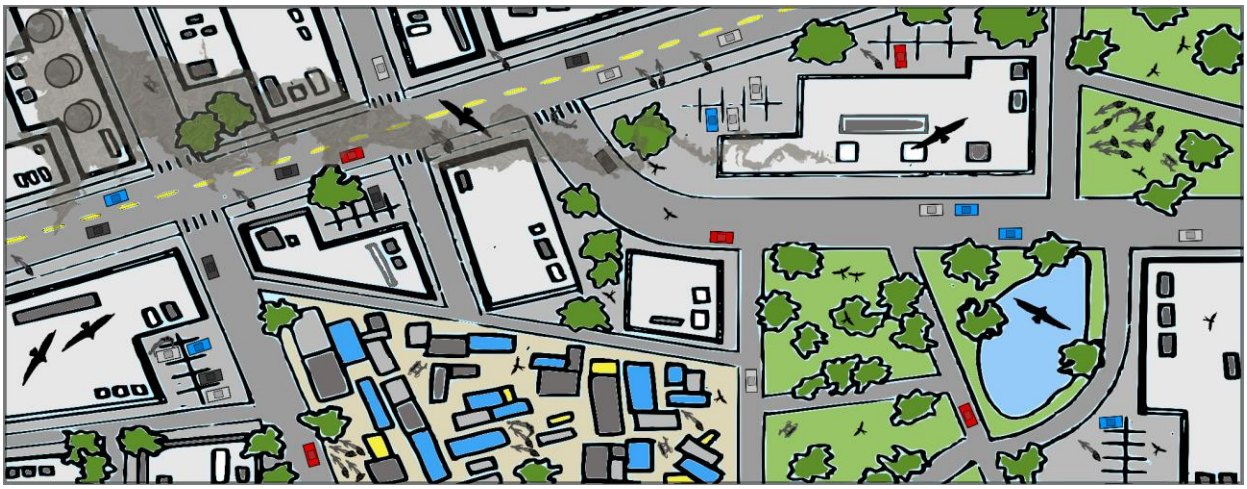
Teaching iThink Biology in your classroom

A Guide to Teaching the Urbanscapes chapter



iThink Biology is different from the types of science textbooks we are familiar within India. The content, organization and features of the e-book have been developed with different objectives in mind. We hope that the chapter-wise guides prepared by the iThink Biology team will help a teacher make the best use of the resource in their learning spaces. The following text is a guide to teaching the Urbanscapes chapter. Please read through the section on how to read iThink Biology before using this resource.

Table of contents

Introductory notes

- The book has been written in an informal and conversational style of English and important or difficult concepts have been linked to the glossary or elaborated in detail within the text.
- The book is hosted on a website, so the reader will require a computer, mobile or tablet to access it. An internet connection will be required to access the different pages of the website, as well as the different interactive features of the book such as weblinks, glossary terms, video interviews, and downloadable research papers.
- Several exercises in the book may require students to step out of their classroom and observe their surroundings, such as a city area, water bodies or garden. The possibility of such an engagement can be important to meet the learning objectives of the book.

