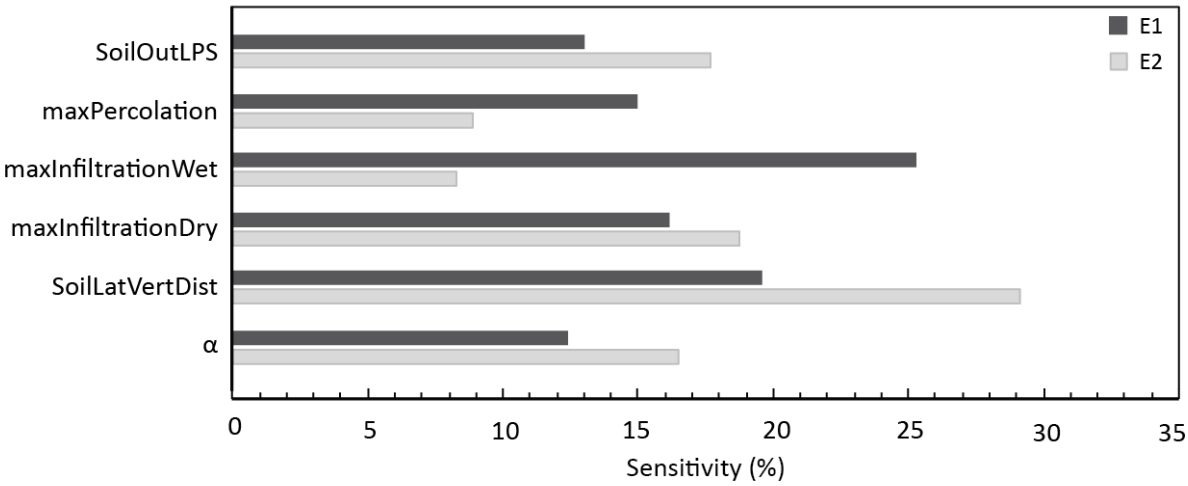

Supplementary Figure 1: The sensitivity analysis conducted for the Verlorenvlei sub-catchment calibration parameters using Nash Sutcliffe Efficiency with squared difference (e2) and absolute values (e1)(Watson *et al*., 2018)

Name of parameter	Description of parameter	min	max	optimized value
FC_Adaptation	multiplies the volume of the middle pore storage of soil	0.8	1.5	1.472503
AC_Adaptation	multiplies the volume of the large pore storage of soil	0.8	1.5	0.804489
gw_CapRise	parameter to govern the amount of capillary rise to replenish the soil storage out of the groundwater	1	10	4.412625
gwRG1_RG2_dist	distribution parameter for the slow and fast groundwater runoff (influences overall hydrograph and especially the baseflow)	0	10	3.023532
gwRG1Fact	fast groundwater (slow interflow) delay f (influences overall hydrograph)	0	0.2	0.065366
gwRG2Fact	Base flow delay (influences especially the baseflow)	0	0.2	0.197137
a_rain	Plant canopy interception parameter (mm/LAI) (Influences basically ET)	1	10	6.570599
soilMaxPerc	Conductivity adaption parameter for leaching water to the groundwater storage. (influences baseflow and overall hydrograph, distribution of runoff components)	0	20	5.161027
soilConcRD2	Interflow delay parameter (influences the quick flow components)	2	5	4.94513
soilConcRD1	Surface runoff delay parameter (influences the quick flow components)	1	2	1.33439
soilOutLPS	Outflow parameter of the large pore storage. (Influencing ET, hydrograph and distribution of runoff components)	0.1	1	0.34583
soilMAXDPS	Parameter describing the maximum storage on the soil surface. (influences ET and surface runoff)	3	10	6.681899
soilMaxInfSummer	Decribing the maximum infiltration capacity of soil in the winter period (influences ET and surface runoff)	10	200	118.514
soilMaxInfWinter	Decribing the maximum infiltration capacity of soil in the winter period (influences ET and surface runoff)	10	200	29.30617
soilLinRed	Actual ET parameter, governing the reduction of potential ET according to the soil moisture (influences the ET and therefore the water balance)	0	1	0.333001
flowRouteTA	Stream routing parameter (overall damping of the hydrograph)	1	100	10.17903

Supplementary Table 1: The model calibration parameters for the Verlorenvlei sub-catchment with minimum, maximum and optimized values

Landuse	Albedo	Root depth (dm)	Sealed grade	Growing season 1 LAI	1 Height (m)	1 Surface resistance (s/m)	2 LAI	2 Height (m)	2 Surface resistance (s/m)	3 LAI	3 Height (m)	3 Surface resistance (s/m)	4 LAI	4 Height (m)	4 Surface resistance (s/m)
Wetlands and waterbodies	150	0	0	1	0.05	150	1	0.05	150	1	0.05	150	0.05	1	1
Cultivated (temporary, commerical and dryland)	0.25	5	0.3	7	2	50	3.5	1.5	90	0.2	0.2	120	3	0.4	60
Shrubland and low fynbos	0.2	15	0	5	2.5	55	4	2.5	80	1	2	80	2	2	50
Thicket, bushveld, bush clumps, high fynbos	0.15	20	0	7	3	50	10	15	75	2	15	75	7	3	50
Cultivated (permanent, commerical, irrigation)	75.125	2.5	0.15	4	1.025	100	2.25	0.775	120	0.6	0.125	135	1.525	0.7	30.5

Supplementary Table 2: The landuse dataset used for the Verlorenvlei sub-catchment model with the albedo, root depth, sealed grade, LAI, height and surface resistance for each landuse type across 4 different growing seasons

Soil type	Horizon	Depth (mm)	Sand, Silt, Clay (%)	Aircap (mm)	FC sum (mm)	Waterholding MPS	Waterholding LPS
Arenosol	A	300	89,6,5	214.43	125.51	33.03	65.37
	B	700	90,5,5			73.36	154.42
					Total	106.39	219.79
Leptosol	A	100	43,29,28	5.87	28.02	28.02	5.87
					Total	28.02	5.87
Solonetz	A	300	35,37,28	137.45	197.63	91.47	13.62
	B	700	27,37,36			221.27	33.95
					Total	312.74	47.57
Fluvisol	A	300	44,33,23	192.52	142.5	85.47	16.38
	B	700	45,31,24			183.47	40.53
					Total	268.94	56.91
Planosol	A	300	56,25,19	138.73	187.45	77.46	22.26
	B	700	44,23,33			191.87	42.98
					Total	269.33	65.24
Regosol	A	300	69,19,12	204.57	116.67	69.63	31.59
	B	700	70,17,13			160.93	72.87
					Total	230.56	104.46
Lixisols	A	300	63,15,22	234.89	125.42	73.41	22.92
	B	700	53,13,34			181.65	43.26
					Total	255.06	66.18
Cambisol	A	300	42,26,32	214.13	120.44	83.79	17.94
	B	700	41,25,34			196.49	41.72
					Total	280.28	59.66
Luvisol	A	300	51,22,27	210.14	122.09	78.69	19.95
	B	700	45,21,34			190.19	43.4
					Total	268.88	63.35

Supplementary Table 3: The soil parameter dataset used for the Verlorenvlei sub-catchment with the depth and texture used to estimate MPS, LPS as well as aircap and field capacity for each soil type horizon