

**GOVERNMENT OF INDIA
MINISTRY OF POWER**

**LOK SABHA
UNSTARRED QUESTION NO.3147
ANSWERED ON 06.08.2026**

IMPACT OF CLIMATE CHANGE ON HYDROPOWER GENERATION

**3147. PROF. SOUGATA RAY:
SHRI KISHORI LAL:**

**Will the Minister of POWER
be pleased to state:**

- (a) whether the Government has assessed the impact of El Niño conditions and long-term climate change on hydropower generation in the country and if so, the details thereof;**
- (b) the details of hydropower generation during the last five years, year-wise, along with the estimated loss in generation, if any, attributed to deficient rainfall, reduced river flows, glacial changes and extreme weather events;**
- (c) whether any major hydropower projects have experienced reduced reservoir storage, lower plant load factor or operational disruptions due to changing rainfall patterns, droughts, flash floods or sedimentation and if so, the details thereof, project-wise ;**
- (d) whether the Government has formulated any long-term strategy to safeguard hydropower generation against the adverse impacts of climate change and if so, the details thereof; and**
- (e) the financial assistance, technological interventions provided during the last five years to States for adaptation, modernization and sustainable operation of hydropower projects affected by climate variability?**

A N S W E R

THE MINISTER OF STATE IN THE MINISTRY OF POWER

(SHRI SHRIPAD NAIK)

(a) : Ministry of Power (MoP) regularly reviews the status of power supply across the country and has specifically reviewed the likely impact of El Niño in the quarter July, 2026 to September, 2026. Historically, El Niño events have been associated with significant temporal and spatial variations in monsoon rainfall, which can materially influence electricity demand, hydroelectric generation, renewable energy availability and overall power system reliability.

It has been assessed that electricity demand during monsoon season is expected to remain elevated owing to factors like sustained economic activity, agricultural irrigation requirements, and weather-related cooling loads.

The India Meteorological Department (IMD) has projected monsoon rainfall in 2026 at roughly 90% of the long-term average. The impact of El Niño on Hydro reservoir levels is expected to reasonably reduce hydropower generation in India as compared to the previous year. During the period from 1st April 2026 to 30th July 2026, the hydropower generation has been 10.75% less than that for corresponding period of previous year (2025), as given at Annexure-I.

(b) & (c): The details of Power Generation from Large Hydro Projects during the last 5 financial years (FY 2021-22 to FY 2025-26) and current financial year i.e. FY 2026-27 (till 30 July, 2026) along with year-on-year growth is given at Annexure-II. Due to the flash floods in the Teesta Basin in October 2023, the hydropower stations such as Teesta-III, Teesta-V, Teesta Low Dam (TLD)-III, and TLD-IV suffered major operational disruptions.

A comparison of reservoir levels as on 30th July 2026 with the corresponding levels as on 30th July 2025 is given at Annexure-III. It indicates that reservoir levels are generally lower than those of the previous year, with the decline being particularly significant in the Southern Region. The details of comparison of energy content in reservoirs as on 30th July from 2023 to 2026 is given at Annexure-IV.

(d) & (e): Government has taken following measures as long-term strategy to safeguard hydropower generation against the adverse impacts of climate change:

(i) The Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2024, notified on 15.03.2024, provide that where the saleable scheduled energy of a hydro generating station during a year is lower than the saleable Design Energy due to reasons beyond the control of the generating station, the generator is permitted to recover the corresponding shortfall in Energy Charges from the beneficiaries in accordance with the provisions of the Regulations. Further, where the actual generation from a hydro generating station remains below the Design Energy for a continuous period of four years due to hydrological factors, the generating station is required to approach the Central Electricity Authority with the relevant hydrological data for revision of the Design Energy of the station.

(ii) Early Warning System (EWS) consisting of systems for monitoring of various hazards like Glacial Lake Outburst Flood (GLOF), Landslide Lake Outburst Flood (LLOF), Flash Floods and Seismic activity has been installed at 42 vulnerable Hydro Electric Projects for disaster preparedness and mitigating the effects of natural calamities. Further, a Central Control Room for integration of EWS at various project sites has been developed at NHPC, Faridabad.

(iii) Central Electricity Authority has issued guidelines for Slope Stability in Hydro Power Projects on 05.10.2023. These guidelines are applicable to Hydro Power Projects developers in hilly terrains guiding them to take cognizance of past slope failures caused by due to change in geometry of the natural slope, hydrogeological regime, deforestation, and/or weathering effect.

(iv) Restoration of Teesta III HEP in Sikkim is being supported through financial assistance (loans) by PFC/REC.