Content Mapping

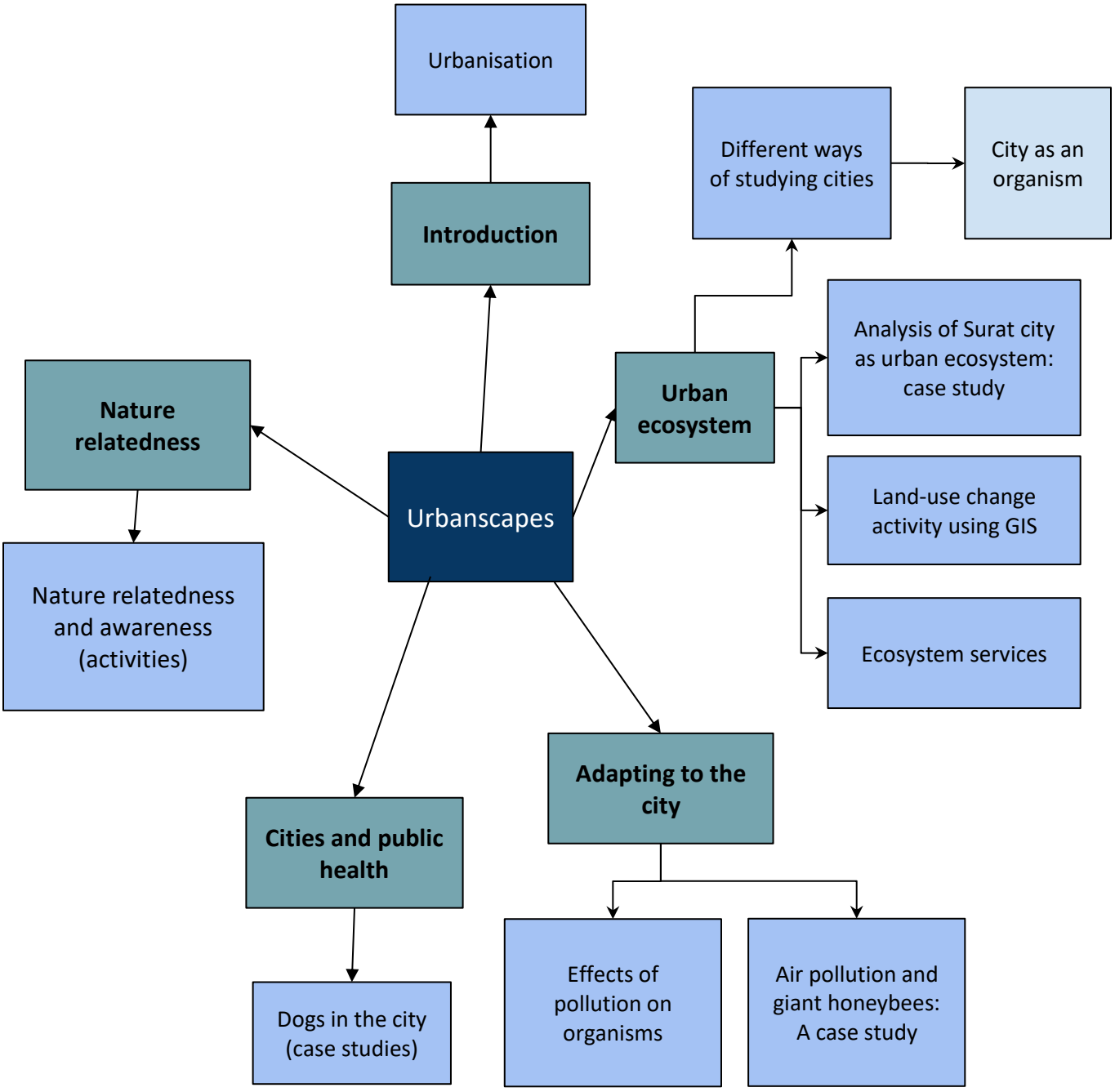
This table will help you map parts of your syllabus to the content and capacity-building approach in iThinkBiology. In the first column, you will find units and topics from your syllabus and the subsequent columns contain the sections, subsections and concepts from our book iThink Biology. By using this table, you can easily identify the relevant concepts from the book that align with your syllabus.

