



**MADE EASY**

India's Best Institute for IES, GATE & PSUs

**ENVIRONMENTAL  
ENGINEERING**

**CLASSROOM  
INTERACTIVE NOTES**

~ Session : 2022-23 ~

**Faculty : Sagar Dodeja** (Ex. IES)

MADE EASY Education Private Limited

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## **5 RULES OF PREPARATION**

1. *Jaan Laga Do Ya Jaane Do*
2. *Practice & Revise Not Until You Are Right, Do It Until  
You Cannot Get It Wrong*
3. *The Key to Effective Time Utilisation is to Follow The  
Teacher As It Is*
4. *A Systematic Approach Is Always The Right Approach*
5. *Pray Daily*

**JAI HIND**



# ENVIRONMENTAL ENGINEERING

BY  
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SR. FACULTY, MADE EASY

## INSTRUCTIONS

These are interactive notes for Made Easy Classroom Students and Made Easy Online Students. These notes contain basic knowledge only and classes need to be attended thoroughly for in-depth explanations and solving Workbook Questions.

All the blank spaces are intentionally left for the students to write during the lectures.

Students should keep a separate copy of 200 pages with them at all times to solve all Workbook questions.

These notes are already tried and tested successfully on thousands of students and the notes provided have ensured maximum output from them.

With these notes, students can focus entirely on concept building and developing problem solving skills as basic theory, diagrams and facts are already written clearly in the notes. This also minimises errors during writing.

*Let's Begin*

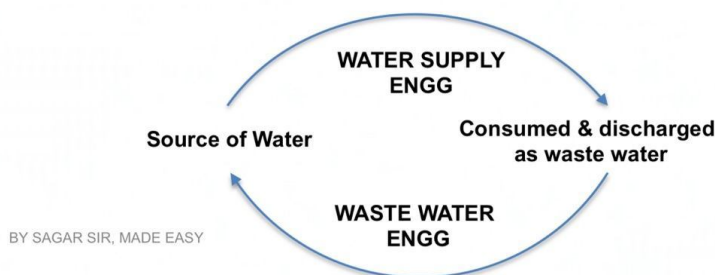
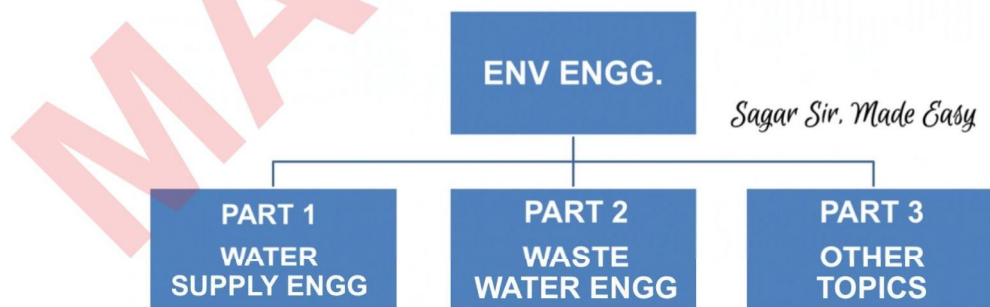
# INTRODUCTION

## WEIGHTAGE IN GATE

| GATE YEAR      | MARKS |
|----------------|-------|
| 2017 average   | 12    |
| 2018 average   | 11    |
| 2019 average   | 11    |
| 2020 average   | 11    |
| 2021 average   | 15    |
| 2022 average   |       |
| <b>Average</b> |       |

## WEIGHTAGE IN ESE

| ESE  | OBJECTIVE | CONVENTIONAL | TOTAL  |
|------|-----------|--------------|--------|
| 2014 | 36.67     | 56           | 92.67  |
| 2015 | 38.33     | 56           | 94.33  |
| 2016 | 33.33     | 56           | 89.33  |
| 2017 | 26.72     | 105          | 131.72 |
| 2018 | 36        | 100          | 136    |
| 2019 | 26        | 96           | 122    |
| 2020 | 30        | 110          | 140    |
| 2021 | 36        | 72           | 108    |



