Supplement for

Impact of Climate Change on Flood Frequency and Intensity in the Kabul River Basin

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Total cumulative estimated economic losses of all the floods that have been already reported in the Kabul river basin. Figure S1 presents all the losses in terms of direct losses, human loss, no of villages that were damaged or destroyed due to these floods in the past 80 years. Similarly, in Table S1 the direct damages due to floods in lower part of the Kabul basin are reported specifically in 2010 flood which was most devastating in the history.

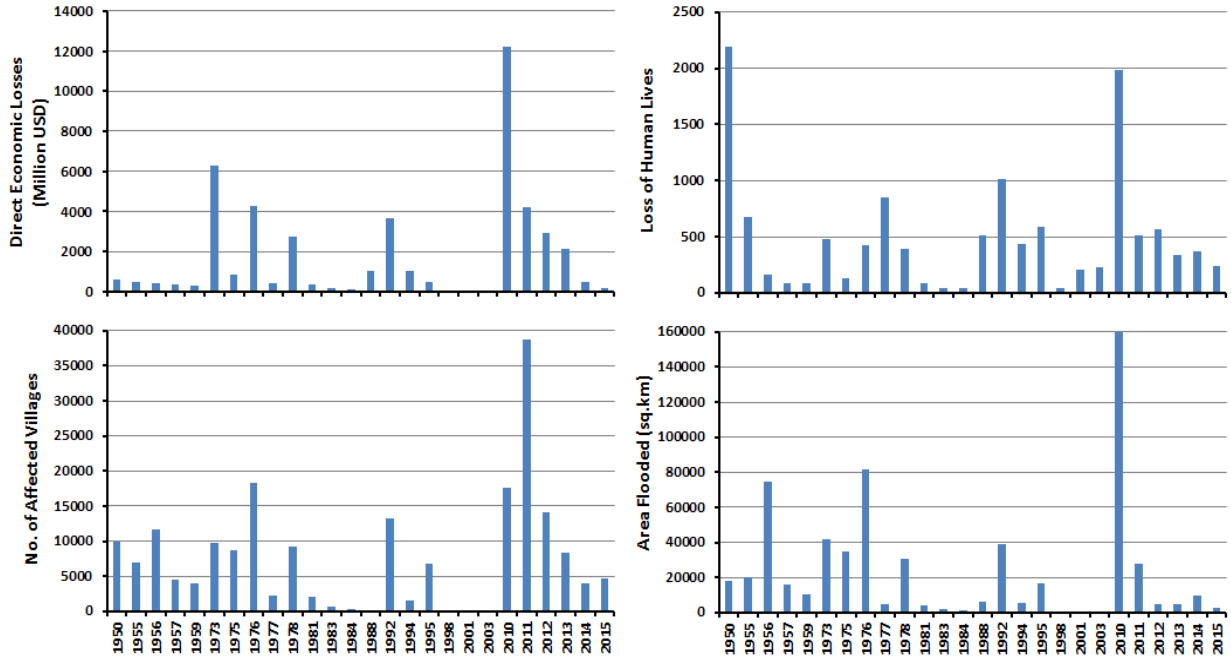

Figure S1: Flood damages during 1950-2015 in the overall Indus Basin, Pakistan (FFC 2015)

Table S1: District-wise flood damages in 2010 in the lower Kabul basin in Pakistan (Khan and Mohmand, 2011).

Districts	Number of Affected Villages	Number of Human Deaths	Number of Injured People	Total Population Displaced	Loss of Crops (ha)
Peshawar	16	46	68	37373	37555
Charsadda	34	66	115	145810	16480
Nowshera	27	167	10	350336	No data
Mardan	43	8	40	11403	285
Swabi	11	7	4	742	40
Swat	42	95	207	101220	13950
Total	**173**	**389**	**444**	**646884**	**68310**