Existing Syllabi	**Corresponding Topics in iThink Biology**			
Subject (Environmental science and Ecology), Topic	**Headings/ Sections**	**Subsection**	**Concepts explored**	**Capacities**
Urban ecosystems, Introduction to urbanisation	Introduction	Urbanisation	Urban areas and population, Urban ecology	Reading and Interpreting
Urban ecosystems, urban sprawl and associated environmental issues	Urban ecosystems	Nature in the city	Urban sprawl, loss of green spaces	Reading and Interpreting
Ecosystem ecology, ecosystem metabolism; **Green future**, ecological footprint		Urban metabolism: the city as an organism	Linear urban metabolism, ecological footprint, Metabolic analysis of Mumbai (case study)	Reading and Interpreting, Scientific process
Ecology and ecosystems, abiotic and biotic components of ecosystem		Urban ecosystems	Components of an urban ecosystem	Reading and Interpreting, Scientific process
Planning and environmental management, smart cities		Case study: Analysing the city of Surat as an urban ecosystem	Analysis of Surat City as urban ecosystem, change in land cover	Scientific process, Scientific tools
Geographical Information Systems, land use/ land cover mapping		Land use change	Land use changes in Delhi, Geographical Information Systems activity	Scientific tools, Quantitative skills
Importance of biodiversity,		Ecosystem services	Types of ecosystem services, calculation	Reading and

ecosystem services**; Costs of land degradation,** loss of ecosystem services			of ecosystem services	Interpreting, Quantitative skills
Environment in an urban setting, urban pollution	Adapting to the city	Effects of urbanisation	Responses of organisms to air, water, noise, and light pollution	Reading and interpreting
Environment in an urban setting, urban pollution; **Air pollution**		Case study: Air pollution and giant honeybees	Effect of different levels of particulate matter on honeybees	Reading and interpreting, Scientific process
Urban ecosystems, waste disposal and accumulation, cities and public health; **Ecology,** trophic cascade regulation	Cities and public health	Dogs in the city	Garbage in city, Human-stray dog interactions (case study), stray dog-wildlife interactions (case study)	Scientific process; Quantitative skills; Bridging science, society and the environment
Natural spaces in a city, importance of nature in a city	Nature relatedness	Do we have a relationship with nature?	Biophilia hypothesis, nature-deficit disorder, examining nature relatedness (activity), nature awareness booster (activity)	Scientific tools, Bridging science, society and the environment

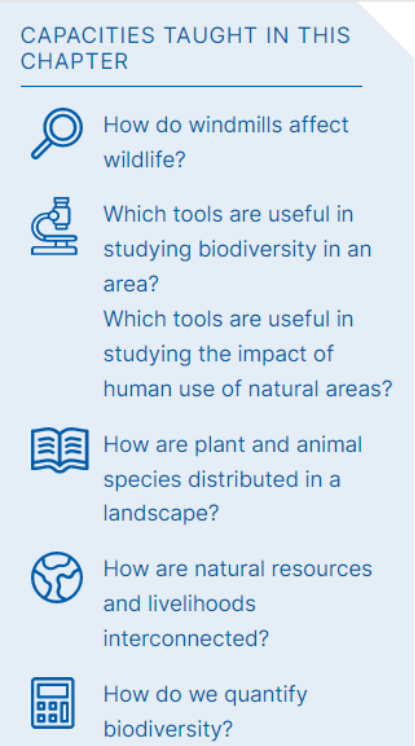
Note: The concepts elucidated in this chapter can be linked to natural ecosystems in a corresponding manner.

Concepts introduced in the chapter



Capacities developed in this chapter

You will notice that every chapter has a set of questions appearing at the beginning of the chapter. These describe the content (indicated by the questions) related to the capacity (indicated by the icon).



In this guide, we have followed different subsections from the ithinkbiology book. We have suggested different activities that are focussed on answering the critical thinking questions given in the book. We have added an annexure to this guide. Annexure-I has three worksheets that teachers can provide to students to record observations for different suggested activities.

Notes for Instructors

In this document, we provide some suggestions for instructors on how to get students to engage with the critical thinking questions that are present throughout the chapter. We have provided the answers and suggested activities for each section in the book. It would be ideal to use these questions along with the book chapter but do adopt these questions and activities to related topics in your curriculum. We hope that this document encourages you to create similar critical thinking questions for the concepts in your course syllabus.

In our experience, there is much value in group work conducted between students. If a student can be accompanied by even one other student while attempting some of the exercises, it will make a difference in their learning experience. If you do conduct these exercises in groups, ensure that the group sizes are not too large (not more than 5 students per group) so that all the students participate in the discussions. Students tend to be curious but having a few pre-prepared questions and hints to promote conversation in groups might be helpful.

