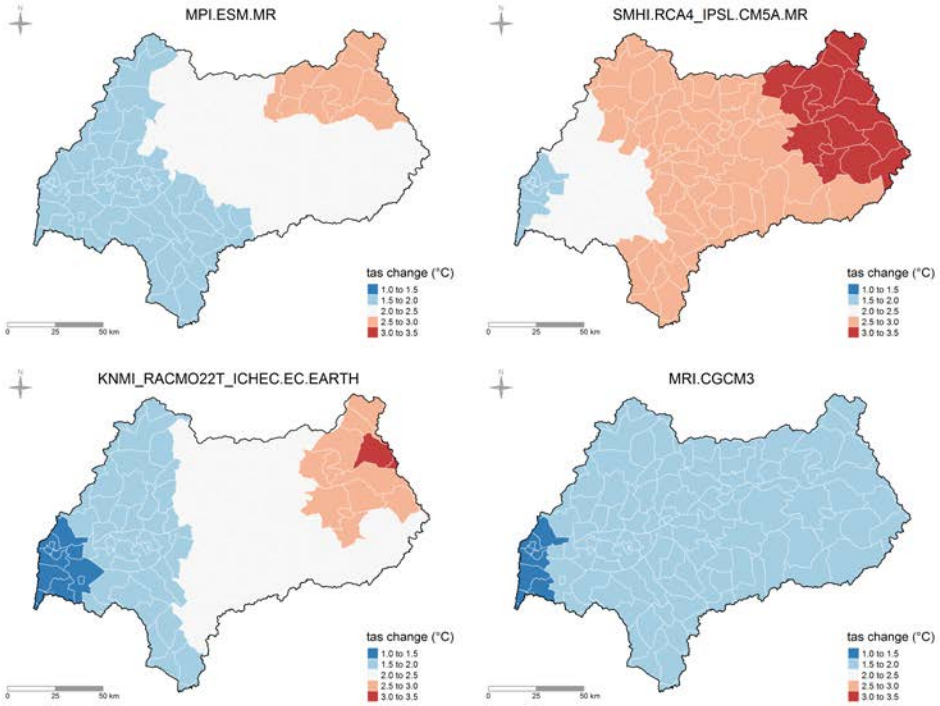
Models	ScP	ScT	Sc	Rank
SMHI-RCA4_NOAA-GFDL-ESM2M	1.000	0.936	0.968	1
SMHI_RCA4_MPI-ESM-LR	0.877	0.996	0.936	2
SMHI-RCA4_MIROC-MIROC5	0.771	0.951	0.861	3
SMHI-RCA4_MOHC-HADGEM2-ES	0.691	0.996	0.843	4
SMHI_RCA4_CNRM-CM5	0.701	0.955	0.828	5
SMHI-RCA4_CSIRO-QCCCE-CSIRO-MK3-6-0	0.686	0.959	0.823	6
SMHI_RCA4_ICHEC-EC-EARTH	0.591	0.992	0.791	7
SMHI-RCA4_NCC-NORESM1-M	0.430	0.944	0.687	8
KNMI-RACMO22T_MOHC-HADGEM2-ES	0.246	0.972	0.609	9
CNRM.CM5	0.213	0.998	0.605	10
SMHI_RCA4_CCCMA-CANESM2	0.231	0.973	0.602	11
CLMCOM_CCLM4-8-17_CNRM-CM5	0.192	0.997	0.594	12
CMCC.CM	0.179	0.998	0.589	13
SMHI-RCA4_IPSL-CM5A-MR	0.212	0.947	0.579	14
CLMCOM_CCLM4-8-17_MPI-ESM-LR	0.116	0.997	0.556	15
KNMI_RACMO22T_ICHEC-EC-EARTH	0.097	0.997	0.547	16
MPI.ESM.LR	0.134	0.950	0.542	17
IPSL.CM5B.LR	0.094	0.968	0.531	18
MIROC5	0.112	0.946	0.529	19
GFDL.ESM2M	0.092	0.956	0.524	20
HADGEM2.CC	0.052	0.995	0.523	21
MPI-CSC_REMO2009_MPI-ESM-LR	0.088	0.955	0.522	22
MRI.CGCM3	0.085	0.955	0.520	23
HADGEM2.ES	0.042	0.990	0.516	24
HADGEM2.AO	0.022	0.996	0.509	25
IPSL.CM5A.LR	0.029	0.988	0.509	26
CSIRO.MK3.6	0.018	0.995	0.507	27
MPI.ESM.MR	0.019	0.992	0.505	28
FGOALS.S2.0	0.011	0.998	0.505	29
CLMCOM_CCLM4-8-17_ICHEC-EC-EARTH	0.016	0.991	0.503	30
IPSL.CM5A.MR	0.022	0.984	0.503	31
INMCM4	0.005	0.998	0.502	32
NORESM1.M	0.004	0.998	0.501	33
GFDL.ESM2G	0.025	0.950	0.488	34
CMCC.CMS	0.010	0.947	0.479	35
MIROC.ESM	0.004	0.949	0.476	36
CanESM2	0.002	0.950	0.476	37
MIROC.ESM.CHEM	0.004	0.938	0.471	38

