Figure S1: Eigen spectra of different flow regime components. (a) Magnitude (b)Variability (c) Duration (d) Frequency (e) Timing (f) Rate of Change and (g) Other at Kalanaur, across the comparing periods prior to the construction of Hathnikund barrage and during decommissioning and construction of barrages

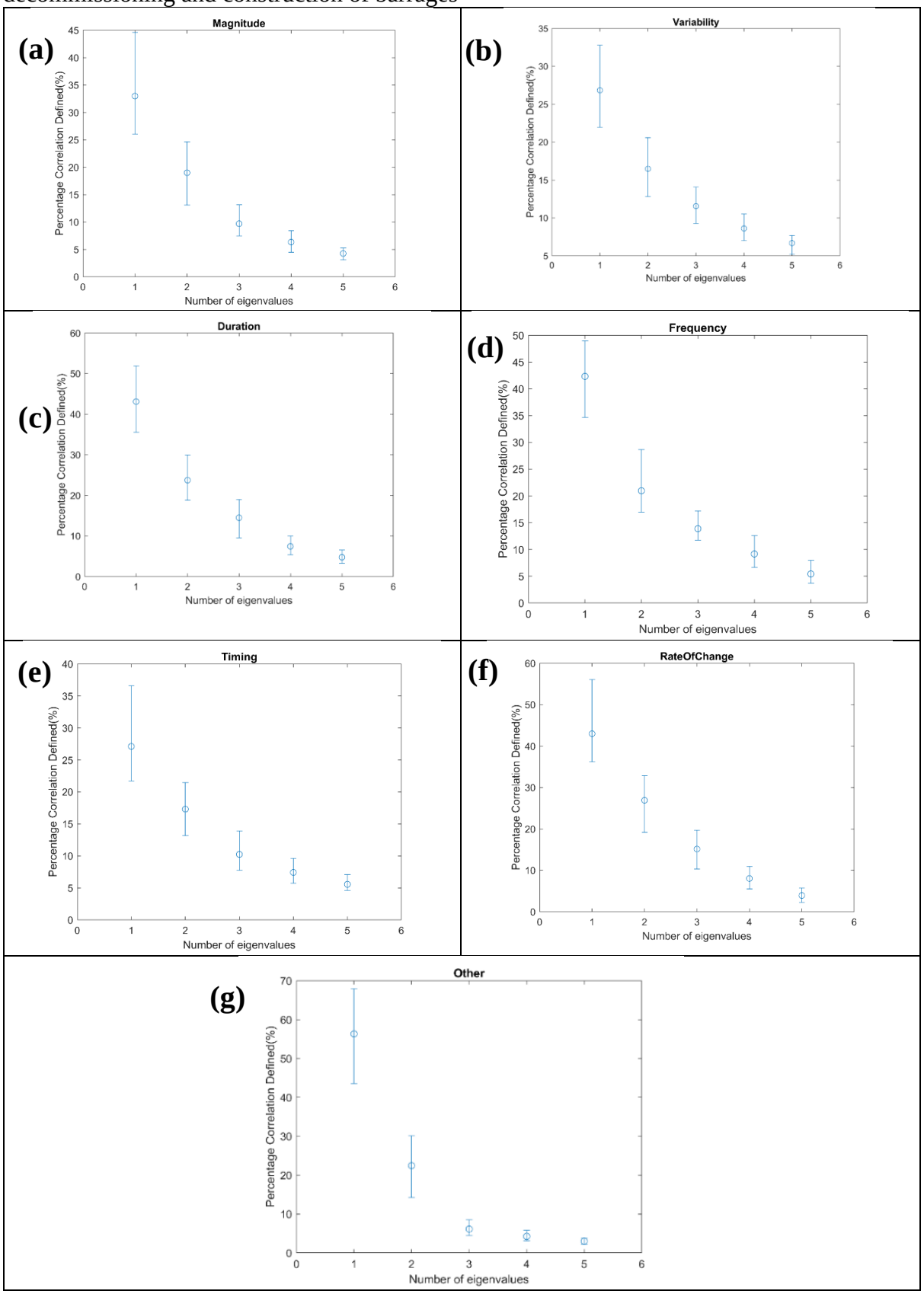


Figure S2: Eigen spectra of different flow regime components. (a) Magnitude (b)Variability (c) Duration (d) Frequency (e) Timing (f) Rate of Change and (g) Other at Kalanaur across Yamuna comparing periods prior to the construction of Hathnikund barrage and post operation of Hathnikund barrage