A wrap-up discussion to combine and connect the individual group learnings is essential to ensure learning objectives are achieved. Do keep some extra time while conducting group work since they tend to run longer than the time estimated.

A3.1 Introduction

Building Capacity: Reading and Interpreting; Bridging science, society and environment

Question
How are natural ecosystems similar to urban ecosystems?

Suggested Activity

Suggested time: 30 minutes.

Information: Before introducing the concept of urbanscapes to students in the classroom, teachers can do a simple activity with the students to understand their prior knowledge and understanding of the urban ecosystem.

Think-Pair-Share

- For this activity, give some questions to the students to *think* about. Give them 10 minutes to think individually about these questions and write down key points. Here are some questions you can ask students to think about:
    - What comes to mind when you hear the terms 'city' or 'urban areas'?
    - How are urban areas different from rural areas (be specific)?
    - How is living in urban areas different from living in rural areas?
    - What key elements or features do you usually find in urban areas that make them distinct?
    - How do urban areas impact the natural environment?
    - Do ecosystems exist only in natural environments such as forests, and oceans or can ecosystems also be found in cities as well?

- After individual reflection, ask students to *pair* up with neighbours (groups of 2-4 depending on class strength), and discuss and compare their responses with each other. Encourage them to learn and understand each other's perspectives.
- Finally, open a discussion in the classroom and ask students to *share* their responses with the whole class. Encourage them to consider different points of view and be respectful of the exchange of ideas.
- During the exchange of ideas, provide additional information to students wherever necessary and clarify any misconceptions they may have. You can introduce any relevant examples during the discussion.
- After introducing students to the concepts of natural and urban ecosystems, ask them to write about the distinguishing characteristics and shared elements of these ecosystems.

Teachers can refer to the table below as a reference to assess students' responses. Teachers can provide worksheet-1 given in Annexure to students to write their responses.

Similarities between natural and urban ecosystems
• Presence of living organisms, interacting with each other and their environment. • Both ecosystems consist of biotic and abiotic components that are interconnected through energy flow and nutrient cycling.

• Ecosystem services such as air and water purification, climate regulation, soil fertility, etc. • Adaptations in organisms to survive in a particular environment. • Ecological interactions between different organisms.
Differences between natural and urban ecosystems
• Natural ecosystems have a higher biodiversity as compared to urban ecosystems. • Natural ecosystems have a more complex habitat structure, whereas urban ecosystems are dominated by manmade infrastructures. • Urban ecosystems are more heavily influenced by human activities, such as urbanisation, pollution, habitat destruction, etc. • Other ideas could be explored such as waste/recycling, linear pathways in urbanscapes v/s circular pathways in use of resources

- Conclude the activity by summarizing the key points. Highlight the distinguishing characteristics of urban and natural ecosystems, as well as the shared elements and interconnections between them.

What does this question make students do?

This activity will facilitate individual reflection as well as a collaborative learning environment among peers. They will think and reflect on their understanding of urbanscapes. With this activity, teachers will be able to gauge the prior knowledge of the students.

Extension activity

Introduce students to the term carrying capacity. *Carrying capacity (K)* is the maximum population size that an ecosystem can support sustainably.

Instruct students to write an essay on the carrying capacity of urban ecosystems. Ask them to reflect on the following questions in their essay:

- What factors influence the carrying capacity of urban ecosystems?
- How does the carrying capacity of urban ecosystems differ from natural ecosystems?
- What will be the potential environmental consequences of exceeding the carrying capacity of urban ecosystems?
- Encourage them to find examples of cities or urban areas that have faced carrying capacity challenges.
- If the carrying capacity of an urban area exceeds, can we extend the limits of the city? If yes, what would be the effects of such extensions? (*Think in terms of resources we derive from outer parts of a city*).

