The revised edition of Environment and Ecology is a Complete Guide on these topics for the Civil Services Preliminary and Main Examinations. It will also be useful for those appearing in the Indian Forest Service Examination.

The book will strengthen the aspirant’s conceptual understanding of the topics, even as it prepares her or him for the examinations. In tune with the kind of questions asked in the Civil Services Examination, it has a strong focus on India, while covering the major international issues as well. The government policies, laws and regulations are covered in a comprehensive manner.

The Question-Answer format has been used to make the book directly useful for the aspirant. The book promotes critical thinking needed for the Examination by presenting diverse aspects of each issue using a prescriptive approach. Written in simple and lucid language, the book will serve as a comprehensive reference book on environment and ecology for the Examination.

New to the Revised Edition
- Solved papers for the Preliminary Examination of the years 2016 and 2017
- Chapter-wise analysis of the questions of the Main Examination 2016.

Key features
- Coverage of the latest developments in the field of Environment & Ecology.
- Lead stories in all the chapters to improve understanding while creating an interest in the topic.
- Chapter-wise categorization of the past questions of Civil Services Preliminary and Main Examination, with comments where necessary.
- Model answers for the questions of Main Examinations and Question Bank for the Preliminary and Main Examinations, based on latest pattern of the UPSC.

The first edition has been a runaway success and here are some reviews, provided by aspirants on Amazon.in:
- The author is very credible person and also covers all the info. This is better than any other popular sources till date.
- I have studied a lot of environmental studies books. But this one does the job. It's the best book for IAS aspirants.
- Awesome book...it helps you to think.. the question answer format is really good effort.. very useful for UPSC.
- Great book...Must read...No need to read other books...Covers all topics and updated data!
- This is the best book available on the environment... Written by a subject expert.
- Superb book, covers everything needed for both Prelims and Mains.
- This is a great book.. especially the manner in which it is written… very easy to read and understand the concepts..

R. Rajagopalan, a former Professor at IIT Madras, is the author of 14 books on environment for schools, colleges, and the general reader. His university-level book has been very popular among students and consistently ranked as the #1 best seller on www.amazon.in. Professor Rajagopalan gives presentations and conducts workshops on environment for diverse groups (including IAS officers) across the country.
ENVIRONMENT AND ECOLOGY
A COMPLETE GUIDE

For Civil Services Preliminary and Main Examinations

R RAJAGOPALAN
Former Professor
Indian Institute of Technology Madras

Foreword by
Prabhat Kumar
IAS (Retd.), Former Cabinet Secretary and Former Governor, Jharkhand

OakBridge
This book is dedicated to the thousands of Indian youth from diverse backgrounds, who are determined to make it to the Civil Services with the intention of making India a great nation.
A book on subjects like ecological systems and their conservation merely for appearing in an examination may not seem very appropriate; but as an ardent advocate and teacher of sustainable development, the thought of reaching out to a huge audience of civil service aspirants must have been compelling to Professor Rajagopalan. That he has succeeded in putting concepts, facts and messages in an altogether captivating form, speaks volumes of his masterly grip on the subject. He is not only a versatile writer but a brilliant speaker as well. Many times I have heard him speak to senior civil servants on related topics of conservationism and biodiversity and every time leaving them mesmerized after a ninety minute session.

The leaders of tomorrow need to be equipped with knowledge and dexterity to face tomorrow’s challenges. The political executives and the bureaucrats of the future should particularly be made aware of the contour of the surroundings they and their children are going to live in. They should be able to comprehend the trade-off between ecological protection and economic development. Environment includes all those things we are directly or indirectly dependent on for our survival, whether it is living organisms like animals, plants or inanimate elements like soil, air or water. Industrial development, by its very nature, disturbs nature’s balance and increases the carbon footprint. We are repeatedly told from every forum that the world is hurtling towards a non-livable eco-system and that we humans are doing everything to methodically devastate it. It is unfortunate that most of us do not know how to deal with the impending catastrophe.