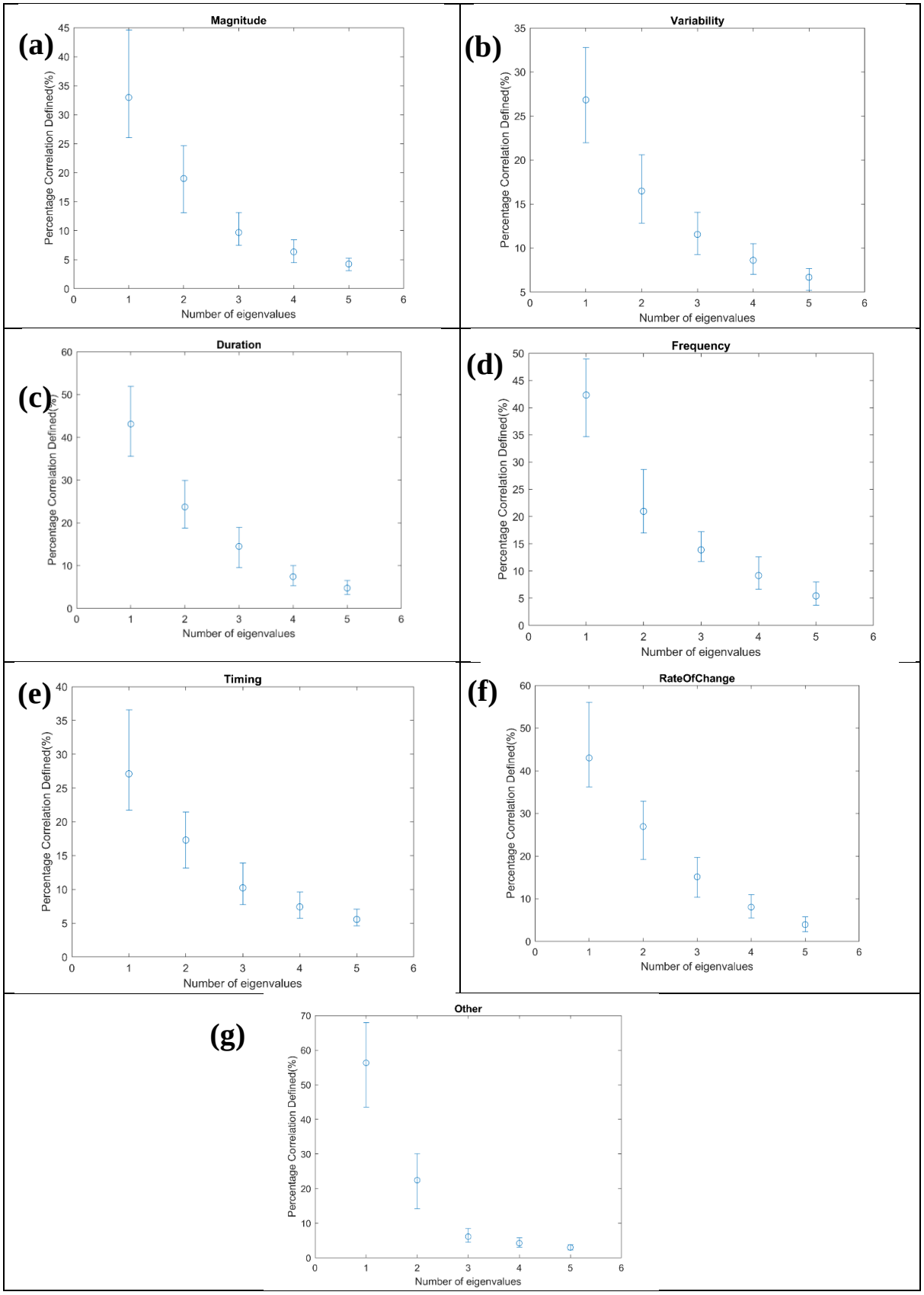


Figure S3: Absolute Loadings of different parameters to significant eigen value (a) Magnitude (b)Variability (c) Duration (d) Frequency (e) Timing (f) Rate of Change and (g) Other at Kalanaur, across the comparing periods prior to the construction of Hathnikund barrage and during decommissioning and construction of barrages