A3.2 Urban Ecosystems

Building Capacity: Reading and Interpreting; Bridging science, society and environment

Question

Based on your personal experience, would you agree or disagree with the statement that Indians appreciate nature while turning a blind eye to its destruction? Think through examples based on your own direct observations.

Hint

Reflect on your own and your friends' attitudes and values with respect to nature and human needs.

Suggested Activity

Suggested time**:** *1 class*

Overview: When we search on the internet, 'Do humans care for nature?', we get thousands of results addressing prevalent issues like deforestation, pollution, global warming, climate change, etc. However, we often overlook how we use (and abuse) nature in our day-to-day lives. With this activity, we expect students to reflect on their personal experiences where they have either witnessed or contributed to the destruction of nature.

Statement: *Indians appreciate nature while turning a blind eye to its destruction.*
Start the class with this statement and ask students to reflect on the following questions:

- What do you think it means to appreciate nature?
- Do you agree or disagree with the statement? Give reasons for your opinion.

Pair students in groups of two and ask them to think of instances where they have personally contributed to or noticed the destruction of nature in their lives. These can be day-to-day instances or experiences from travelling.
Encourage students to reflect on their actions and attitude towards nature and have them write about their personal anecdotes. Ask them to write examples in the first person (this will help students to self-reflect and take ownership of their actions/experiences). Teachers can provide worksheet-2 given in Annexure to students to write their responses.

Table-1: Examples of nature's appreciation vs. destruction

Appreciation	**Destruction (personal experience)**	**Action**
In India, rivers hold religious importance. Rivers like Ganga, Yamuna, and Saraswati are considered Holy rivers in Hinduism.	*'When I was 12 years old, I visited Rishikesh with my parents. I was amused to see that even though we worship this river, we also contributed unwanted material that does not belong to it.'*	Write whether this behaviour has changed over time or not. If not, can we do something to change it?
Cows are considered sacred and regarded as mothers in Hinduism, and many people worship them.	'*Near my house, there is a designated space for garbage disposal, however, I have witnessed people throwing the garbage in the open which becomes a breeding ground for mosquitos and flies, emitting a foul odour. Disturbingly, animals like cows that we hold in such*	Have you witnessed this behaviour changing over time? If not, what steps can we take as a community to change this?

	high regard, feed on the trash and end up consuming polyethene bags which pose a high risk to their health.'	
People enjoy going to parks, forests and beaches to escape the hustle and bustle of city life. They appreciate the beauty and tranquillity that these places provide.	*'I have always enjoyed family trips to the mountains during summer vacations. But I also noticed that even though people enjoy nature, they also harm the environment by littering.'*	Have you seen any changes? How can tourism be improved without destroying natural spaces?
We value and appreciate a clean home, but do we extend that thinking to public spaces?	*'Once I was with my friends at a posh club - we were sitting on the lawns having tea. A 5-year-old girl was playing with a biscuit wrapper which she then threw on the lawn and walked away. Her parents looked on indulgently and did not ask her to pick it up nor did they pick it up themselves'*	How can we expand the concept of 'home' so that it includes public spaces? How do we inculcate these values in young people?

After students have filled out their worksheets, ask them to contemplate the following questions. Lead a class discussion to share common experiences and insights.

- Do you think there is a paradoxical relationship between humans appreciating nature and destroying it?
- Reflect and discuss the reasons behind this destructive behaviour.
- What could be the potential solutions? Are there any practical steps that can be taken at both personal and community levels?
- How can students engage the community in their efforts to reduce harm to nature?

Conclude the class by discussing the common experiences of the students and potential solutions to different issues. Reflect on the reasons for such destructive behaviours by humans even though they appreciate nature. Encourage students to implement these ideas and spread awareness to protect nature.

<u>What does this question make students do?</u>
This activity will promote self-awareness and critical thinking skills in students. This will help in cultivating empathy towards the natural environment.

Building Capacity: Reading and Interpreting

<u>Question</u>
Do you agree that a city can be compared to a living cell? Justify the decision you make.

Hint

Consider all the processes that a cell performs. Which cellular function can apply to a city? Which processes do not apply to a city?

