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EFFECT OF NEARBY CITIES ON WATER QUALITY OF CHAMBAL RIVER

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Abstract: *Now a day's water pollution is the common problem for rivers in our country due to discharge of untreated waste products by nearby cities. Most of cities use this water as drinking water so regular water qualities check up of these rivers are necessary. The physico chemical characteristics of Chambal river water in national Chambal sanctuary (Madhya Pradesh) have been studied. The stretch of Chambal river contained in the National Chambal sanctuary (located at $25^0$23□- $26^0$52□ N, $76^0$28□-$79^0$15□) is extending up to 600 km downstream to Kota (Rajasthan) to meet Yamuna river at Etawah in Uttar Pradesh. The river flow in Madhya Pradesh approximately a span of 400 km. Three locations are selected for sampling as Kota (Rajasthan), Dhaulpur (Rajasthan) and Bhind- Etawah border. Various parameters were taken to test the water sample during winter and summer season (2014-2015).*

Keywords: *Water quality, Regular checks up, nearby cities, untreated waste products, Water Pollution.*

I. INTRODUCTION

River pollution in India has now reached to a point of crisis due to unplanned urbanization and rapid growth of industrialization. The entire array of life is affected due to pollution of water. The main causes of water pollution are disposal of death bodies, discharge of untreated industrial and domestic sewage which are major causes of health hazards and ecological damages (Meitei et al., 2004). The degree of pollution is generally calculated on the basis of physical and chemical parameters of water body (Duran and Suicnz, 2007). The Chambal river is tributary of the Yamuna river in central part of India and forms part of the greater Gangetic drainage system. The river flows north-northeast through Madhya Pradesh, running for a time through Rajasthan then forming a boundary between Rajasthan and Madhya Pradesh before turning southeast to join the Yamuna in Uttar Pradesh.

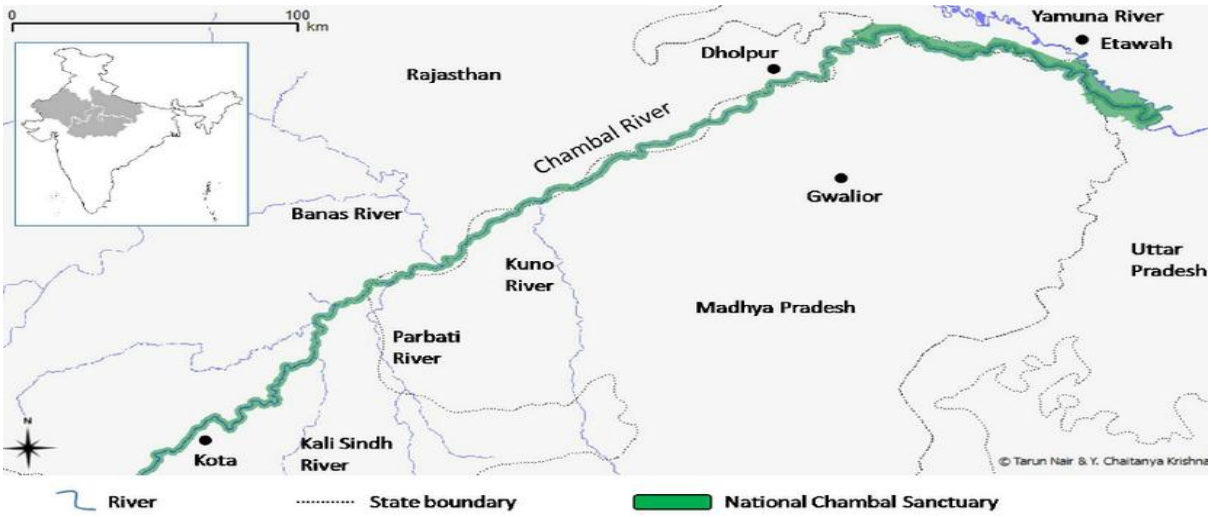

Figure 1: Span of Chambal River

II.OBJECTIVE OF STUDY

To predict water quality of Chambal river according to values of physical and chemical parameters like pH, Alkalinity, Acidity, Colour, Temperature, Total Dissolve Solids (TDS), Chloride, Hardness, Electrical conductivity, Turbidity, Dissolve Oxygen (DO), BOD, COD and Calcium in summer and winter seasons separately and comparison with IS:10500:2012 standards and find changes in water quality of Chambal River from 2008 according to study done by Saxena et.al,2008 at same selected three stations.