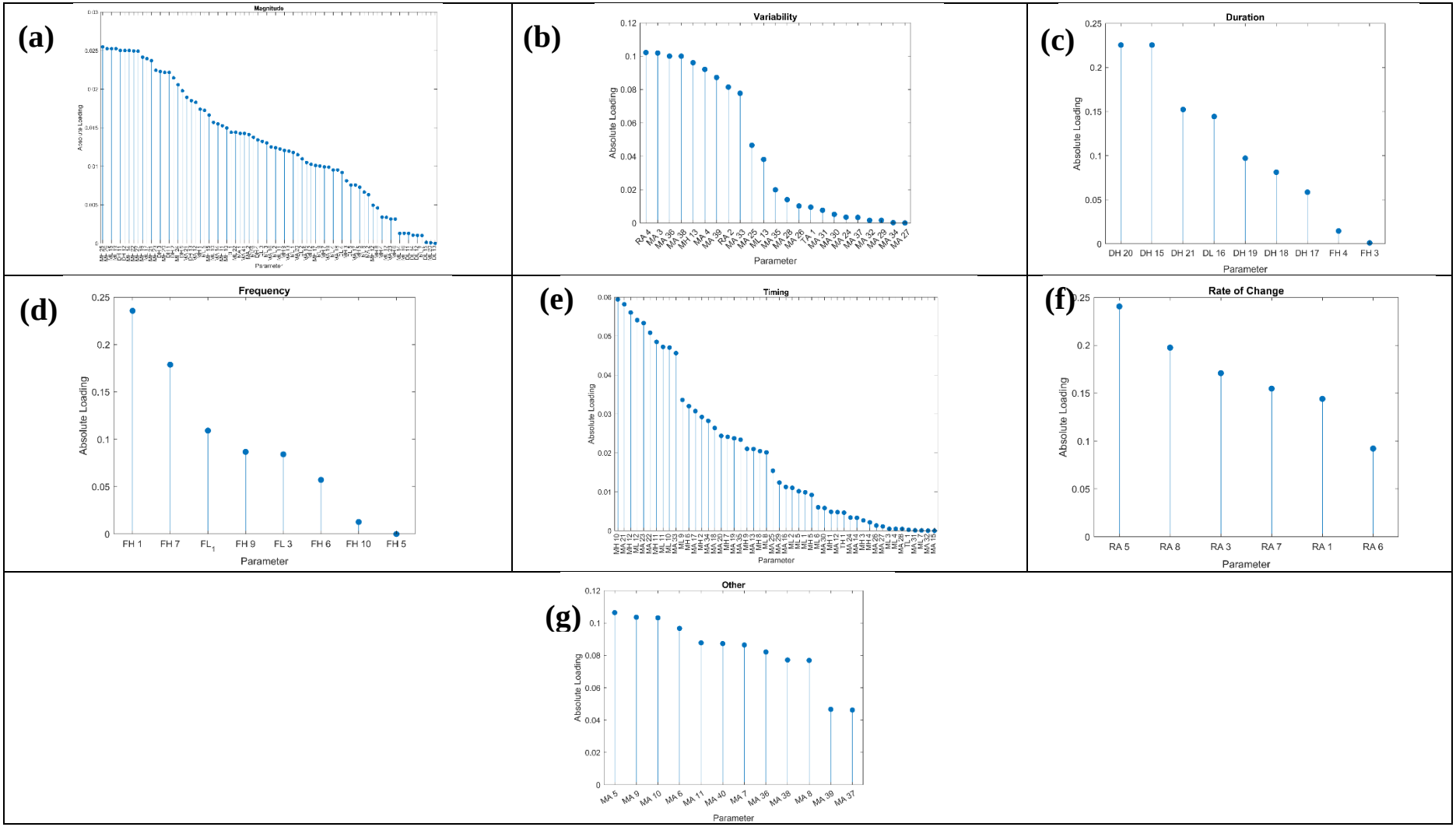
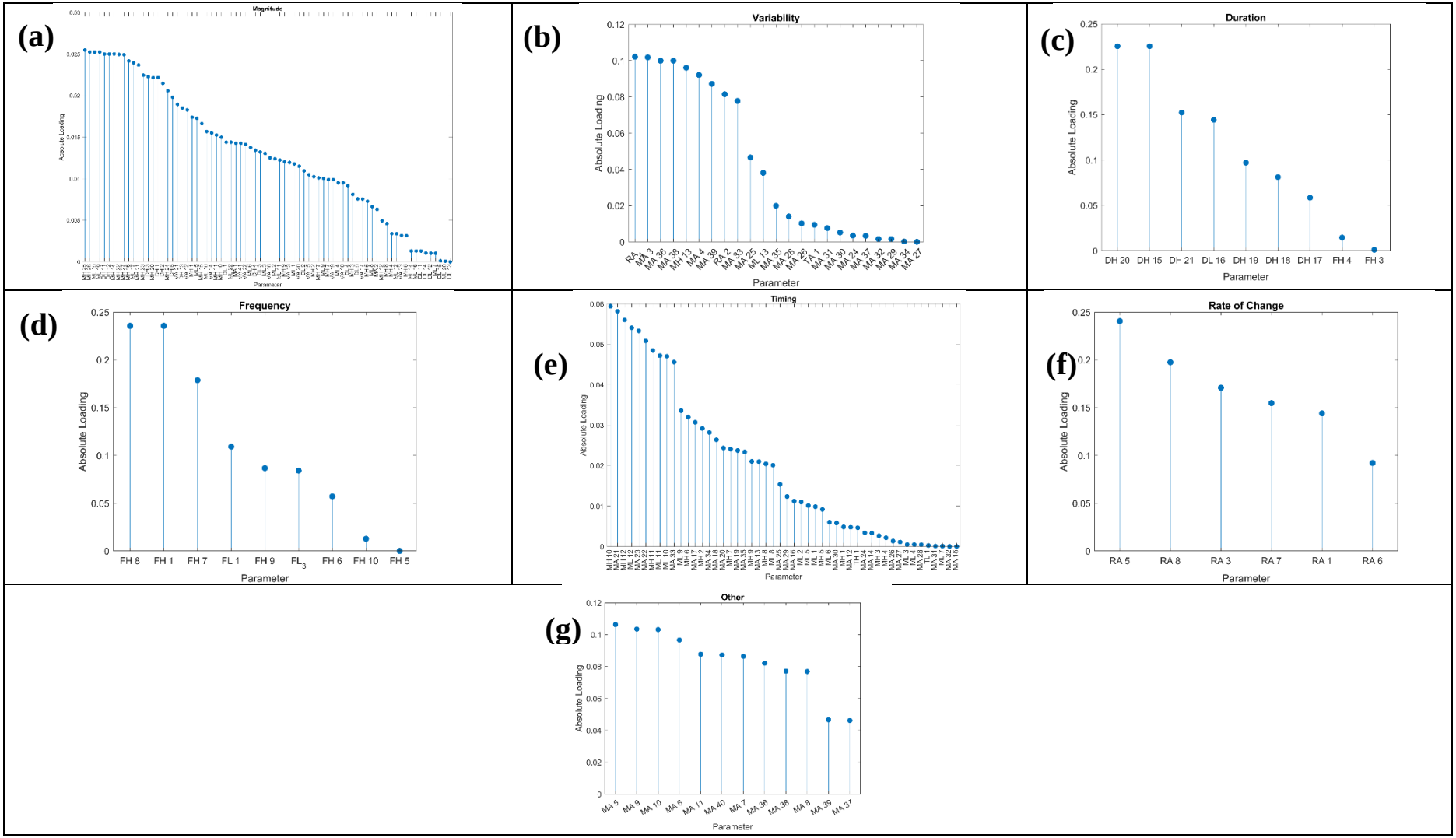


Figure S4: Absolute Loadings of different parameters to significant eigen value (a) Magnitude (b)Variability (c) Duration (d) Frequency (e) Timing (f) Rate of Change and (g) Other at Kalanaur across Yamuna comparing periods prior to the construction of Hathnikund barrage and post operation of Hathnikund barrage



13 **Table S1:** Description of the 171 hydrologic parameters used in the study.

CODE	DEFINITION	UNITS
MA# - Magnitude, average flow event		
MA1	Mean of the daily mean flow values for the entire flow record	Cubic meter per sec
MA2	Median of the daily mean flow values for the entire flow record	Cubic meter per sec
MA3	Compute the mean of the annual coefficients of variation	Percent
MA4	Compute the 5th, 10th, 15th, 20th, 25th, 30th, 35th, 40th, 45th, 50th, 55th, 60th, 65th, 70th, 75th, 80th, 85th, 90th, and 95th percentiles for the flows of the entire flow record. Compute the standard deviation of the percentiles of the entire flow record divided by the mean of percentiles.	Percent
MA5	**The skewness of the entire flow record** is computed as the mean for the entire flow record (MA1) divided by the median (MA2) for the entire flow record	Dimensionless
MA6	Ranges in daily flows: (P10/P90)	Dimensionless
MA7	Ranges in daily flows: (P20/P80)	Dimensionless
MA8	Ranges in daily flows: (P25/P75)	Dimensionless
MA9	Spread in daily flows: (P90-P10)/MA2	Dimensionless
MA10	Spread in daily flows: (P80-P20)/MA2	Dimensionless
MA11	Spread in daily flows: (P75-P25)/MA2	Dimensionless
MA12-MA23	**Means Of monthly flow values.**	Cubic meter per sec