Background information: We tend to think of a city in terms of its physical infrastructure, such as concrete buildings, roads, and the electricity network. But are there ways to think about a city as a dynamic and functioning whole? For instance, could we think of a city as a cell, doing all the processes that a cell does to stay alive?

Suggested Activity

Suggested time*:* 1 class

Pre-activity assignment: Assign students to come prepared with the knowledge of the structural and functional components of a eukaryotic cell.

Recommendation: Before embarking on this activity, we recommend that students go through the subsection 'Urban metabolism: the city as an organism' from chapter 'Urbanscapes' and attempt exercise A3.1 to gain an understanding of how they can use a metaphor to study urban cities.

Activity: Divide students into groups of 3 or 4. Ask them to consider a city as a 'living cell.' Instruct them to brainstorm with their partners and jot down the similarities/connections between a city and a living cell. Encourage them to be creative and come up with their own analogies. Remind them there are no right or wrong analogies, as long as they can explain the connections.

We have provided worksheet-3 in the Annexure that teachers can provide to students.

Table-2: City as a living cell

Parts of a cell	**The function of the organelle**	**Analogous to which component of the city and how?**
Nucleus	It is the control centre of the cell.	Similarly, cities have a central government that establishes laws and regulations in a city that govern various aspects of the city's functioning.
Mitochondria	It is known as the powerhouse of the cell as it produces energy in the form of ATP.	In an urban city, there are power plants that generate energy which powers different establishments within the city. (Does a city generate its own energy or does it come from somewhere else).
Endoplasmic reticulum	It is a network of membrane-bound tubules that are involved in protein synthesis, lipid metabolism and transport within the cell.	In a city, ER can represent infrastructure and utilities that support the city's functions. Examples - power plants, water treatment facilities, communication networks, and distribution centres. This ensures proper functioning, communication, and

		transportation of essential resources.
Golgi bodies	It is a membrane-bound organelle made up of a series of flattened cisternae. It is involved in the sorting and transportation of proteins and lipids within or outside the cell.	Similarly, in the city, there are post offices which sort and distribute mail and packages within and outside the city.
Lysosomes	These organelles are involved in the breakdown of waste and foreign material within the cell.	Likewise, in cities, there is a waste management system i.e. municipality, that collects, treats and disposes of the waste material in the city.
Ribosomes	These organelles are involved in protein synthesis in a cell.	In cities, there are various factories and manufacturing units that produce different types of goods/ materials.
Plasma membrane	It is the outer layer that surrounds the cells and regulates the entry and exit of substances.	Cities also have their boundaries defined i.e. city borders. These borders have security checkpoints to regulate the inflow and outflow of goods and people in and out of the city.
Actin and microtubules	Actin are thin protein filaments in a cell that provides mechanical support and contribute to cell movement. Microtubules are involved in cell division and intracellular transport.	In the city, there are transportation networks such as roads, highways and railways that allow the movement of people and goods within the city.

***Note**: the table given here is for the reference of teachers. The analogies given above are not absolute.*

Once students are done with their analogies, encourage them to present their work in class. Ask them to use visuals, such as concept maps, diagrams, presentations, or any other creative means of their own choice.

Facilitate a class discussion after each group is done with their presentations. Encourage students in the audience to ask questions and provide feedback.

Wrap-up: Lead a class discussion and summarise the main analogies presented by different groups. Discuss the importance and limitations of using analogies to understand a system. Talk about how cells adapt to changes in the environment and evolve over time, likewise, cities also grow and develop with the changing human needs. Reflect on the fact this activity does not include biotic life in the city, which could help students to understand the impact of anthropogenic activities.

<u>What does this question make students do?</u>

This activity will help students to broaden their perspective by visualising the city as a whole entity rather than focusing solely on the specific areas where they live. It will allow them to understand the multifaceted nature of cities. This activity encourages critical and creative thinking and facilitates collaborative learning.