## Flow of Course

| <b>Part 1 Water Supply Engineering</b> |  |   |
|--|--|---|
| <b>S NO.</b>                           | <b>DESCRIPTION</b>   | <b>INSTRUCTIONS FOR STUDENTS</b>  |
| 1                                      | WATER DEMAND<br>- Population Forecasting<br>- Various Types of Demand  | -SOLVE WB AS SOON AS IT ENDS  |
| 2                                      | SOURCES OF WATER<br>- Focus on Sub Surface Sources<br>- Geological Formations<br>- Well Hydraulics   | -SOLVE WB AS SOON AS IT ENDS<br><br><i>Sagar Sir, Made Easy</i>                               |
| 3.                                     | WATER QUALITY PARAMETERS<br>-Physical, Chemical & Biological Parameters  | -REVISE AS MUCH AS POSSIBLE<br>-MEMORIZE KEY POINTS OF IS 10500<br>-SOLVE WB ALONG WITH CLASS |
| <b>S.NO.</b>                           | <b>DESCRIPTION</b>   | <b>INSTRUCTIONS FOR STUDENTS</b>  |
| 4                                      | TREATMENT OF WATER<br>-General process of treatment - Screening, Aeration, Coagulation, Flocculation, Sedimentation, Filtration & Disinfection<br>-Minor methods of treatment - Lime Soda Process, Ion Exchange, Demineralisation, Nalgonda, Prashanti and other techniques. | -DESIGN DATA NOT REQUIRED FOR GATE.<br>- SOLVE WB TWICE BEFORE EE ENDS                        |
| 5                                      | WATER DISTRIBUTION<br>-Types of Distribution Networks<br>-Types of Pipes, Valves and Joints<br>-Balancing Reservoir/ Distribution Reservoir Design   | -SOLVE WB AS SOON AS IT ENDS<br><br><i>Sagar Sir, Made Easy</i>                               |

Note : All the reforms for water treatment which were extensively adopted by the Water Act of 1974 are also included in the lectures along with the standard GOI Manuals & IS Codes.

## Part 2 Waste Water Engineering

| S.NO. | DESCRIPTION  | INSTRUCTIONS FOR STUDENTS  |
|-------|--|--|
| 6     | WASTEWATER MICROBIOLOGY  | -MEMORIZE IT BEFORE NEXT CHAPTER                                   |
| 7     | QUALITY CHARACTERISTICS OF WASTEWATER  | -SOLVE WB AS SOON AS IT ENDS                                       |
| 8     | DISPOSAL OF WASTEWATER<br>- Self purification Mechanism in Rivers<br>- Disposal in Land, Sea<br>- Lake characteristics and terminologies     | - SOLVE WORKBOOK AS SOON AS IT ENDS<br><i>Sagar Sir, Made Easy</i> |
| 9     | TREATMENT OF WASTEWATER<br>-Primary, Secondary & Tertiary Treatment<br>-Sludge Handling<br>-Oxidation Ponds, Septic Tanks, Imhoff tanks etc. | - SOLVE WORKBOOK QUESTIONS TWICE ALONG WITH CLASS                  |
| 10    | SEWERS AND SEWERAGE SYSTEM<br>- Components and Layout of Sewerage System<br>- Design of sewers<br>- Hydraulic characteristics                | - SOLVE WORKBOOK AS SOON AS IT ENDS                                |

## Part 3 - Small but an important portion

| CHAPTER NO. | DESCRIPTION   |
|-------------|---|
| 11          | SOLID WASTE MANAGEMENT<br>-Sources and classification of Solid Wastes<br>-Municipal Solid Waste Management – Characteristics, generation, collection & disposal<br>- Generation of energy<br>- Characteristic terminologies |
| 12          | AIR POLLUTION<br>- Types of pollutants, sources, impacts, control, air quality standards & limits<br>- Air Pollution Meteorology<br>- Lapse Rates, types of atmosphere<br>- Plume behaviour<br><i>Sagar Sir, Made Easy</i>  |
| 13          | NOISE POLLUTION<br>Impacts of noise, permissible limits, measurement of noise, & control of noise pollution<br>Various terms such as Leq, Ln etc  |