	Compute the means for each month over the entire flow record. For example, MA12 is the mean of all January flow values over the entire record.	
MA24-MA35	**Coefficient of variation of monthly flow values.** Compute the standard deviation for each month in each year over the entire flow record. Divide the standard deviation by the mean for each month. Average these values for each month across all years.	Percent
MA36	**Variability across monthly flows 1:** Compute the monthly means for each month across each year. MA36= (maximum of monthly means – minimum of monthly means) / median of monthly means.	Dimensionless
MA37	**Variability across monthly flows 2:** Compute the monthly means for each month across each year. MA37= (P75 of monthly means – P25 of monthly means) / median of monthly means.	Dimensionless
MA38	**Variability across monthly flows 3:** Compute the monthly means for each month across each year. MA38= (P90 of monthly means – P10 of monthly means) / median of monthly means.	Dimensionless
MA39	**Coefficient of variation across monthly flow means.** Compute the standard deviation for the monthly means. MA39 is the standard deviation times 100 divided by the mean of the monthly means.	Percent
MA40	**Skewness in monthly flows:** Compute (mean of monthly means -median of monthly means)/median of monthly means	Dimensionless

MA41	**Annual runoff.** MA41 is the mean of the annual means divided by the drainage areaCalculate the average of the annual means for all the years divided by the drainage area	Cubic meter per sec
MA42	**Variability across annual flows 1:** Compute the annual flow means for each year. MA42= (maximum of annual means – minimum of annual means) / median of annual means.	Dimensionless
MA43	**Variability across annual flows 2:** Compute the annual flow means for each year. MA42= (P75 of annual means – P25 of annual means) / median of annual means.	Dimensionless
MA44	**Variability across annual flows 3:** Compute the annual flow means for each year. MA42= (P90 of annual means – P10of annual means) / median of annual means.	Dimensionless
MA45	**Skewness in monthly flows:** Compute (mean of annual means -median of annual means)/median of annual means	Dimensionless

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ML# -Magnitude, low flow event

ML1- ML12	**Mean minimum flows for each month across all years.** For example, ML1 is the mean of the minimums of all January flow values over the entire record.	Cubic meter per sec
ML13	**Variability (coefficient of variation) across minimum monthly flow values.** Compute the mean and standard deviation for the minimum monthly flows over the entire flow record. ML13 is the standard deviation times 100 divided by the mean minimum monthly flow for all years.	Percent
ML14	Compute the minimum annual flow for each year. ML14 is the mean of the ratios of minimum annual flows to the median flow for each year.	Dimensionless
ML15	**Low flow index.** ML15 is the mean of the ratios of minimum annual flows to the mean flow for each year.	Dimensionless
ML16	**Median of annual minimum flows.** ML16 is the median of the ratios of minimum annual flows to the median flow for each year.	Dimensionless
ML17	**Baseflow 1:** Compute the mean annual flows for each year. Compute the minimum of a 7-day moving average flow for each year and divide them by the mean annual flow for that year. ML17 is the mean of those ratios.	Dimensionless
ML18	**Variability in base flow 1** Compute the standard deviation for the ratios of 7-day moving average flows to mean annual flows for each year. ML18 is the standard deviation times 100 divided by the mean of the ratios.	Percent
ML19	**Baseflow 2:**	Cubic meter per sec

	Compute the ratios of the minimum annual flow to mean annual flow for each year. ML19 is the mean of these ratios' times 100. ML19=ML15*100	
ML20	**Baseflow 3:** ML20 is the ratio of base flow volume to total flow volume.	Percent
ML21	**Variability across annual minimum flows.** Compute the mean and standard deviation for the annual minimum flows. ML21 is the standard deviation times 100 divided by the mean.	Percent
ML22	**Specific mean annual minimum flow.** ML22 is the mean of the annual minimum flows divided by the drainage area.	Cubic meter per sec /m2

MH# - Magnitude, high flow event		
MH1- MH12	**Mean maximum flows for each month across all years** For example, MH1 is the mean of the maximums of all January flow values over the entire record.	Cubic meter per sec
MH13	**Variability (coefficient of variation) across maximum monthly flow values.** Compute the mean and standard deviation for the maximum monthly flows over the entire flow record. MH13 is the standard deviation times 100 divided by the mean maximum monthly flow for all years.	Percent
MH14	**Median of annual maximum flows.**	Dimensionless

	Compute the annual maximum flows from monthly maximum flows. Compute the ratio of annual maximum flow to median annual flow for each year. MH14 is the median of these ratios	
MH15	**High flow discharge index 1:** Compute the 1 percent exceedance value for the entire data record. MH15 is the 1 percent exceedance value divided by the median flow for the entire record.	Dimensionless
MH16	**High flow discharge index 2:** Compute the 10 percent exceedance value for the entire data record. MH16 is the 10 percent exceedance value divided by the median flow for the entire record.	Dimensionless
MH17	**High flow discharge index 3:** Compute the 25 percent exceedance value for the entire data record. MH17 is the 25 percent exceedance value divided by the median flow for the entire record.	Dimensionless
MH18	**Variability across annual maximum flows.** Compute the logs (log10) of the maximum annual flows. Find the standard deviation and mean for these values. MH18 is the standard deviation times 100 divided by the mean.	Percent
MH19	**Skewness in annual maximum flows** Compute (mean of annual maximum -median of annual maximum)/median of annual maximum	Dimensionless
MH20	**Specific mean annual maximum flow.** MH20 is the mean of the annual maximum flows divided by the drainage area.	Cubic meter per sec /m2
MH21	**High flow volume index 1.** Compute the average volume for flow events above a threshold equal to the median flow for the entire record. MH21 is the average volume divided by the median flow for the entire record.	days