Though the present volume seeks to equip the civil service aspirants for answering questions on the subject in their preliminary and main examinations, it imperceptibly imparts basic knowledge about the changing configuration of Earth’s environment, its attendant problems and develops in them an attitude of concern for the environment. It covers the areas like the scope and structure of environment and the interaction of nature, society and development, environment impact assessment, economics of pollution, prevention, environmental management standards etc.

I am sure that the examinees who study this book will not only score well in the preliminary and main examinations for the civil services, but also carry their acquired consciousness into
whatever profession they pursue in life. Hundreds of thousands of young men and women will thus become more responsible global citizens. For myself, I can only say that I will certainly obtain a copy of the book despite my ineligibility to appear for the civil service examination now.

Prabhat Kumar
IAS (Retd.), Former Cabinet Secretary and Former Governor, Jharkhand
To the aspirant and reader:
Let me begin with wishing you success in the UPSC Civil Services Examination or any other competitive test that you are taking. This book covers the Environment and Ecology sections of the UPSC Preliminary Examination and General Studies Paper III of the Main Examination. Additionally, it also covers the environment related topics from other papers of the General Studies.

I was motivated to write this book because I had been receiving positive reviews from Civil Services aspirants for my university-level textbook. The book 'Environment and Ecology - A Complete Guide' has been written specifically for Civil Services aspirants and is designed to help them answer the questions on Environment and Ecology in the Preliminary and Main Examinations. I have altogether published 14 books on environment for schools, universities, and the general reader.

What is new in this revised edition?
- This edition includes all the environment-related questions from:
  - 2016 and 2017 Preliminary Examinations (with answers and explanations)
  - Chapter-wise categorization of 2016 Main Examination
- A few corrections pointed out by the aspirants have been incorporated.
- Beginning with this edition, the book is being published by OakBridge.

Why should you study a book on environment and ecology?
Even though Environment and Ecology form just a small part of the whole examination syllabus, here are some reasons why you should study a whole book on the subject:
• Environment and Ecology account for 20-25% of the questions in General Studies Paper I of the Preliminary Examination since 2011.
• In the General Studies Paper III of the Main Examination, an average of 8 questions per year have appeared on the subject since 2013.
• Questions on environmental ethics have also occurred in the General Studies Paper IV of the Main Examination, which is ‘Ethics, Integrity, and Aptitude’.
• The environmental crisis and phenomena like climate change have become a serious threat to humanity and this fact will surely be reflected in all the competitive examinations and interviews.

There is also another important and general reason for studying this book: ‘Environment’ is different from all the other subjects you are studying for the examination. The environmental crisis is going to affect you, your family, and the succeeding generations. As a citizen of this world, you must become aware of the crisis and also take action to reverse the slide towards serious environmental destruction.

What were my objectives while writing this book?
As the title implies, this book is intended to be a complete guide on Environment and Ecology for the Civil Services Examination. I set out to write a book that would:
• be interesting to read,
• give the aspirant a good grounding on the basic concepts of Environment and Ecology, and
• help the aspirant answer correctly the maximum number of questions on Environment and Ecology in the Preliminary and Main Examinations as well as the Interview.

Please let me know whether I have met the objectives.

How should you use this book?
• Go through the next section ‘Effective Study: SQ3R Method and Use of Flash Cards.’ If the methods that I have suggested appeal to you, understand the method and get yourself a set of flash cards.
• Examine carefully the following section ‘A Strategy for the Preliminary and Main Examinations (for Environment and Ecology).’ I have analysed the pattern of questions of the previous years and suggested a strategy for you to follow.
• Go through the contents quickly to understand the sequence of chapters and topics.
• Read the first chapter quickly to get an overview of the subject.
• Include the chapters of this book in the time table you would be making for your preparation.

Follow the SQ3R Method while reading a chapter and prepare the flash cards as suggested. The first reading and writing will take some time. Once it is done properly, however, you may never need to study the book again section by section. Later, you will only be using the flash cards and reviewing only those sections you have difficulty in remembering. The first reading is thus very important and so do it well.
Preface to the Revised Edition

What are the contents of this book?