Extension activity (optional): The activity provided above is one of the ways to understand Urban cities as cohesive entities. Encourage students to come up with their own analogies to understand cities. Some examples are – the city as a machine, the city as different organ systems, etc.

Suggested reading:

We think of cities as concrete jungles, but is there any way that cities and nature can co-evolve together?

Bio-design is an innovative and emerging field that unlocks a world where cities can be built along with nature. Learn more about this new form of green urban design here:

https://www.archdaily.com/984738/the-city-as-an-organism

Building Capacity: Scientific tools; Reading and interpreting

Topic: Urban ecosystem mapping

Suggested Activity

Suggested time*:* 1 class

Create an ecosystem map of your neighbourhood area or your university campus. You can use GIS to map the area. Refer to Exercise 3.2 to learn how to mark an area in Google Earth.

Instruct students, to identify and mark different components of the urban ecosystem, such as:

- Green spaces (gardens, lawns)
- Water bodies (ponds, fountains)
- Trees and vegetation
- Built structures (buildings, roads, pathways)
- Human activities (cafeterias, sports facilities, gathering areas)

After mapping the urban ecosystems, ask students to analyse interactions between these components.

Note: If students want to map their university campus, then this activity is better suited for 2nd or 3rd-year students who are familiar with the university campus.

Ask students to reflect on the following questions (modify the questions based on the area students are studying) and write their responses:

- How do green spaces, trees and vegetation improve the aesthetics of the campus and contribute to biodiversity?
- What kind of biodiversity is present in these green spaces?

- Do you think these green spaces provide any ecosystem services within the campus? If yes, elaborate on which ecosystem services they provide.
- Are there any non-green spaces on campus that can be converted into green spaces? How will it benefit the campus?
- What measures can be taken by the university to make the campus more sustainable?
- What are the potential barriers to implementing sustainable practices on campus?

Wrap-up: Summarise the key points provided by different groups and emphasise the importance of green spaces in urban areas.

Extension activity – Students can also find out changes in land use by calculating the area of different regions over a period of time. Refer to Exercise 3.2

An example map for the teacher's reference:

We have selected an area in Manikbaug Orchid in Maharashtra. Select your area of interest.

Map different landscape elements using different colours.

Landscape elements: Red – Apartment Buildings, Blue – Lakes, Yellow – Open Grounds, Green – Vegetation

What does this question make students do?

This activity promotes skills in urban planning. It will develop critical thinking and the use of tools like Google Earth for mapping.

A3.3 Adapting to the City

Building Capacity: Scientific process; Scientific tools

Question

With rapid urbanisation, how are different organisms adapting to the cities?

Hint

Think about how urbanisation can change the diversity, morphology, or behaviour of organisms.

Suggested Activity

Suggested time: 1 class

Recommendation: Before moving on to this activity, we recommend that students go through the subsection 'Land use change' from chapter 'Urbanscapes' and attempt 'Geographic Information Systems (GIS) Activity' to gain an understanding of how to use simple tools like Google Earth.

Activity: Instruct students to design an experiment to understand how different organisms are adapting to the cities. This activity can be done individually or in groups (teachers can decide depending on the class' strength).

Tools: Google Earth (GIS) - this activity will foster scientific design in students, and they will also learn to use tools like GIS to conduct preliminary research for a study site.

Note: Students do not need to conduct this experiment. They are expected to design one experiment. Read the subsection 'The Scientific Process' in the chapter Western Ghats to learn about the steps of scientific discovery.

For instance, let's say one wants to learn how the diversity of a particular species has been affected by urbanisation. To understand this, a student needs to study the population of that species in urban and non-urban areas. Keep the following points in mind:

- Students will choose an organism (plant or animal) of their choice. Ask them to do preliminary research on the organism's natural habitat and adaptations. Further, explore the challenges that organism faces due to urbanisation.
- Encourage students to think about the study sites they will select to study this organism. Ask students to identify specific locations within the study sites where they will collect their data. For example, to understand how diversity has changed due to urbanisation, one can select three sites: rural areas, semi-urban areas and urban areas.
- Ask students to determine appropriate methods to collect data. Ask them to consider various factors such as sample size, size of the study site, etc.
- With satellite imagery, it is now easier to select study areas as you can observe the types of terrain these sites have, their vegetation type, the extent of development and changes in land use, etc. Tools like google earth are thus can be potentially helpful in identifying study sites at the preliminary level. To select their study area and specific locations within, urge the students to use Google Earth. For example, ask them to select rural, semi-urban and urban areas. Can they recognise these areas using only GIS (without going to the site)? What landscape elements can they observe to recognise a particular study area?