MH22	**High flow volume index 2.** Compute the average volume for flow events above a threshold equal to three times the median flow for the entire record. MH22 is the average volume divided by the median flow for the entire record.	days
MH23	**High flow volume index 3.** Compute the average volume for flow events above a threshold equal to seven times the median flow for the entire record. MH23 is the average volume divided by the median flow for the entire record.	days
MH24	**High peak flow index 1:** Compute the average peak flow value for flow events above a threshold equal to the median flow for the entire record.	Dimensionless
MH25	**High peak flow index 2:** Compute the average peak-flow value for flow events above a threshold equal to three times the median flow for the entire record. MH25 is the average peak flow divided by the median flow for the entire record.	Dimensionless
MH26	**High peak flow index 3:** Compute the average peak flow value for flow events above a threshold equal to seven times the median flow for the entire record. MH26 is the average peak flow divided by the median flow for the entire record.	Dimensionless
MH27	**High peak flow index 4:** Compute the average peak flow value for flow events above a threshold equal to 75th percentile value for the entire flow record. MH27 is the average peak flow divided by the median flow for the entire record.	Dimensionless

DL# - Duration, low flow event

DL1	**Annual minimum daily flow.** Compute the minimum 1-day average flow for each year. DL1 is the mean of these values	Cubic meter per sec
DL2	**Annual minimum of 3-day moving average flow.** Compute the minimum of a 3-day moving average flow for each year. DL2 is the mean of these values.	Cubic meter per sec
DL3	**Annual minimum of 7-day moving average flow.** Compute the minimum of a 7-day moving average flow for each year. DL3 is the mean of these values.	Cubic meter per sec
DL4	**Annual minimum of 30-day moving average flow.** Compute the minimum of a 30day moving average flow for each year. DL4 is the mean of these values.	Cubic meter per sec
DL5	**Annual minimum of 90-day moving average flow.** Compute the minimum of a 90day moving average flow for each year. DL5 is the mean of these values.	Cubic meter per sec
DL6	**Variability of annual minimum daily average flow.** Compute the standard deviation for the minimum daily average flow. DL6 is 100 times the standard deviation divided by the mean.	Percent
DL7	**Variability of annual minimum of 3-day moving average flow.** Compute the standard deviation for the minimum 3-day moving averages. DL7 is 100 times the standard deviation divided by the mean.	Percent

DL8	**Variability of annual minimum of 7-day moving average flow.** Compute the standard deviation for the minimum 7-day moving averages. DL8 is 100 times the standard deviation divided by the mean.	Percent
DL9	**Variability of annual minimum of 30-day moving average flow.** Compute the standard deviation for the minimum 30-day moving averages. DL9 is 100 times the standard deviation divided by the mean.	Percent
DL10	**Variability of annual minimum of 90-day moving average flow.** Compute the standard deviation for the minimum 90-day moving averages. DL10 is 100 times the standard deviation divided by the mean.	Percent
DL11	Annual minimum daily flow divided by the median for the entire record. Compute the minimum daily flow for each year. DL11 is the mean of these values divided by the median for the entire record.	Dimensionless
DL12	Annual minimum of 7-day moving average flow divided by the median for the entire record. Compute the minimum of a 7-day moving average flow for each year. DL12 is the mean of these values divided by the median for the entire record.	Dimensionless
DL13	Annual minimum of 30-day moving average flow divided by the median for the entire record. Compute the minimum of a 30-day moving average flow for each year. DL13 is the mean of these values divided by the median for the entire record.	Dimensionless
DL14	**Low exceedance flows 1:** Compute the 75 percent exceedance value for the entire flow record.	Dimensionless

DL15	**Low exceedance flows 2:** Compute the 90 percent exceedance value for the entire flow record.	Dimensionless
DL16	**Low flow pulse duration.** Compute the average pulse duration for each year for flow events below a threshold equal to the 25th percentile value for the entire flow record. Calculate 25th percentile. Calculate the number of daily discharges below the 25th percentile(x). Calculate the number of these events i.e. the start and end dates of these daily discharges(y). Then median (x/y). DL16 is the median of the yearly average durations.	number of days
DL17	**Variability in low pulse duration.** Compute the standard deviation for the yearly average low pulse durations. This stdev(x)/mean(x) DL17 is 100 times the standard deviation divided by the mean of the yearly average low pulse durations.	Percent
DL18	**Number of zero-flow days.** Count the number of zero-flow days for the entire flow record. DL18 is the mean annual number of zero flow days.	Number of days/year
DL19	**Variability in the number of zero-flow days.** Compute the standard deviation for the annual number of zero-flow days. DL19 is 100 times the standard deviation divided by the mean annual number of zero-flow days.	Percent
DL20	**Number of zero-flow months.** Count the number of months in which there was no flow over the entire flow record.	Percent

DH# - Duration, high flow event		
DH1	**Annual maximum daily flow.** Compute the maximum of a 1-day moving average flow for each year. DH1 is the mean of these values.	Cubic meter per sec
DH2	**Annual maximum of 3-day moving average flows.** Compute the maximum of a 3day moving average flow for each year. DH2 is the mean of these values.	Cubic meter per sec
DH3	**Annual maximum of 7-day moving average flows.** Compute the maximum of a 7day moving average flow for each year. DH3 is the mean of these values.	Cubic meter per sec
DH4	**Annual maximum of 30-day moving average flows.** Compute the maximum of a 30-day moving average flow for each year. DH4 is the mean of these values	Cubic meter per sec
DH5	**Annual maximum of 90-day moving average flows.** Compute the maximum of a 90day moving average flow for each year. DH5 is the mean of these values	Cubic meter per sec
DH6	**Variability of annual maximum daily flows.** Compute the standard deviation for the maximum 1-day moving averages. DH6 is 100 times the standard deviation divided by the mean.	Percent