The contents of the book are based on:

- Syllabi of the Preliminary and Main Examinations
- Environment-related questions from papers of previous years:
  - Preliminary Examination General Studies I since 2011
  - Main Examination General Studies III since 2013
- Additional environment-related questions from the papers of Main Examination - General Studies I, II, and IV since 2013
- An analysis of all the environment-related questions from the papers of General Studies from 1987 to 2011
- Additional ‘must-know’ topics with potential for questions in the coming years
- Current affairs and recent developments

In tune with the questions asked in the Civil Services Examination, the book has a strong focus on India, even while it covers the major international issues. The last chapter includes the developments during the six months it took me to write the book.

I have not given a summary of points at the end of each chapter. I want you to be an active reader and write down the important points, questions, and answers on flash cards. I have also not covered topics that are purely in the domain of geography, agriculture, botany, or biology.

What are the outstanding features of the book?

- Simple language, easy to understand.
- Question-Answer format for easy preparation for the examination.
- Liberal use of bullet points in order to reduce the length of text and enable you to read and remember the main points.
- Many true stories that would improve your understanding while creating an interest in the topic. I have included all the stories that have figured in the past papers and also stories that have the potential of appearing in the examination.
- Complete coverage of government policies, laws, and regulations.
- Answers to all the past questions in the Preliminary Examination with comments where necessary.
- A large Question Bank for the Preliminary and Main Examination.
- Extensive References including books, articles, websites, and films.

The Appendices include:

- Glossary of Terms
- A Guide to Critical Thinking for the UPSC Main Examination
- Model Answers for UPSC Main Examinations (2014 and 2015)
- Major Environmental Organizations
- Questions on Environment and Ecology (Preliminary Examination 2016)
- Questions on Environment and Ecology (Main Examination 2016)
• Questions on Environment and Ecology (Preliminary Examination 2017)
• Index

I know that it is difficult to keep up a strenuous discipline of study over several months. So I begin each chapter with a motivational quotation that might give you a psychological boost and help you to keep going. There is also a quotation on the topic of the chapter to excite your interest.

**How can you keep up with the current events?**

You can keep track of current events by accessing my special blog for this book: IASEnvironmentEcology.blogspot.com

**What is my request to you?**

Please give me a feedback on the book:

• What did you like about this book?
• What did you not like about this book?
• Which sections of the book were unnecessary and could be removed?
• Are there errors, missing topics, insufficient or unclear explanations, etc.?
• What other features should be included in the book?

Your comments and suggestions will be invaluable to us, when we prepare the next edition of the book. Send your comments to: rrgopalanoakbridge@gmail.com.

**Acknowledgements**

I have referred to a large number of books, articles, and websites in the process of writing this book. In most cases, I have simplified, modified, or combined the source material. At the end of each chapter I have given the most important references and sources. Again, most of the Boxes and Tables carry the sources.

I have taken material from websites I believe to be in the public domain or under the Creative Commons category. These include websites of the UN agencies, international NGOs, and Indian ministries as well as Wikipedia. I have also acknowledged the sources. If, however, any permissions are needed for any of the material and my attention is drawn to such cases, I will immediately seek the needed permissions.

Data on Ecological Footprint has been taken from:


Some of the data on disasters in Chapter 16 are based on:


I wish you a great preparation followed by success in the Examination!

**R.Rajagopalan**

Bangalore

August 1, 2017
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<td>16. Disasters and Disaster Management</td>
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When you were a student in college, how did you study the prescribed textbook? If you have already been preparing for the Civil Services Examination, what is your preferred way of reading a chapter in a recommended book?

If you are a ‘normal’ student, you would probably read the chapter from the beginning to the end. Being a ‘serious’ Civil Services aspirant, it is likely that you underline the important points for easy revision later on. For your study to be effective and for achieving superior performance in the examination, however, you could follow a more active way called the SQ3R Method combined with the use of flash cards.

**What is the SQ3R method of study?**

SQ3R is an acronym for a 5-step reading and study method developed by Francis Robinson (1906–1983), who was a Professor of Psychology at Ohio State University (OSU) in the US. During World War II, thousands of US army personnel had to be trained very quickly in skills relevant to the war. Based on his research as well as earlier studies on study skills, Professor Robinson came up with the SQ3R Method to help the army personnel learn new skills in a short period of time. Later, Robinson’s book *Effective Study*, which described the method, became popular with all students in universities and schools. Even today, many US universities recommend this method to the new students.