Online Resource 5. Selected simulations for each corner based on the change in the means after bias correction

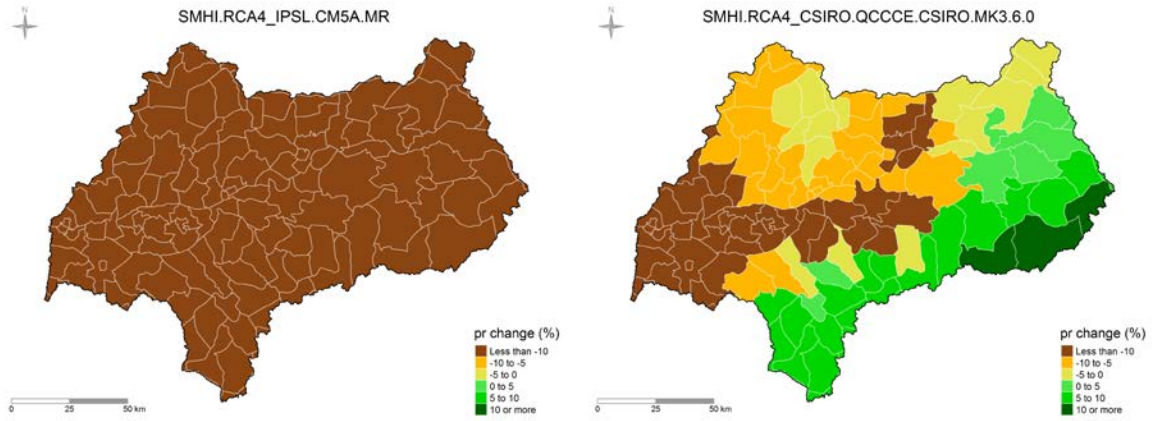
Projection	GCM/RCM runs	ΔP	ΔT
	RCP4.5		
Dry-Cold	HADGEM2.ES	-9.96	0.86
	SMHI-RCA4_MIROC-MIROC5	-12.07	0.70
	HADGEM2.CC	-8.98	0.76
	MPI-CSC_REMO2009_MPI-ESM-LR	-8.55	0.79
	CLMCOM_CCLM4-8-17_MPI-ESM-LR	-8.05	0.47
Dry-Warm	HADGEM2.ES	-9.96	0.86
	SMHI-RCA4_MIROC-MIROC5	-12.07	0.70
	HADGEM2.CC	-8.98	0.76
	MPI-CSC_REMO2009_MPI-ESM-LR	-8.55	0.79
	CLMCOM_CCLM4-8-17_MPI-ESM-LR	-8.05	0.47
Wet-Cold	GFDL.ESM2G	-1.21	0.63
	KNMI-RACMO22T_MOHC-HADGEM2-ES	-1.94	0.37
	SMHI_RCA4_CCCMA-CANESM2	-0.79	0.67
	SMHI-RCA4_MOHC-HADGEM2-ES	-2.38	0.33
	SMHI-RCA4_IPSL-CM5A-MR	-2.57	0.39
Wet-Warm	GFDL.ESM2G	-1.21	0.63
	SMHI_RCA4_CCCMA-CANESM2	-0.79	0.67
	KNMI-RACMO22T_MOHC-HADGEM2-ES	-1.94	0.37
	SMHI-RCA4_MOHC-HADGEM2-ES	-2.38	0.33
	MIROC.ESM	-1.41	2.44
	RCP8.5		
Dry-Cold	HADGEM2.ES	-9.96	0.86
	SMHI-RCA4_MIROC-MIROC5	-12.07	0.70
	HADGEM2.CC	-8.98	0.76
	MPI-CSC_REMO2009_MPI-ESM-LR	-8.55	0.79
	CLMCOM_CCLM4-8-17_MPI-ESM-LR	-8.05	0.47
Dry-Warm	HADGEM2.ES	-9.96	0.86
	SMHI-RCA4_MIROC-MIROC5	-12.07	0.70
	HADGEM2.CC	-8.98	0.76
	MPI-CSC_REMO2009_MPI-ESM-LR	-8.55	0.79
	CLMCOM_CCLM4-8-17_MPI-ESM-LR	-8.05	0.47
Wet-Cold	GFDL.ESM2G	-1.21	0.63
	KNMI-RACMO22T_MOHC-HADGEM2-ES	-1.94	0.37
	SMHI_RCA4_CCCMA-CANESM2	-0.79	0.67
	SMHI-RCA4_MOHC-HADGEM2-ES	-2.38	0.33
	SMHI-RCA4_IPSL-CM5A-MR	-2.57	0.39
Wet-Warm	GFDL.ESM2G	-1.21	0.63
	SMHI_RCA4_CCCMA-CANESM2	-0.79	0.67
	KNMI-RACMO22T_MOHC-HADGEM2-ES	-1.94	0.37
	SMHI-RCA4_MOHC-HADGEM2-ES	-2.38	0.33
	MIROC.ESM	-1.41	2.44