DH7	**Variability of annual maximum of 3-day moving average flows.** Compute the standard deviation for the maximum 3-day moving averages. DH7 is 100 times the standard deviation divided by the mean.	Percent
DH8	**Variability of annual maximum of 7-day moving average flows.** Compute the standard deviation for the maximum 7-day moving averages. DH8 is 100 times the standard deviation divided by the mean.	Percent
DH9	**Variability of annual maximum of 30-day moving average flows.** Compute the standard deviation for the maximum 30-day moving averages. DH9 is 100 times the standard deviation divided by the mean.	Percent
DH10	**Variability of annual maximum of 90-day moving average flows.** Compute the standard deviation for the maximum 90-day moving averages. DH10 is 100 times the standard deviation divided by the mean.	Percent
DH11	Annual maximum of 1-day moving average flows divided by the median for the entire record. Compute the maximum of a 1-day moving average flow for each year. DL11 is the mean of these values divided by the median for the entire record.	Dimensionless
DH12	Annual maximum of 7-day moving average flows divided by the median for the entire record. Compute the maximum daily average flow for each year. DL12 is the mean of these values divided by the median for the entire record.	Dimensionless
DH13	Annual maximum of 30-day moving average flows divided by the median for the entire record. Compute the maximum of a 30-day moving average flow for each year. DL13 is the mean of these values divided by the median for the entire record.	Dimensionless

DH14	Compute the mean of the mean monthly flow values. Find the 95th percentile for the mean monthly flows. DH14 is the 95th percentile value divided by the mean of the monthly means.	Dimensionless
DH15	**High flow pulse duration.** Compute the average duration for flow events with flows above a threshold equal to the 75th percentile value for each year in the flow record. DH15 is the median of the yearly average durations.	Days/year
DH16	**Variability in high flow pulse duration.** Compute the standard deviation for the yearly average high pulse durations. DH16 is 100 times the standard deviation divided by the mean of the yearly average high pulse durations.	Percent
DH17	**High flow duration 1:** Compute the average duration of flow events with flows above a threshold equal to the median flow value for the entire flow record. DH17 is the average duration of the events.	days
DH18	**High flow duration 2:** Compute the average duration of flow events with flows above a threshold equal to three times the median flow value for the entire flow record. DH18 is the average duration of the events.	days
DH19	**High flow duration 3:** Compute the average duration of flow events with flows above a threshold equal to seven times the median flow value for the entire flow record. DH19 is the average duration of the events.	days
DH20	**High flow duration 4:** Compute the 75th percentile value for the entire flow record. Compute the average duration of flow events with flows above a threshold equal to the 75th percentile value for the entire set of flows. DH20 is the average duration of the events.	days

DH21	**High flow duration 5:** Compute the 25th percentile value for the entire flow record. Compute the average duration of flow events with flows above a threshold equal to the 25th percentile value for the entire set of flows. DH21 is the average duration of the events.	days
DH22	**Flood interval:** Compute the flood threshold as the flow equivalent for a flood recurrence of 1.67 years. Determine the median number of days between flood events for each year. DH22 is the mean of the yearly median number of days between flood events.	days
DH23	**Flood duration:** Compute the flood threshold as the flow equivalent for a flood recurrence of 1.67 years. Determine the number of days each year that the flow remains above the flood threshold. DH23 is the mean of the number of flood days for years in which floods occur. Same as FH11	days
DH24	**Flood-free days:** Compute the flood threshold as the flow equivalent for a flood recurrence of 1.67 years. Compute the maximum number of days that the flow is below the threshold for each year. DH24 is the mean of the maximum yearly no-flood days.	days

RA# - Rate of change, average event		
RA1	**Rise rate.**	Cubic meter per sec/day

	Compute the change in flow for days in which the change is positive for the entire flow record. RA1 is the mean of these values.	
RA2	**Variability in rise rate.** Compute the standard deviation for the positive flow changes. RA2 is 100 times the standard deviation divided by the mean.	Percent
RA3	**Fall rate.** Compute the change in flow for days in which the change is negative for the entire flow record. RA3 is the mean of these values.	Dimensionless
RA4	**Variability in fall rate.** Compute the standard deviation for the negative flow changes. RA4 is 100 times the standard deviation divided by the mean.	Percent
RA5	**Number of day rises.** Compute the number of days in which the flow is greater than the previous day. RA5 is the number of positive gain days divided by the total number of days in the flow record.	Dimensionless
RA6	**Change of flow.** Compute the log10 of the flows for the entire flow record. Compute the change in log of flow for days in which the change is positive for the entire flow record. RA6 is the median of these values.	Cubic meter per sec/day
RA7	**Change of flow.** Compute the log10 of the flows for the entire flow record. Compute the change in log of flow for days in which the change is negative for the entire flow record. RA7 is the median of these log values.	Cubic meter per sec/day

RA8	**Number of reversals.** Compute the number of days in each year when the change in flow from one day to the next changes direction. RA8 is the average of the yearly values.	days
RA9	**Variability in reversals.** Compute the standard deviation for the yearly reversal values. RA9 is 100 times the standard deviation divided by the mean.	Percent