**What are flash cards?**

A flash card is just a small card, about 130 mm x 80 mm in size, available in shops selling invitation cards. You write a question, keyword, or phrase on one side of the card. On the other side, you write the answer to the question or an explanation for the keyword or phrase. In this way, you can create a deck of cards for each chapter that you study. We will see presently how such cards can be extremely useful as a study aid.

**What is the key idea behind SQ3R?**

SQ3R differentiates between reading and studying. You can just read a novel or a magazine, while you must study a textbook or a test-prep guide like this one. In studying this book, your
aim is to achieve mastery over the topics of environment and ecology, and to be able to answer correctly all the relevant questions in the examination.

SQ3R recognizes the fact that, while studying a book, the most important things you must do often occur before and after reading, not actually during the reading act itself. SQ3R makes you an active reader of the book, enabling you to learn well and remember the material.

How can you apply the 5 steps of SQ3R and also use flash cards, while studying a chapter of this book?

SQ3R consists of five related activities: Survey, Question, Read, Recite, and Review. You will see that the format of this book makes it easy for you to follow this method.

1. Survey: Before reading a chapter, make a quick survey of what the chapter contains. It is like looking at a map to plan your route before you begin a journey.
   - Read the following:
     - Chapter title
     - Quotation: How is the quotation connected to the main topic of the chapter?
     - Main Questions Addressed
     - Keywords and Phrases
     - Title of the Lead Story
   - Read the section headings (questions) and the titles of Boxes.
   - Read the titles of the tables and look at the figures, if any, to get an overall idea.
   - Go through the items to remember list at the end of the main text before the Exercises.
   - Read quickly the UPSC questions given under Exercises.

2. Question: While you are surveying the chapter, focus on the questions that the chapter attempts to answer. This approach keeps your mind alert and concentrated.
   - Read the questions at the head of sections and subsections.
   - Convert the Box titles into questions and write them down.
   - Add some more from the UPSC papers and the Question Bank – the ones you find interesting.
   - Add your own questions.
   - Write down each question on a flash card.

As you follow the Survey and Question Steps, try to recall what you already know about the topics. Check whether you can answer any of the questions even without reading the chapter.

3. Read (and Write): Read one section of the chapter, looking for answers to the questions you have written down. Separate the key ideas from the supporting details and examples. This makes you an active reader.

As you read the section of the chapter, pick up the relevant flash card and write down the answer as bullet points on the other side of the card. In the case of a keyword or phrase, write the explanation, also as bullet points. You can also copy figures from the book or add a diagram of your own. Don’t forget to write down the chapter number at one corner of the card.
4. Recite: This is the process of immediate recall of what you have learned. After reading each section:
   • Pick up each card and answer orally the question from memory; check your answer by turning over the card.
   • If need be, read the relevant section of the chapter again and correct the answer on the card.
   • Make up mnemonics, if you find it difficult to remember a list of points. (A mnemonic is a word, sentence, or poem that helps you remember something. An example is the easy-to-remember word VIBGYOR, which stands for the colours of the rainbow.)

When you are able to answer all the questions, move to the next section. Follow the steps Read and Recite for that section. Continue until you complete the chapter.

5. Review: This is the most important step for retaining in memory what you have learned. After finishing all the sections of the chapter:
   • Review immediately:
     ▪ Again look at each flash card and orally answer the question from memory.
     ▪ Look for connections between sections.
     ▪ If you have time and the inclination, look up the ‘References’ given at the end of the chapter. Access the websites and go through the books and articles. Watch the films, if you can.
     ▪ Look for connections to the previous chapters.
   • Review again the next day.

Why is ‘Review’ the most important step in learning?

Without a proper review, you will soon forget most of what you learned by reading a chapter. Many years ago, the German psychologist Hermann Ebbinghaus studied the processes of learning and forgetting and came up with what is now called the Ebbinghaus Forgetting Curve (See figure).