III.MATHODOLOGY

1. **pH:** In drinking water permissible limit of pH ranges between 6.6 to 8.5 (IS 10500). Low pH value causes corrosion of distribution pipes and high pH value causes bitter taste. If pH value crosses range of permissible limits it affects aquatic life strongly. pH also affects most of treatment processes.
2. **Alkalinity:** Alkalinity of water is referred to its capacity to neutralize an acid and it is sum of titrable alkalis. It is usually due to the presence of carbonate, bicarbonate and hydroxide compounds of calcium, magnesium, sodium and potassium. Borate, phosphate and silicate also contribute to alkalinity. Value of alkalinity provides idea about loss of chemicals used in water and wastewater treatment.
3. **Acidity:** It referred to its quantitative capacity to react with strong base. Acidity is due to strong mineral acid such as carbonic and acetic acid hydrolyzing salts such as iron and aluminium sulphates may contribute to acidity. There are two forms of acidity such as mineral acidity and carbon di oxide acidity.
4. **Colour:** Colour also indicates about presence of minerals, organic matter and impurities present in water. Pure water exhibits a light blue colour which changes greenish blue, green, greenish yellow, yellow to brown by presence of organic matter. Before discharge in to water body colour should be removed.
5. **Temperature:** Identification of source of water supply, such as deep well, often is possible by temperature measurement alone. Temperature affects almost all the purification processes of water and wastewater.
6. **Total Dissolve Solids (TDS):** TDS in drinking water originate from natural sources, sewage urban runoff, industrial waste water and chemical used in purification process. The high level of TDS may also be objectionable to consumers, owing to excessive scaling in water pipes, heaters, boilers and house hold appliances.
7. **Chloride:** If chloride limit exceed it leads high blood pressure, salty taste, corroded pipes and pitting to stainless steel.
8. **Electrical conductivity (EC):** Measure of electrical conductivity also relates to solids present in water which needs to remove.
9. **Hardness:** Water hardness is traditional measure of precipitate shop. Hard water is not suitable for drinking because high concentration of calcium and magnesium and also not suitable for cooking.
10. **Turbidity:** Turbidity is generally due to presence of waste products which are not suitable for drinking.
11. **Dissolve Oxygen (DO):** Dissolve oxygen level less than permissible value is very harmful for aquatic life.
12. **Biochemical Oxygen Demand (BOD):** BOD is amount of oxygen required by bacteria's while stabilizing decomposable organic matter, so oxygen should be supplied according to degree of treatment required.
13. **Chemical Oxygen Demand (COD):** COD is used widely for measuring of pollution strength.

IV.RESULTS AND DISCUSSION

Tables 1, table 2 and table 3 contains values of different physical and chemical parameters at three locations Kota (Rajasthan), Dhaulpur (Rajasthan) and Bhind (Uttar Pradesh and Madhya Pradesh border). Results are compared with Indian Standard – Drinking Water Specifications (IS 10500:2012) and also compared with the last research carried out on River Chambal on same locations Sakshena D.N et al, 2008 and check the changes occurred during the time shown in table 4

Chloride content in all samples of water of Chambal river is within the limit when compared with IS 10500:2012, whose permissible limit is not greater than 250 ppm in both summer and winter seasons. On behalf of permissible value of chloride content it is estimated that there no problem of sewage disposal. Turbidity value of all three stations is also within safe limit and varies between 5-10 NTU. In both seasons there are minute changes seen.

Electrical conductivity (EC) value varies between 319µmho/cm to 461µmho/cm at station A, at station B it varies between 342µmho/cm to 497µmho/cm and same at station C varies between 337µmho/cm to 517µmho/cm between both the seasons. This variation is due to combined effect of variation of temperature and TDS in summer and winter seasons.

pH value is safe according to IS 10500:2012 at all three locations in summer and winter both, so it can be said that water is safe for aquatic life and human as well but at station A attention should be paid.