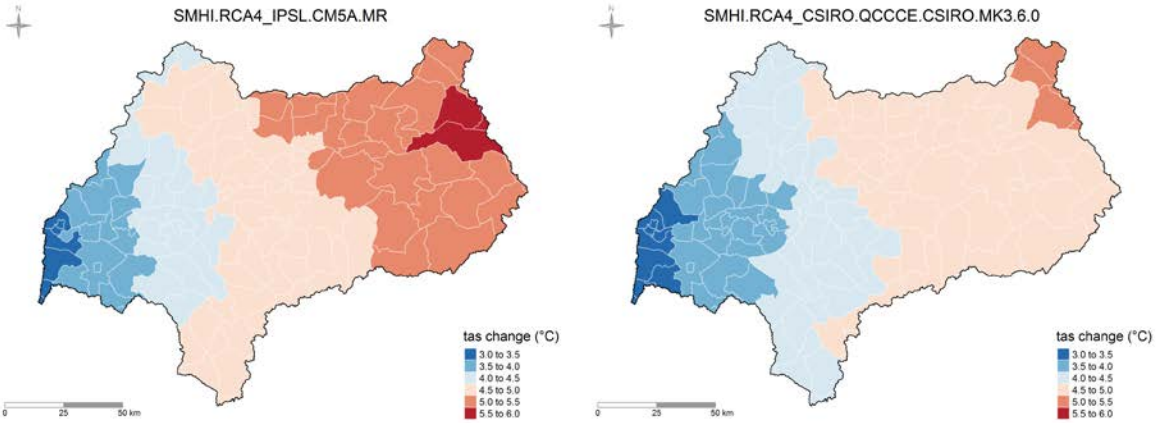
Online Resource 6. Future projections (2066-2095) of precipitation change for selected simulations following the first selection procedure for RCP4.5



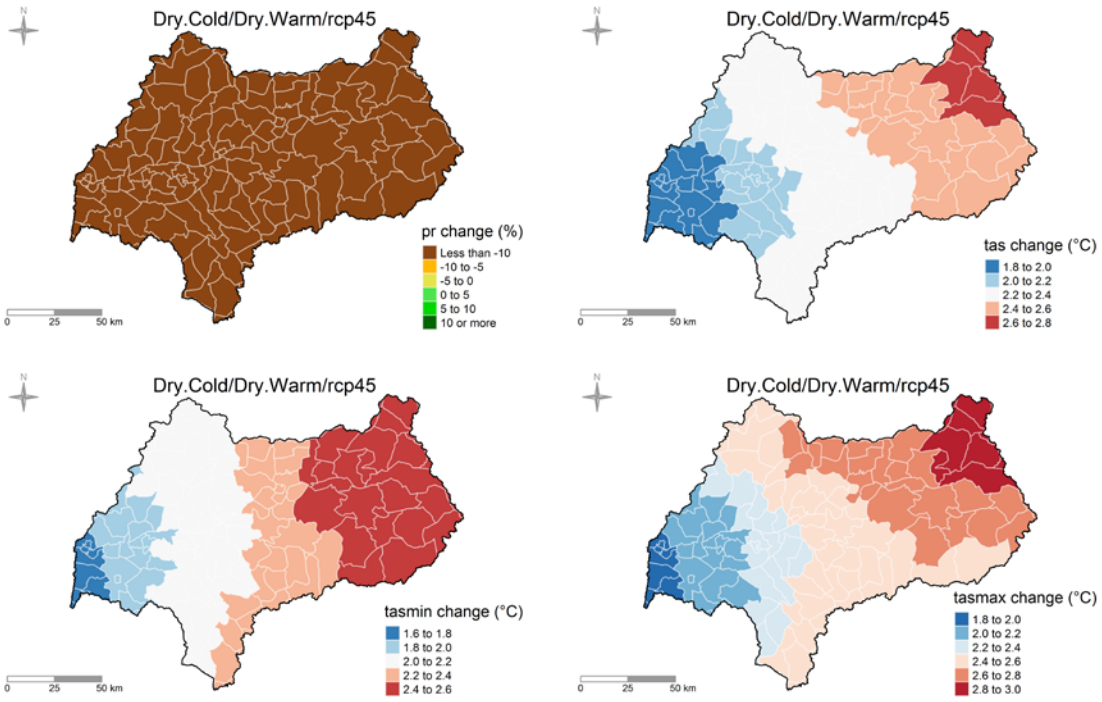
Online Resource 7. Future projections (2066-2095) of temperature change for selected simulations following the first selection procedure for RCP4.5