![Ebbinghaus Forgetting Curve](image-url)
The Ebbinghaus Curve gives us shocking news. Once we have learned something new, the brain begins to forget the new information almost immediately and quite rapidly. In 20 minutes, we forget about 40% of it and by the end of 24 hours, two-thirds would be gone from the memory. Fortunately, as time passes, the rate of forgetting reduces and the curve flattens. In a month’s time, just 20% remains in memory and this level does not go down drastically. A small part of what we learned stays in the memory for a long time. There are, of course, people with strong memories and age too is a factor. The Ebbinghaus Curve, however, applies to most of us most of the time.

How can we counter the Ebbinghaus Effect? Writing down the answers on the cards and the use of mnemonics definitely strengthen memory and recall. A sure method, however, is spaced repetition, that is, frequent review of the material using flash cards. Thus, you must review the chapter after 24 hours and repeat the review at longer and longer intervals, say, after one week, then after a month and so on. Draw up a time table for study and spaced repetition and stick to it.

As you review the material in succession, you may notice that you remember easily the material on some cards. You can then drop those cards from the deck. If you continue the periodic review, you will retain more and more of the material in your memory. The deck of flash cards would get thinner and you will have a much smaller deck to review just before the examination. Retain the dropped cards in proper order – you may want to review them again later.

All this may appear to involve too much time and effort. You might say: ‘With so many subjects to cover, I do not have the time to follow this method.’ In reality, this method will take less time and give you better results, if you work according to a timetable. There will be much less need to study the same books again and again.

**What is the importance of writing down the answers on cards?**

In these days of email and text messages, we have lost the art of writing. Every coaching institute and guide book will tell you how important writing practice is for success in the examination. Flash cards force you to get back into the writing mode.

Writing down the answers improves retention, brings up points you had not understood well, and leads you to more questions on the topic. Further, writing practice improves your speed, which is vital in the examination.

**Is the SQ3R method with flash cards the best method of study for all aspirants and all subjects?**

Aspirants differ widely in their motivation levels, general work habits, previous education, language competence, and so on. In the same way, books too differ in the way of presentation, difficulty levels of concepts, simplicity of language, format of chapters, and so on. Thus, one method of study may not suit all students and all books. You will have to explore and find the study skill that suits you and the subject best.

What is important is to follow a method of active reading, not a passive one. Even if you are not comfortable with the actual steps of SQ3R, try to follow the principles of learning it is built upon: Getting the larger context first, examining the book’s overall organizational plan, setting
specific goals and then pursuing them, and the use of immediate recall and verbal paraphrase as aids to learning and retention.

Try these key elements while studying this book and others. It is very likely that you will learn better, faster, and retain more!

Where can you find more information on SQ3R and other such study skills?

For more information on SQ3R and other study skills, access some of the following websites:

1. Virginia Polytechnic Institute and State University, US: [www.ucc.vt.edu/academic_support_students/study_skills_information/sq3r_reading-study_system/index.html](http://www.ucc.vt.edu/academic_support_students/study_skills_information/sq3r_reading-study_system/index.html)
2. University of Chicago, US: [https://counseling.uchicago.edu/page/sq3r-improve-reading-comprehension](https://counseling.uchicago.edu/page/sq3r-improve-reading-comprehension)
4. Bethel University, US: [http://cas.bethel.edu/dept/aesc/resources](http://cas.bethel.edu/dept/aesc/resources)

Finally, do share your questions and experiences with us through email!
A Strategy for the Preliminary and Main Examinations (for Environment and Ecology)

This book has 18 chapters. Which ones are important for the examination? Which topics should you focus on? To help answer such questions, here is an analysis of all the questions related to environment and ecology that appeared in the Preliminary and Main Examinations from 1979 to 2016. Please note that questions that fell purely in the areas of Geography or Agriculture were not included in this analysis.

Table 1 gives the number of questions by chapter, combining Chapters 5 and 6 (Biodiversity and its Conservation) and Chapters 8 and 9 (Energy Resources). Two time periods have been considered: The entire period of 1979-2016 and the more recent years, 2011-2016 (given that the examination format and syllabi were modified in 2011).