	TA# - Timing, average flow event	
TA1	**Constancy** Find the patterns of fluctuation in discharge in all the years. Formula in Cowell et al (1974)	Dimensionless
TA2	**Predictability** Find the patterns of fluctuation in discharge in all the years. Formula in Cowell et al (1974)	Dimensionless
TA3	**Seasonal predictability of flooding.** Divide years up into 2-month periods (that is, Oct-Nov, Dec-Jan, and so forth). Count the number of flood days (flow events with flows > 1.67-year flood) in each period over the entire flow record. TA3 is the maximum number of flood days in any one period divided by the total number of flood days.	Dimensionless
	TL# - Timing, low flow event	
TL1	**Julian date of annual minimum.** Determine the Julian date that the minimum flow occurs for each water year. Transform the dates to relative values on a circular scale (radians or degrees). Compute the x and y components for each year and average	Julian day

	them across all years. Compute the mean angle as the arc tangent of y-mean divided by x-mean. Transform the resultant angle back to Julian date.	
TL2	**Variability in Julian date of annual minima.** Compute the coefficient of variation for the mean x and y components and convert to a date	Julian day
TL3	**Seasonal predictability of low flow.** Divide years up into 2-month periods (that is, Oct-Nov, Dec-Jan, and so forth). Count the number of low flow events (flow events with flows <= 5-year flood threshold (80 percentile)) in each period over the entire flow record. TL3 is the maximum number of low flow events in any one period divided by the total number of low flow events.	Dimensionless
TL4	**Seasonal predictability of non-low flow.** Compute the number of days that flow is above the 5-year flood threshold (80 percentile) as the ratio of number of days to 365 or 366 (leap year) for each year. TL4 is the maximum of the yearly ratios.	Dimensionless
	TH# - Timing, high flow event	
TH1	**Julian date of annual maximum.** Determine the Julian date (i.e. the row number) that the maximum flow occurs for each year. Transform the dates to relative values on a circular scale (radians or degrees). Compute the x and y components for each year and average them across all years. Compute the mean angle as the arc tangent of y-mean divided by x-mean. Transform the resultant angle back to Julian date	Julian day

TH2	**Variability in Julian date of annual maxima.** Compute the coefficient of variation for the mean x and y components and convert to a date i.e. sqrt(2*(1-norm([mean(x), mean(y)]))/rad2day	Julian day
TH3	**Seasonal predictability of non-flooding.** Computed as the maximum proportion of a 365-day year that the flow is less than the 1.67-year flood threshold and also occurs in all years. Accumulate non flood days that span all years. TH3 is maximum length of those flood-free periods divided by 365.	Dimensionless
	FL# - Frequency, low flow event	
FL1	**Low flood pulse count.** Compute the average number of flow events with flows below a threshold equal to the 25th percentile value for the entire flow record. FL1 is the average number of events.	Number of events/year
FL2	**Variability in low pulse count.** Compute the standard deviation in the annual pulse counts for FL1. FL2 is 100 times the standard deviation divided by the mean pulse count.	Percent
FL3	**Frequency of low pulse spells.** Compute the average number of flow events with flows below a threshold equal to 5 percent of the mean flow value for the entire flow record. FL3 is the average number of events.	Number of events/year
	FH# - Frequency, high flow event	
FH1	**High flood pulse count 1:** Compute the average number of flow events with flows above a threshold equal to the 75th percentile value for the entire flow record. FH1 is the average number of events.	Number of events/year

FH2	**Variability in high pulse count:** Compute the standard deviation in the annual pulse counts for FH1. FH2 is 100 times the standard deviation divided by the mean pulse count.	Number of events/year
FH3	**High flood pulse count 2:** Compute the average number of days per year that the flow is above a threshold equal to three times the median flow for the entire record. FH3 is the mean of the annual number of days for all years.	Number of days/year
FH4	**High flood pulse count 3:** Compute the average number of days per year that the flow is above a threshold equal to seven times the median flow for the entire record. FH4 is the mean of the annual number of days for all years.	Number of days/year
FH5	**Flood frequency 1:** Compute the average number of flow events with flows above a threshold equal to the median flow value for the entire flow record. FH5 is the average number of events.	Number of events/year
FH6	**Flood frequency 2:** Compute the average number of flow events with flows above a threshold equal to three times the median flow value for the entire flow record. FH6 is the average number of events.	Number of events/year
FH7	**Flood frequency 3:** Compute the average number of flow events with flows above a threshold equal to seven times the median flow value for the entire flow record. FH6 is the average number of events.	Number of events/year
FH8	**Flood frequency 4:** Compute the average number of flow events with flows above a threshold equal to 25 percent exceedance value for the entire flow record. FH8 is the average number of events.	Number of events/year

FH9	**Flood frequency 5:** Compute the average number of flow events with flows above a threshold equal to 75 percent exceedance value for the entire flow record. FH9 is the average number of events.	Number of events/year
FH10	**Flood frequency 6:** Compute the average number of flow events with flows above a threshold equal to median of the annual minima for the entire flow record. FH10 is the average number of events.	Number of events/year
FH11	**Flood frequency 7:** Compute the average number of flow events with flows above a threshold equal to flow corresponding to a 1.67-year recurrence interval. FH11 is the average number of events.	Number of events/year

Table S2: Description of the planform parameters used in the study (Adopted from Mohanta, 2018)

Planform Parameter	Description
Sinuosity	Sinuosity is the ratio of valley gradient to channel gradient over a stream reach.
Braid channel ratio	It differentiates between rivers with a single thalweg and rivers with several thalwegs. A higher value implies that the stream contains a network of small channels divided by small deposits of silt known as bars.
Average channel width	The average width of the primary channel.
Channel area	The area occupied by water in the stream.
Bar area	The area occupied by different depositional units like mid channel bar, side bar, point bar, alluvial island, and confluence bar.
Bar density	Bar density comprises of almost all channel belt attributes which includes side bar, point bar, alluvial island, and mid channel bar along with the channel area.
Bar Complexity	Bar complexity refers to the shape of the bars and was calculated by taking the ratio of the average bar perimeter to the bar area.
Occupancy	Occupancy defines the lateral accommodation within the valley margin. It also represents the relationship between the valley width and the floodplain width on both sides.
Floodplain Development	Floodplain development primarily represents the lateral connectivity between channel and floodplain in each reach.

Table S3: Selected set of parameters for different flow regime components at Kalanaur, the downstream station across the Yamuna comparing periods prior to the construction of Hathnikund barrage and during construction of barrage conditions.