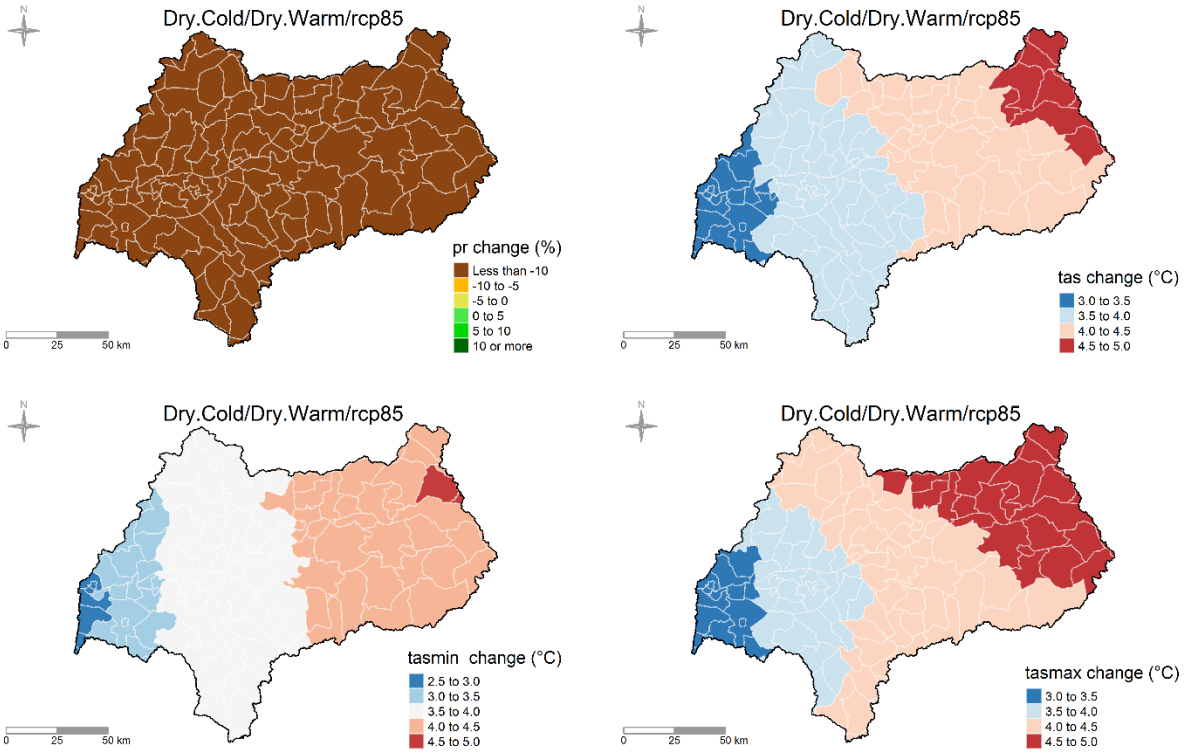
Online Resource 8. Future projections (2066-2095) of precipitation change for selected simulations following the first selection procedure for RCP8.5