Total dissolve solid (TDS) is within permissible limits at all locations. Colour at station C is transparent by visualization and same is turbid at stations B and C according to observation taken at site. Hardness is also within permissible limit at all locations and not shows remarkable variation in summer and winter. Dissolve oxygen (DO) in winter season at station B have more value 32 mg/l and at stations B and C are 20 mg/l and 16 mg/l respectively but in summer seasons DO values are nearly same at all locations. Calcium content should vary from 75-200 mg/l according to IS 10500:2012 and value is within safe limit at all locations in summer and winter.

Alkalinity of Chambal River is also in safe limit. At station A and B phenolphthalein alkalinity is absent but methyl orange alkalinity is present while at station C both type of alkalinity are present in which carbonate and bicarbonate are present in winter and in summer season station A and B have phenolphthalein is zero but at station C both methyl orange and phenolphthalein is present. Acidity at station C having both (phenolphthalein and methyl orange) are absent and at station A methyl orange is absent and station B have no phenolphthalein carbonates shown. On comparing with last research it is clear that in winter season the parameters are almost same but in summer seasons there is huge difference to

be seen but recent study shows that river water is safe in both the seasons. Value of various water quality parameters at various stations, experimentally found is listed in table 1 – table 3.

Parameters	Units	Station A, Kota (Raj)		IS: 10500:2012	Saxena D.N. et al, 2008 At Station A	
		Winter (Oct-Nov,14)	Summer (May,15)		Winter	Summer
Temperature	^{0}C	26	38	-	17.6	31
Colour	-	Transparent	Transparent	-	Very turbid	Transparent
Turbidity	NTU	3	2	5-10	1.6	86.3
EC	µmho/cm	349	461	-	145.6	403.2
TDS	mg/l	340	270	500-2000	270	460
pH	-	7.6	8.1	6.5-8.5	7.9	9.3
Alkalinity	mg/l	170	200	200-600	72.5	275
Acidity	mg/l	25	40	-	-	-
T. hardness	mg/l	210	240	300-600	42	94
Chloride	mg/l	56.80	86	250-1000	15.62	59.64
BOD	mg/l	2	2	-	0.81	3.24
COD	mg/l	7	6.5	-	24.4	26.8
DO	mg/l	6	8	-	4.86	10.33
Calcium	mg/l	20	36	75-200	9.61	31.26

Table 1: Comparison of values of parameters at station A with IS: 10500:2012 and study done by Saxena D.N.et.al, 2008

Parameters	Units	Station B, Dhaulpur (Raj)		IS: 10500:2012	Saxena D.N. et al, 2008 At Station B	
		Winter (Oct-Nov,14)	Summer (May,15)		Winter	Summer
Temperature	^{0}C	24	28	-	17.9	33
Colour	-	Transparent	Yellowish	-	Transparent	Black
Turbidity	NTU	2	26	5-10	1.25	178
EC	µmho/cm	342	497	-	100	666.4
TDS	mg/l	200	292	500-2000	260	450
pH	-	7.4	6.8	6.5-8.5	8.10	8.92
Alkalinity	mg/l	270	220	200-600	70	270
Acidity	mg/l	10	20	-	-	-
T. hardness	mg/l	250	210	300-600	52	134
Chloride	mg/l	49.7	64	250-1000	16.33	39.76
BOD	mg/l	4	4.5	-	1.9	5.67
COD	mg/l	5	4	-	4	22.5
DO	mg/l	10	10	-	5.6	11.75
Calcium	mg/l	32	52	75-200	17.63	44.08

Table 2: Comparison of values of parameters at station B with IS: 10500:2012 and study done by Saxena D.N.et.al, 2008

Parameters	Units	Station C, Bhind (M.P)		IS: 10500:2012	Saxena D.N. et al, 2008 At Station B	
		Winter (Oct-Nov,14)	Summer (May,15)		Winter	Summer
Temperature	^{0}C	25	28	-	18.1	32.1
Colour	-	Transparent	Transparent	-	Transparent	Very turbid
Turbidity	NTU	2	1	5-10	1	107
EC	µmho/cm	337	517	-	168	884
TDS	mg/l	260	316	500-2000	260	500
pH	-	7.4	6.7	6.5-8.5	7.6	8.98
Alkalinity	mg/l	130	210	200-600	75	290
Acidity	mg/l	11	18	-	-	-
T. hardness	mg/l	220	240	300-600	62	140
Chloride	mg/l	35.5	71	250-1000	18.46	80.94
BOD	mg/l	2	3	-	0.6	3.24