Table 1  No. of UPSC Questions

<table>
<thead>
<tr>
<th>Chapter/Topics</th>
<th>1979-2016</th>
<th></th>
<th></th>
<th>2011-16</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preliminary</td>
<td>Main</td>
<td>Total</td>
<td>Preliminary</td>
<td>Main</td>
<td>Total</td>
</tr>
<tr>
<td>5&amp;6. Biodiversity</td>
<td>58</td>
<td>12</td>
<td>70</td>
<td>37</td>
<td>3</td>
<td>40</td>
</tr>
<tr>
<td>8&amp;9. Energy Resources</td>
<td>45</td>
<td>22</td>
<td>67</td>
<td>15</td>
<td>8</td>
<td>23</td>
</tr>
<tr>
<td>13. Climate Change, Ozone, Acid Rain</td>
<td>39</td>
<td>17</td>
<td>56</td>
<td>18</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>10. Land &amp; Ocean Resources</td>
<td>35</td>
<td>26</td>
<td>61</td>
<td>16</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>2. Ecosystems</td>
<td>30</td>
<td>1</td>
<td>31</td>
<td>12</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>3. Forest, Grassland, Mountain, and Desert</td>
<td>27</td>
<td>7</td>
<td>34</td>
<td>7</td>
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<td>4. Aquatic Ecosystems</td>
<td>22</td>
<td>8</td>
<td>30</td>
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<td>14</td>
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<td>12. Water, Soil, and Marine Pollution</td>
<td>19</td>
<td>12</td>
<td>31</td>
<td>9</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>7. Water Resources</td>
<td>11</td>
<td>8</td>
<td>19</td>
<td>8</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>11. Waste, Pollution, and Environmental Health</td>
<td>9</td>
<td>8</td>
<td>17</td>
<td>5</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>15. Population Growth and Urbanization</td>
<td>8</td>
<td>7</td>
<td>15</td>
<td>0</td>
<td>3</td>
<td>3</td>
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<tr>
<td>16. Disaster Management</td>
<td>8</td>
<td>9</td>
<td>17</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17. Sustainable Development</td>
<td>9</td>
<td>14</td>
<td>23</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>14. Environmental Law, Ethics and EIA</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>1. Introduction</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>322</td>
<td>159</td>
<td>481</td>
<td>146</td>
<td>50</td>
<td>196</td>
</tr>
</tbody>
</table>
What do these Tables show?

- Number of questions on environment/ecology:
  - During the 31 years 1979-2010: 285 questions
  - During the 6 years 2011-2016: 196 questions

  Clearly, the field has gained importance with the examiners in recent years.

- In Table 2, we can see the sharp increase in the average number of questions (in both Preliminary and Main Examinations) since 2011.

- Table 3 shows that, since 2011, the number of questions in the Preliminary Examination has been fairly steady, but not so in the Main Examinations.

Suggested strategy:

- Skim through the entire book in the SQ3R way.

- For the Preliminary Examination you should focus on:
  - Chapters 5 and 6: Biodiversity and its Conservation
  - Chapters 8 and 9: Energy Resources
  - Chapter 13: Climate Change
  - Chapter 10: Land/Ocean Resources
  - Chapter 2: Ecosystems
  - Chapter 3: Forests
  - Chapter 4: Aquatic Life Zones (Ocean, wetlands, etc.)

- For the Main Examination, you should focus on:
  - Chapters 5 and 6: Biodiversity and its Conservation
  - Chapters 8 and 9: Energy Resources
  - Chapter 13: Climate Change
  - Chapter 10: Land/Ocean Resources
  - Chapter 17: Sustainable Development

- For both the examinations, study also Chapter 18: Recent Events
Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>MoEFCC</td>
<td>Union Ministry of Environment, Forests, and Climate Change</td>
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<tr>
<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>US</td>
<td>United States of America</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
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<tr>
<td>UNESCO</td>
<td>UN Educational, Scientific, and Cultural Organization</td>
</tr>
<tr>
<td>UN FAO</td>
<td>UN Food and Agricultural Organization</td>
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<tr>
<td>UNEP</td>
<td>UN Environment Programme</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>WWF</td>
<td>First known as World Wildlife Fund, later as Worldwide Fund for Nature, now simply as WWF</td>
</tr>
</tbody>
</table>