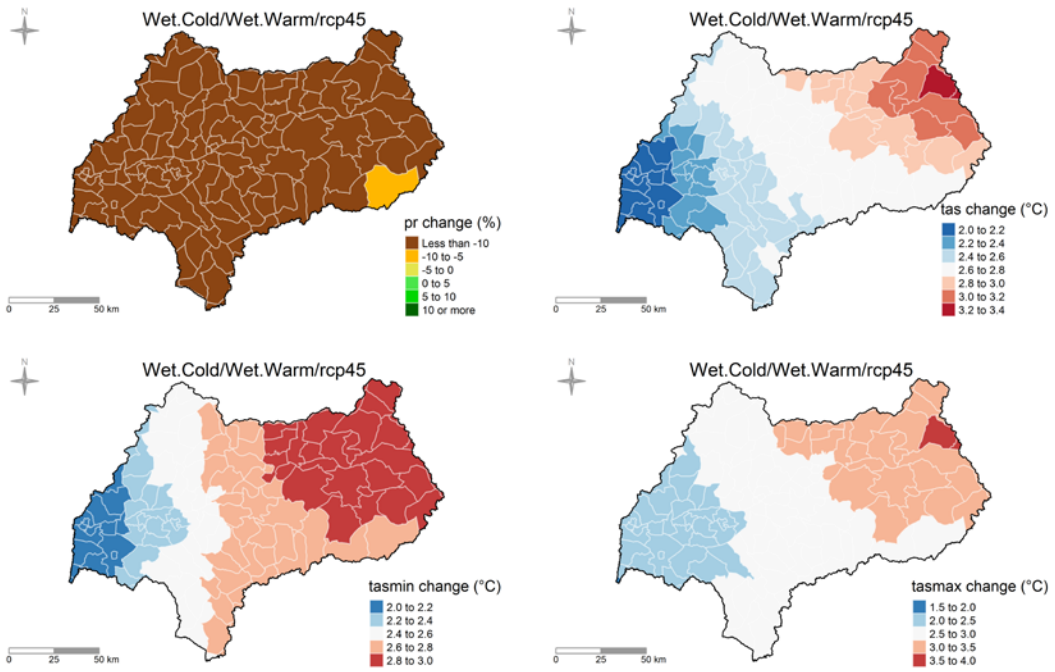
Online Resource 9. Future projections (2066-2095) of temperature change for selected simulations following the first selection procedure for RCP8.5



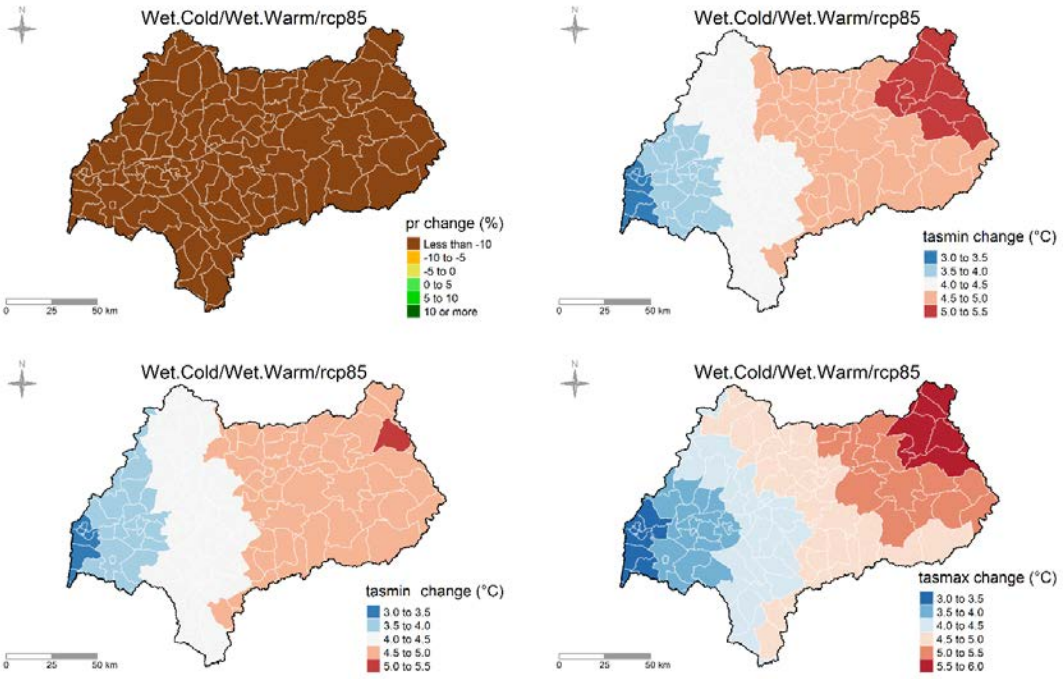
Online Resource 10. Dry-Cold/Dry-Warm projections (2066-2095) for selected simulations following the third selection procedure for RCP4.5



Online Resource 11. Dry-Cold/Dry-Warm projections (2066-2095) for selected simulations following the third selection procedure for RCP8.5



Online Resource 12. Wet-Cold/Wet-Warm projections (2066-2095) for selected simulations following the third selection procedure for RCP4.5



Online Resource 13. Warm-Cold/Wet-Warm projections (2066-2095) for selected simulations following the third selection procedure for RCP8.5