Group	Components	Variance captured (%)	Selected Parameters
1	Magnitude	40.51	MH_25: High peak flow 1 (mean maximum daily flow using 3 x median threshold/median annual daily flows)
			MH_26: High peak flow 1 (mean maximum daily flow using 7 x median threshold/median annual daily flows)
			ML_15: Low flow index (mean annual minimum flows/mean annual daily flows)
			ML_19: Baseflow index 2 (mean ratio of annual minimum and annual mean flows)
			DH_11: Means of 1-day maxima of daily discharge (mean annual maximum/median daily flow)
2	Variability	26.08	RA_4: Variability in fall rate (CV of RA004)
			MA_ 3: Variability in daily flows 1 (CV in daily flows)
			MA_36: Variability across monthly flow 1 ((maximum-minimum)/median monthly flows)
			MA_38: Variability across monthly flow 1 ((P90-P10)/median monthly flows)
			MH_13: Variability across maximum monthly flows (CV of mean maximum monthly flows)
3	Duration	37.07	DH_20: High flow duration 2 (mean duration of pulses above P75)
			DH_15: High flow pulse duration (mean duration of FH001)
			DH_21: High flow duration 2 (mean duration of pulses above P25)
			DL_16: Low flow pulse duration (mean duration of FL001)
			DH_19: High flow duration 1 (mean duration of pulses above 7 x median daily flow)

4	Frequency	36.20	FH_ 1: High flood pulse count 1 (number of pulses greater than the P75 value)
			FH_ 7: Flood frequency 1 (number of pulses greater than 7 x median flow)
			FL_1: Low flood pulse count (number of pulses less than the P25 value)
			FH_ 9: Flood frequency 2 (number of pulses greater than NE FD 25%)
			FL_3: Frequency of low flow spells (total no. of pulses less than the P5 value/record length)
5	Timing	24.51	MH_10: Mean maximum monthly flows (October)
			MA_21: Mean monthly flow (October)
			MH_12: Mean maximum monthly flows (December)
			ML_12: Mean minimum monthly flows (December)
			MA_23: Mean monthly flow (December)
6	Rate of Change	46.08	RA_5: No. day rises (ratio of number of days where flow is greater than previous day/total number of days)
			RA_8: Reversals (AVG number of days where flow changes direction from one day to the next)
			RA_3: Fall rate (mean change in flow for consecutive days with decreasing flows)
			RA_7: Change of flow. Compute the log10 of the flows for the entire flow record(negative)
			RA_1: Rise rate (mean change in flow for consecutive days with increasing flows)
7	Other (Distribution, range)	64.09	MA_ 5: Skewness in daily flows (daily mean flows/daily median flows)
			MA_ 9: Spread in daily flows is the ratio of the difference between the 90th and 10th percentile of the logs of the flow data to the log of the median of the entire flow record.
			MA_10: Spread in daily flows is computed like MA9 except using the 20th and 80th percentiles
			MA_ 6: Ranges in daily flows (P10/P90)
			MA_11: Spread in daily flows is computed like MA9 except using the 25th and 75th percentiles

Table S4: Selected set of parameters for different flow regime components at Kalanaur, the downstream station across the Yamuna comparing periods of during construction and post operation of Hathnikund barrage.

Group	Components	Variance captured (%)	Selected Parameters
1	Magnitude	40.51	MH_25: High peak flow 1 (mean maximum daily flow using 3 x median threshold/median annual daily flows)
			MH_26: High peak flow 1 (mean maximum daily flow using 7 x median threshold/median annual daily flows)
			ML_15: Low flow index (mean annual minimum flows/mean annual daily flows)
			ML_19: Baseflow index 2 (mean ratio of annual minimum and annual mean flows)
			DH_11: Means of 1-day maxima of daily discharge (mean annual maximum/median daily flow)
2	Variability	26.08	RA_4: Variability in fall rate (CV of RA004)
			MA_ 3: Variability in daily flows 1 (CV in daily flows)
			MA_36: Variability across monthly flow 1 ((maximum-minimum)/median monthly flows)
			MA_38: Variability across monthly flow 1 ((P90-P10)/median monthly flows)
			MH_13: Variability across maximum monthly flows (CV of mean maximum monthly flows)
3	Duration	37.07	DH_20: High flow duration 2 (mean duration of pulses above P75)
			DH_15: High flow pulse duration (mean duration of FH001)
			DH_21: High flow duration 2 (mean duration of pulses above P25)
			DL_16: Low flow pulse duration (mean duration of FL001)
			DH_19: High flow duration 1 (mean duration of pulses above 7 x median daily flow)

4	Frequency	36.20	FH_ 8: Flood frequency 2 (number of pulses greater than NE FD 75%)
			FH_ 1: High flood pulse count 1 (number of pulses greater than the P75 value)
			FH_ 7: Flood frequency 1 (number of pulses greater than 7 x median flow)
			FL_1: Low flood pulse count (number of pulses less than the P25 value)
			FH_ 9: Flood frequency 2 (number of pulses greater than NE FD 25%)
5	Timing	24.51	MH_10: Mean maximum monthly flows (October)
			MA_21: Mean monthly flow (October)
			MH_12: Mean maximum monthly flows (December)
			ML_12: Mean minimum monthly flows (December)
			MA_23: Mean monthly flow (December)
6	Rate of Change	46.08	RA_5: No. day rises (ratio of number of days where flow is greater than previous day/total number of days)
			RA_8: Reversals (AVG number of days where flow changes direction from one day to the next)
			RA_3: Fall rate (mean change in flow for consecutive days with decreasing flows)
			RA_7: Change of flow. Compute the log10 of the flows for the entire flow record(negative)
			RA_1: Rise rate (mean change in flow for consecutive days with increasing flows)
7	Other (Distribution, range)	64.09	MA_ 5: Skewness in daily flows (daily mean flows/daily median flows)
			MA_ 9: Spread in daily flows is the ratio of the difference between the 90th and 10th percentile of the logs of the flow data to the log of the median of the entire flow record.
			MA_10: Spread in daily flows is computed like MA9 except using the 20th and 80th percentiles
			MA_ 6: Ranges in daily flows (P10/P90)
			MA_11: Spread in daily flows is computed like MA9 except using the 25th and 75th percentiles