Units of Measurement

<table>
<thead>
<tr>
<th>Unit</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>m</td>
<td>Metre</td>
</tr>
<tr>
<td>km</td>
<td>Kilometre</td>
</tr>
<tr>
<td>sq. km</td>
<td>Square Kilometre</td>
</tr>
<tr>
<td>ha</td>
<td>Hectare (Thousand Square Metres)</td>
</tr>
<tr>
<td>g</td>
<td>gram</td>
</tr>
<tr>
<td>kg</td>
<td>kilogram</td>
</tr>
<tr>
<td>MW</td>
<td>Megawatt (Million watts)</td>
</tr>
<tr>
<td>GW</td>
<td>Gigawatt (Billion watts or Thousand MW)</td>
</tr>
<tr>
<td>Tonne</td>
<td>Metric Ton, 1000 kg</td>
</tr>
</tbody>
</table>
Motivational Quotes
Every chapter begins with a quotation for motivating the reader to keep up the tough task of preparing for the examination.

Importance of the Chapter
This Box explains the relevance of the chapter/topic to the examination: Frequency of occurrence of questions, importance for Preliminary and/or Main Examination, significance of the Lead Story, etc.

Learning Objectives
This is a list of major questions addressed in the chapter. This is in tune with the SQ3R method.

Keywords and Phrases
The list of keywords and phrases are items to be understood and remembered. They also help in following the SQ3R approach.

Lead Stories
Each chapter begins with a Lead Story connected with the topic of the chapter. While the story helps the reader understand the topic better, it can also be used as a case study or example while answering questions in the Main Examination.
Active Learning

The question-answer format of the book promotes active learning (through the SQ3R Method) and directly helps in preparing for the examination.

What should you remember from this chapter?
- The Chindia Tower of 2015 was caused by climate change, ENSO, and the disappearance of the city’s water supplies.
- Global and national disasters show a sharp decline in the area of environmental conservation.
- Extreme natural events are more frequent and more severe than in the previous decades.
- While an extreme event occurs, the impact on the environment and human communities is made each season for our own good and national welfare.
- We are causing the environmental crisis by exploiting our finite natural resources at an ever-increasing rate and, in the process of using up the resources, we are also rapidly and heedlessly polluting the planet.

Exercises

The Exercises include all the UPSC questions of the previous years as well as practice questions. Answers have been given for all the multiple-choice questions, with explanations where necessary.

Tables and Boxes

While the Boxes highlight the must-know facts, the Tables contain the data necessary for answering the questions in the examination.
R Rajagopalan holds a B.E. (Honours) degree in Mechanical Engineering from the University of Madras and M.Tech. and Ph.D. degrees in Industrial Management from the Indian Institute of Technology (IIT) at Kanpur, India. He taught for over 30 years at IIT Kanpur and IIT Madras, handling a variety of courses on industrial engineering, management, environment, and development.

More than 20 years ago, he shifted his focus to environmental issues. At IIT Madras, he was also the Director of International Ocean Institute (IOI, India) and coordinated several international ocean and environment-related courses and workshops. He was a member of the Governing Board of International Ocean Institute, Malta, during 2003–2009.

Prof. Rajagopalan continues to be active, giving presentations and conducting workshops on environment for school and college teachers as well as the public across the country. He is a regular facilitator at Initiatives of Change, Panchgani, where he has made presentations on environment to over 300 IAS and other Civil Services officers since 2008.

Prof. Rajagopalan has written 14 books on environment for schools, colleges and the general reader. The Third Edition of his university-level book was formally released at the New Delhi World Book Fair on 10 January, 2016. This book has been very popular among students and consistently ranked as the #1 bestseller on www.amazon.in, in the Environment and Environmental Studies categories.

Prof. Rajagopalan lives in an environment-friendly house in Bengaluru.