COD	mg/l	7	6	-	4	17.6
DO	mg/l	06	10	-	5.37	14.59
Calcium	mg/l	16	36	75-200	19.23	34.46

Table 3: Comparison of values of parameters at station C with IS: 10500:2012 and study done by Saxena D.N.et.al, 2008
Variations of different parameters at stations A,B,C with IS 10500:2012 as shown in from figure 1 to figure 6

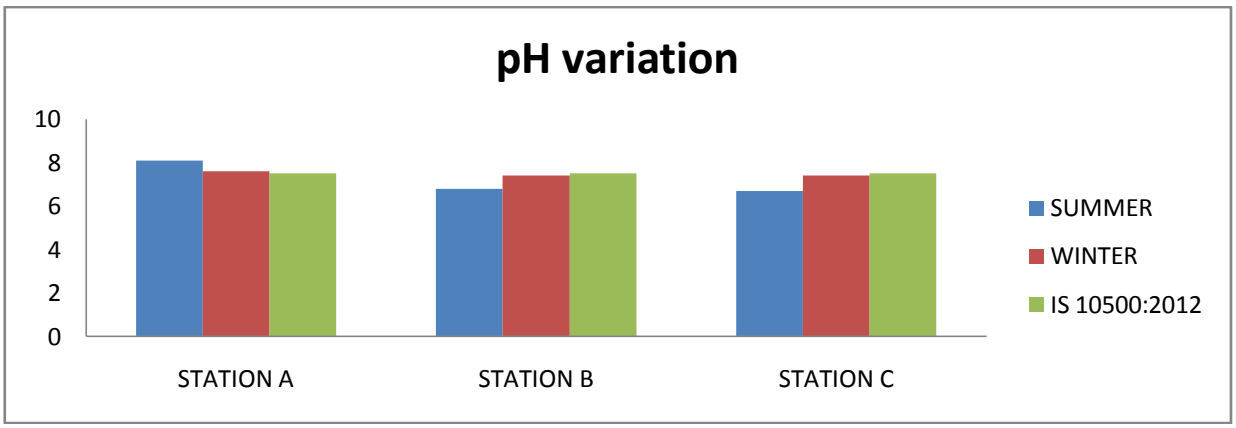

Figure 1 pH variations at different stations with IS 10500-2012