## CHAPTER WISE ANALYSIS

| CHAPTER NAME                                 | ESE   | GATE  |
|--|-------|-------|
| WATER DEMAND                                 | 2.3%  | 1%    |
| SOURCES OF WATER <i>Sagar Sir, Made Easy</i> | 7.2%  | 5%    |
| WATER QUALITY PARAMETERS                     | 10.3% | 18.3% |
| TREATMENT OF WATER                           | 22.5% | 21.9% |
| CONVEYANCE & DISTRIBUTION SYSTEMS            | 3.6%  | 3.1%  |
| WASTE WATER CHARACTERISTICS                  | 5.4%  | 13%   |
| DISPOSAL OF WASTE WATER                      | 4%    | 2%    |
| WASTE WATER TREATMENT                        | 17.3% | 15.5% |
| DESIGN OF SEWERS & SEWERAGE SYSTEMS          | 6.7%  | 3.5%  |
| MUNICIPAL SOLID WASTE MANAGEMENT             | 6.45% | 4.3%  |
| AIR & NOISE POLLUTION                        | 14.3% | 12.4% |

## Reference Books

- GOI Manuals
  - Environmental Engg – Peavy, Rowe & Tchobanoglous
  - Environmental Engg – Metcalf & Eddy
  - Water Supply Engg - S K Garg
  - Waste Water Engg – S K Garg *Sagar Sir, Made Easy*
  - Environmental Chemistry - Sawyer, McCarty, Parkin
  - Environmental Engineering - Davis & Cornwell
- *Everything related to GATE & ESE will be covered in class itself. If anything else is required, above materials can be referred.*

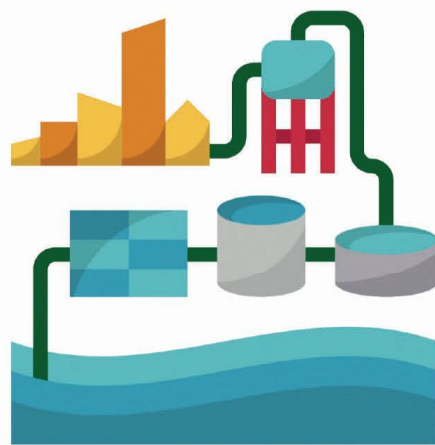
## MANUALS

- GOI Manual on Water Supply & Treatment, 1999
- GOI Manual on Sewerage and Sewage treatment (Part A, B & C), 2013
- GOI Manual on Municipal Solid Waste Management, 2016

*Note : All manuals are developed by CPHEEO (Central Public Health & Environmental Engineering Organization) under MoUD (Ministry of Urban Development)*

*Download link : <http://cpheeo.nic.in/> Sagar Sir, Made Easy*

Apart from GOI Manuals, there will be references to various IS Codes in the lectures



START OF  
**WATER SUPPLY ENGINEERING**



# CHAPTER 1 WATER DEMAND

## CONTENTS

Students should write this after chapter completion. This provides with overall view & acts as a tool for active recalling.

### WATER DEMAND.

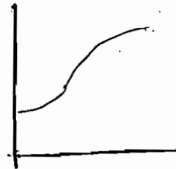
PPL<sup>n</sup>  
Forecast<sup>g</sup>

Per Capita  
Consumption

Design Period

Mathematical

Graphical

- ① SGM — not used
- ② CGM — practical
- ③ LCM — 

- ① AIM — large fest d
- ② GIM — young & rapidly
- ③ IIM — Somewhere in bet<sup>n</sup> ① & ②
- ④ DRGM — rising / <sup>downward</sup> trend

Domestic  
(135-225)

I + C (20)

Ind (50)

Q  
(AADD)

PU D (10 & 5% max)

L + T.

F D

India

$S = 100 \sqrt{P}$   
120-150  $\text{lit}/\text{m}^2$   
1100  $\text{lit}/\text{mi}^2 \times 3$   
3-4 h

EPA

Kuchling's  
Freemans  
Bustons  
NB OF U

CD

TD.

## WATER DEMAND

Water Demand implies water quantity estimation. The quantity of water required for municipal uses for which the water supply scheme has to be designed requires the following data :-

1. Forecasted Population
2. Rate of Consumption (lpcd or l/c/d)

## Design Period

The quantity of water is worked out with due provision for requirement of future population because the water supply system involves huge and costly structures such as dams, reservoirs, complex and vast structures such as distribution networks, various water treatment units etc. which cannot be easily replaced or modified.

- The future period for which the water supply scheme is designed to cater for the future population is referred as DESIGN PERIOD.

Q → Design period is neither very less nor very high. Why?