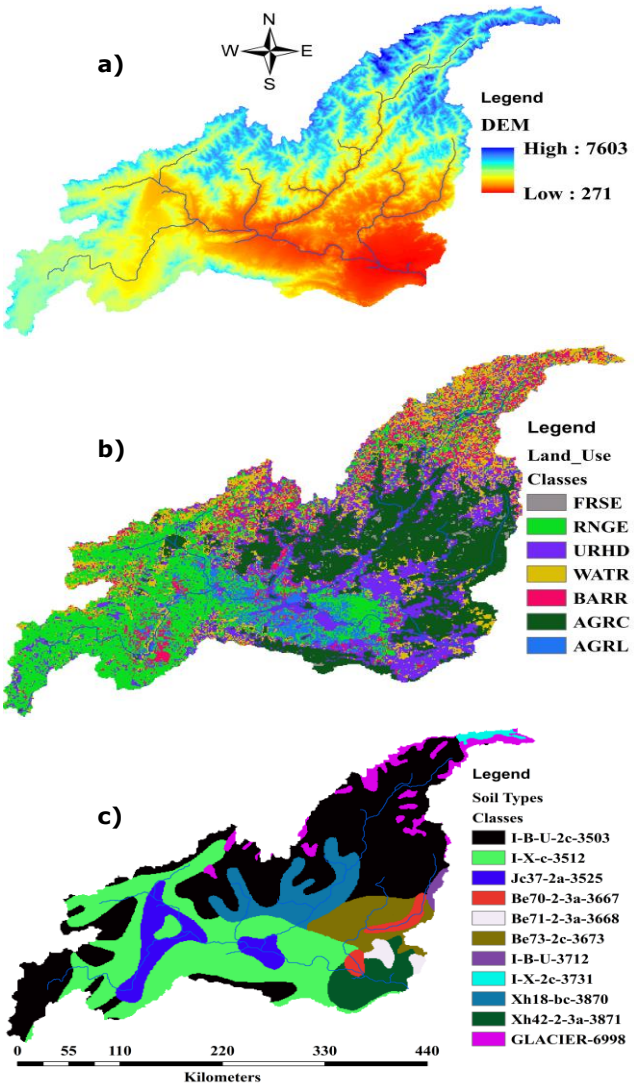

Figure S2: (a)Digital Elevation Model (resolution 90m) ranges from 271m to 7603m (b) land-use classes, where FRSE = Forest, RNGE = Range Land / Pasture land, URHD= Urban area, WATR= Water bodies, BARR= Barren land, AGRC= Agricultural land close grown crops, and AGRL= General Agricultural land, all the land-use classes were taken from (Arnold et al. 2009) (c) soil types classification of the Kabul basin.

Table-S2: Parameters selected and final calibrated values for SWAT-Model.

Parameter_ Name	**Min_value**	**Max_value**	**Calibrated_Value**
Snow peak temperature ^{0}C lag factor (*TIMP*)	0.373601	1	0.462
Snowmelt base temperature ^{0}C (*SMTMP*)	3.89562	6.460076	5.616
Snowfall temperature ^{0}C (*SFTMP*)	0.277164	2.808696	1.841
Curve number (CN_2)	75.157191	78.54298	73.084
Average slop steepness (*HRU_SLP*)	0.726551	1.753337	1.144
"n" value for overland flow (*OV_N*)	-0.06826	0.434154	0.219
Average slop length in meters (*SLSUBBSN*)	1.047301	3.084937	1.057
Base-flow alpha factor days(*ALPHA_BF*)	0.344094	0.660076	0.455
Groundwater delay (*GW_DELAY*)	37.193033	47.708542	41.933
Soil available water capacity (*SOL_AWC*)	0.089423	0.289731	0.179
Evaporation compensation coefficient (*ESCO*)	0.603259	1.061997	0.776
Surface runoff lag coefficient (*SURLAG*)	5.141996	18.747337	13.501
Saturated hydraulic conductivity (*SOL_K*)	1.041996	3.3747337	1.377
Threshold depth of water in the shallow aquifer for return flow (*GWQMIN*)	1.952797	4.084298	2.789

Table-S3: Flow (m^3/s) for the 5, 25, 50, 100, and 500 year return periods for RCP 4.5 and RCP 8.5 for all selected GCMs and observed annual maximum flow for the contemporary period (1981-2015), near (2031-2050) and far (2081-2100) future.

	Time Period per RCP	5 yrs.	25 yrs.	50 yrs.	100 yrs.	500 yrs.
Observed	**1981-2015**	4500	5700	7300	8200	9150
INM-CM4	**RCP4.5 2031-2050**	4300	5165	6880	7733	8622
IPSL-CM5A		5829	6565	8580	9644	10753
EC-EARTH		6384	7172	9840	11060	12332
MIROC5		9626	10250	11698	13148	14660
INM-CM4	**RCP8.5 2031-2050**	4320	5093	7194	8086	9016
IPSL-CM5A		5520	6295	9094	10222	11397
EC-EARTH		7063	8088	11024	12391	13816
MIROC5		11360	12335	12814	14403	16059
INM-CM4	**RCP4.5 2081-2100**	4205	5262	7258	8158	9096
IPSL-CM5A		6181	6962	8781	9870	11005
EC-EARTH		7870	9079	10932	12288	13701
MIROC5		11929	13215	13455	15123	16862
INM-CM4	**RCP8.5 2081-2100**	4510	5100	7042	7915	8825
IPSL-CM5A		5872	6614	8342	9376	10454
EC-EARTH		7366	8305	10205	11471	12790
MIROC5		11030	12500	13122	14749	16445