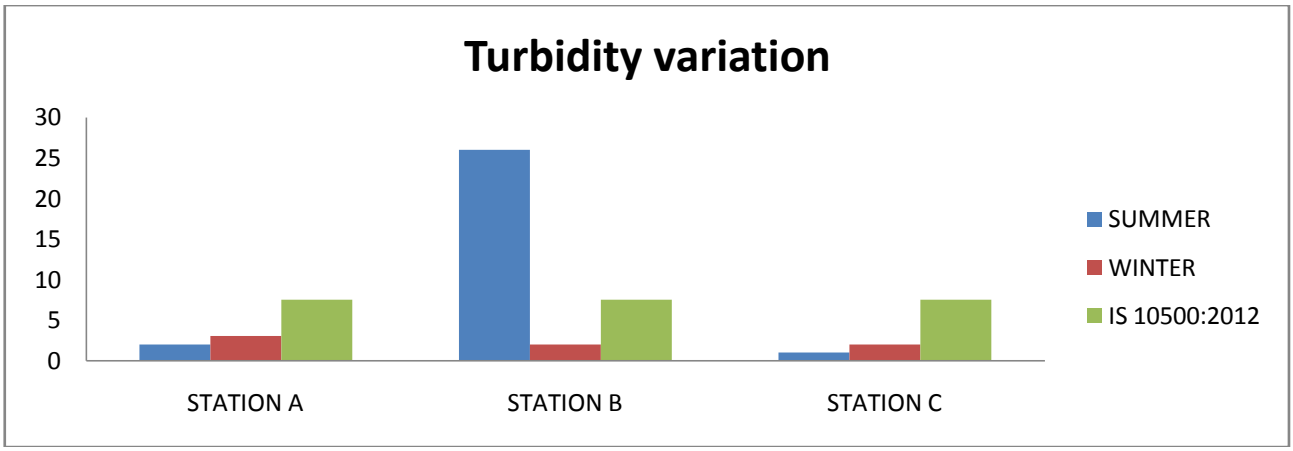

Figure 2 Turbidity (NTU) variations at different stations with IS 10500-2012

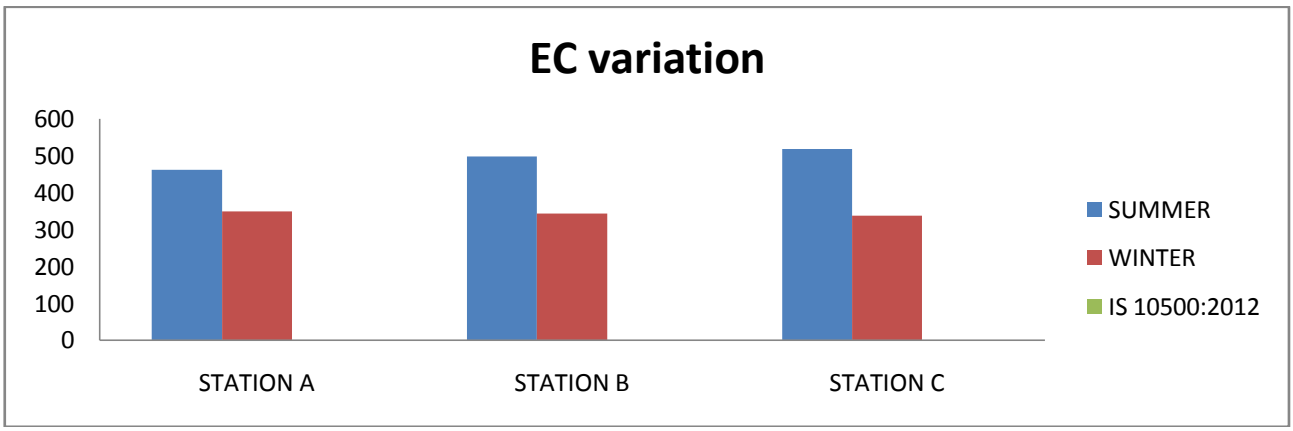

Figure 3 Electrical conductivity (µmho/cm) variations at different stations with IS 10500-2012

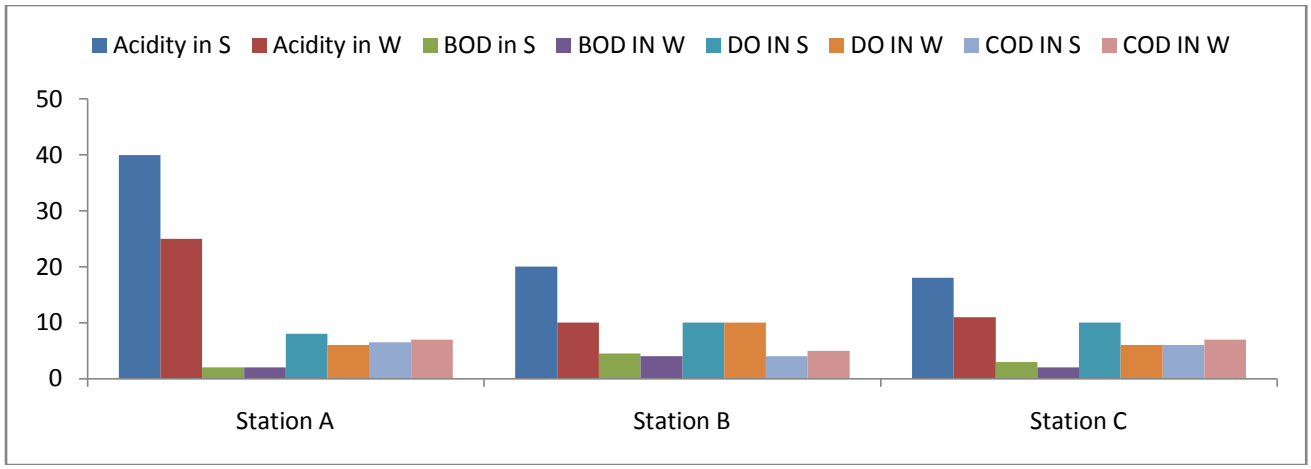

Figure 4 Acidity, BOD, COD and DO (mg/l) variations at different stations with IS 10500-2012