ANNEXURE-I**ANNEXURE REFERRED IN REPLY TO PART (a) OF UNSTARRED QUESTION NO. 3147 ANSWERED IN THE LOK SABHA ON 06.08.2026**

Detail of hydro power generation from 1st April 2026 to 30th July 2026:

Duration	Generation from Large Hydro Power Plants (MUs)	% Change
1st Apr'26 to 30th Jul'26	54,019.42	(-)10.75%
1st Apr'25 to 30th Jul'25	60,522.95	

ANNEXURE-II**ANNEXURE REFERRED IN REPLY TO PARTS (b) & (c) OF UNSTARRED QUESTION NO. 3147 ANSWERED IN THE LOK SABHA ON 06.08.2026**

The details of Power Generation from Large Hydro Projects during the last 5 financial years (FY 2021-22 to FY 2025-26) and current financial year i.e. FY 2026-27 (till 30 July, 2026):

All Generation figures are in Million Units (MUs)

Financial Year	Generation from Large Hydro Projects (*)	Percentage Growth on Year-to-Year basis (in %)
2021-22	1,51,627.33	-
2022-23	1,62,098.77	6.91
2023-24	1,34,053.92	(-)17.3
2024-25	1,48,633.98	10.88
2025-26	1,67,203.78	12.49
2025-26 (upto 30th July'25)	60,522.95	-
2026-27 (upto 30th July '26)	54,019.42	(-)10.75

Note: (*) Large Hydro refers to hydroelectric power plant with an installed capacity of 25 MW and above

ANNEXURE-III**ANNEXURE REFERRED IN REPLY TO PARTS (b) & (c) OF UNSTARRED QUESTION NO. 3147 ANSWERED IN THE LOK SABHA ON 06.08.2026**

The details of comparison of reservoir levels as on 30th July 2026 with the corresponding levels as on 30th July 2025:

Sl. No.	Reservoir	Region	30-07-2025 (in metres)	30-07-2026 (in metres)	Difference (+/-)
1.	BHAKRA	Northern	494.08	487.48	(-)6.6
2.	PONG	Northern	412.73	407.94	(-)4.79
3.	RANJIT SAGAR	Northern	509.3	509.53	0.23
4.	R.P. SAGAR	Northern	352.44	347.35	(-)5.09
5.	RAM GANGA	Northern	341.92	341.14	(-)0.78
6.	TEHRI	Northern	796	797.03	1.03
7.	RIHAND	Northern	264.6	257.74	(-)6.86
8.	SARDAR SAROVAR	Western	127.92	128.71	0.79
9.	UKAI	Western	100.34	96.46	(-)3.88
10.	GANDHI SAGAR	Western	393.91	395.71	1.8
11.	INDIRA SAGAR	Western	259.96	251.15	(-)8.81
12.	BHIRA	Western	605.26	605.22	(-)0.04
13.	KOYNA	Western	654.71	654.59	(-)0.12
14.	SRISAILAM	Southern	269.08	251.4	(-)17.68
15.	ALMATTI	Southern	517.95	519.25	1.3
16.	KALINDI SUPA	Southern	551	536.55	(-)14.45
17.	SHARAVATHY	Southern	551.99	541.02	(-)10.97
18.	IDAMALAYAR	Southern	159.04	144.86	(-)14.18
19.	IDUKKI	Southern	724.03	710.05	(-)13.98
20.	SABRIGRI	Southern	975.02	955.61	(-)19.41
21.	METTUR	Southern	240.79	226.68	(-)14.11
22.	PERIYAR	Southern	41.21	34.15	(-)7.06
23.	NAGARJUN SAGAR	Southern	178.92	156.39	(-)22.53
24.	BALIMELA	Eastern	446.93	444.15	(-)2.78
25.	HIRAKUD	Eastern	187.28	188.73	1.45
26.	INDRAVATI	Eastern	634.05	632.68	(-)1.37
27.	MACHKUND	Eastern	834.97	828.26	(-)6.71
28.	RENGALI	Eastern	121.75	122.15	0.4
29.	UPPER KOLAB	Eastern	852	849.46	(-)2.54
30.	LOKTAK	North Eastern	767.61	767.4	(-)0.21

**ANNEXURE REFERRED IN REPLY TO PARTS (b) & (c) OF UNSTARRED QUESTION NO. 3147
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The details of comparison of energy content in reservoirs as on 30th July from 2023 to 2026:

Energy content in Reservoirs and Comparison with past years (as on 30-Jul)												
Name of Reservoir	State	Region	2023	2024	2025	2026	2026 vs 2023	2026 vs 2024	2026 vs 2025	2026 vs 2023	2026 vs 2024	2026 vs 2025
			[MU]	[MU]	[MU]	[MU]	[MU]	[MU]	[MU]	[%]	[%]	[%]
			A	B	C	D	[D-A]	[D-B]	[D-C]	[D/A-1]*100	[D/B-1]*100	[D/C-1]*100
BHAKRA	Himachal	NR	1382	762	891	681	-702	-81	-211	-51%	-11%	-24%
PONG	Himachal	NR	759	244	520	378	-381	134	-142	-50%	55%	-27%
RANJIT SAGAR	Punjab	NR	345	22	213	215	-130	193	3	-38%	866%	1%
R.P. SAGAR	Rajasthan	NR	137	89	163	60	-77	-29	-103	-56%	-32%	-63%
RAM GANGA	Uttarakhand	NR	139	121	117	110	-29	-11	-7	-21%	-9%	-6%
TEHRI	Uttarakhand	NR	937	3268	599	616	-322	-2653	16	-34%	-81%	3%
RIHAND	Uttar Pradesh	NR	103	95	491	190	87	94	-302	85%	99%	-61%
Total NR			3802	4602	2995	2249	-1553	-2352	-746	-41%	-51%	-25%
SARDAR SAROVAR	Gujarat	WR	934	371	788	848	-86	477	60	-9%	128%	8%
UKAI	Gujarat	WR	563	432	498	345	-218	-87	-153	-39%	-20%	-31%
GANDHI SAGAR	Madhya Pradesh	WR	469	431	355	450	-19	19	95	-4%	5%	27%
INDIRA SAGAR	Madhya Pradesh	WR	769	555	1042	311	-459	-244	-731	-60%	-44%	-70%
BHIRA	Maharashtra	WR	544	615	581	579	35	-36	-2	6%	-6%	0%
KOYNA	Maharashtra	WR	2168	2639	2684	2670	502	31	-14	23%	1%	-1%
Total WR			5448	5043	5949	5203	-245	161	-746	-4%	3%	-13%
SRISAILAM	Andhra Pradesh	SR	402	1282	1314	184	-218	-1098	-1130	-54%	-86%	-86%
ALMATTI	Karnataka	SR	128	69	132	163	35	95	32	27%	138%	24%
KALINDI SUPA	Karnataka	SR	1328	1901	1787	889	-439	-1012	-898	-33%	-53%	-50%
SHARAVATHY	Karnataka	SR	2022	3739	3787	1402	-620	-2337	-2385	-31%	-62%	-63%
IDAMALAYAR	Kerala	SR	103	158	183	101	-2	-57	-82	-2%	-36%	-45%
IDUKKI	Kerala	SR	639	1182	1490	638	-1	-545	-852	0%	-46%	-57%
SABRIGRI	Kerala	SR	280	373	568	253	-28	-121	-316	-10%	-32%	-56%
KUNDAH GROUP	Tamil Nadu	SR	522	1080	1465	668	146	-412	-797	28%	-38%	-54%
METTUR	Tamil Nadu	SR	43	199	204	55	12	-144	-149	27%	-73%	-73%
PERIYAR	Tamil Nadu	SR	46	83	113	8	-38	-75	-105	-82%	-90%	-93%
NAGARJUN SAGAR	Telangana	SR	202	197	1333	180	-22	-16	-1153	-11%	-8%	-86%
Total SR			5716	10263	12376	4540	-1176	-5723	-7836	-21%	-56%	-63%
BALIMELA	Odisha	ER	218	384	213	132	-87	-253	-82	-40%	-66%	-38%
HIRAKUD	Odisha	ER	80	153	149	200	120	47	51	151%	31%	34%
INDRAVATI	Odisha	ER	139	177	257	219	80	41	-38	58%	23%	-15%
MACHKUND	Odisha	ER	81	334	394	164	83	-170	-230	102%	-51%	-58%
RENGALI	Odisha	ER	9	9	199	205	196	196	6	2140%	2216%	3%
UPPER KOLAB	Odisha	ER	168	299	248	128	-39	-171	-119	-23%	-57%	-48%
Total ER			695	1357	1460	1047	353	-309	-412	51%	-23%	-28%
LOKTAK	Manipur	NER	39	129	73	57	17	-73	-16	44%	-56%	-22%
Total NER			39	129	73	57	17	-73	-16	44%	-56%	-22%
ALL INDIA			15699	21393	22852	13097	-2602	-8296	-9755	-17%	-39%	-43%