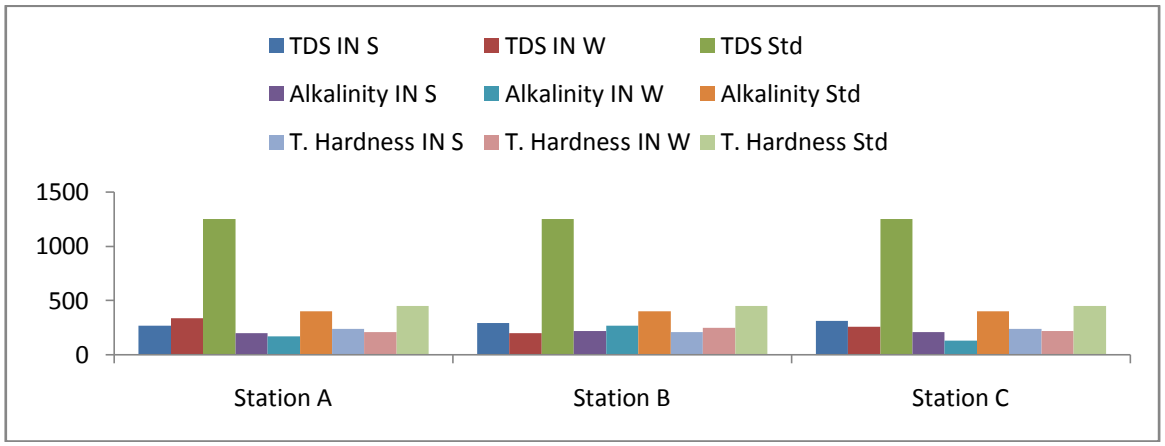

Figure 5 TDS, Alkalinity and T. Hardness (mg/l) variations at different stations with IS 10500-2012

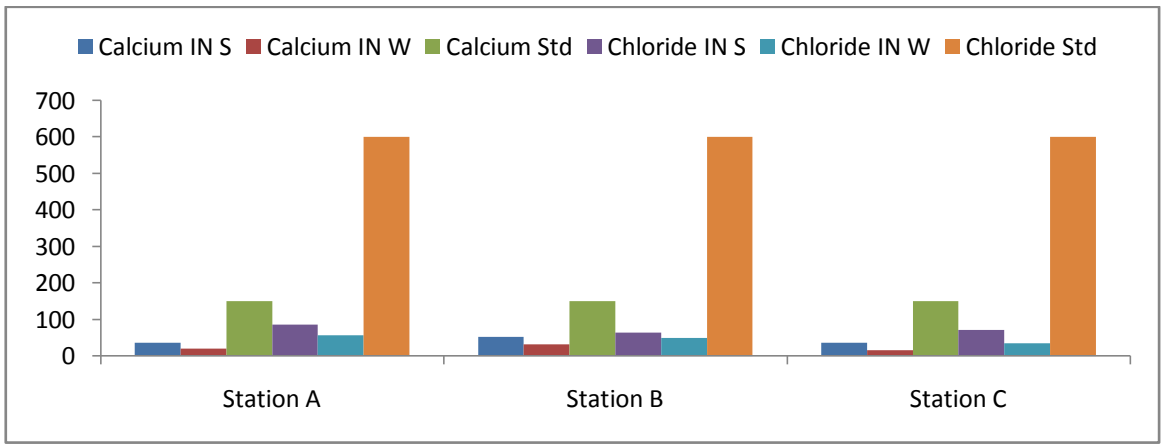

Figure 6 Calcium and Chloride (mg/l) variations at different stations with IS 10500-2012

V. CONCLUSION

A comparative study of water samples of Chambal river at three different stations for winter and summer seasons carried out by taking certain important water quality parameters like pH, TDS, alkalinity, DO, chloride, BOD, COD, total hardness, acidity, EC and calcium and result comparison with IS 10500:2012 and also check the changes occurred from last research carried out on same river. After analysis it is concludes that water quality of these locations are acceptable for drinking and other purposes after minor treatment as per uses. However some parameters like DO require keen

attention. In terms of future station A require attention otherwise it will get polluted and strict attention is required at quality of discharge effluent from industries at station A.

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