Table-3: Landscape elements in GIS for different areas

Rural areas	**Semi-rural areas**	**Urban areas**
Large stretches of undeveloped land with minimal infrastructure.	A patch that has representative elements from both urban and rural areas, but one type of element does not necessarily dominate the other.	Human infrastructure such as clusters of tall buildings, skyscrapers, etc.
Presence of agricultural lands and pastures.		Presence of roads, highways, and bridges.
Small villages or isolated settlements.		Sparse vegetation.
Dense vegetation.		

Note: the landscape elements provided here are for reference. Most of the time there is overlap in these elements and the study area would be dependent on the research question.

What does this question make students do?

This activity promotes developing skills in scientific enquiry and research skills. It will foster critical thinking and the use of tools like Google Earth for preliminary research.

Suggested video:

In this video, evolutionary biologist Menno Schilthuizen talks about how organisms are adapting to human-made habitats.

https://www.ted.com/talks/menno_schilthuizen_how_animals_and_plants_are_evolving_in_cities?language=en

Suggested reading:

https://knowablemagazine.org/article/living-world/2022/urban-evolution-species-adapt-survive-cities

A3.4 Cities and Public Health

Building Capacity: Reading and Interpreting; Bridging science, society and environment

Question

How does urbanisation affect different animals and lead to human-wildlife conflict?

Hint

Think in terms of habitat loss and food insecurity for animals. Can humans and wildlife co-exist?

Suggested Activity

***Suggested time**: 1 class (students are expected to come prepared for presentations)*

Background information: Introduce human-wildlife conflict in the class. With the human population expanding and increased urbanisation, the habitat range of many animals has narrowed. This has commonly resulted in conflicts between humans and animals in the cities.

Bear in mind that human-animal conflict can vary from one region to another based on multiple factors such as the local wildlife population and human activities.

Some examples of animals that are usually involved in the human-wildlife conflict are:

- Monkeys
- Elephants
- Leopard
- Snakes
- Dogs

For this activity, organise students into groups of 4 and encourage them to choose one case study of the human-animal conflict from the list above or they can propose their animal of interest. Each group will

research the chosen organism and the conflict with humans in the urban areas. Instruct them to gather information on the species' natural habitat, its behaviour, and the conflict arising due to human activities. Each group will prepare a presentation.

***Note**: if you are confused about how to search for literature, go to the subsection 'Locating information' in chapter 'Waterscapes'.*

To make presentations more creative, ask students to represent different stakeholders during their presentations. For example, stakeholders can be:

Student 1: represents affected humans- This student will discuss the effects of the invasion of wildlife (particular organism) on humans, ranging from property damage, crop loss, safety concerns, etc.

Student 2: represents animal species involved in the conflict - This student will keep forward the points of the organism, discussing the reasons for their intrusion in human territory, including their habitat loss, availability of food, etc.

Student 3: represents local authorities - This student will present the efforts taken by authorities to minimise the human-wildlife conflict.

Student 4: represents environmentalists and conservationists - This student will discuss the conservation and protection of this particular species. They will further elaborate on potential solutions for promoting co-existence.

Remind students that this is not a debate among themselves, they are supposed to present multiple perspectives and look for potential solutions. They will work as a group to prepare for their presentations. After each group presentation, allocate time for Q&A with students.

After the presentations, lead a class discussion to reflect on the similarities and differences between different case studies. Focus on the challenges faced by different stakeholders and talk about finding sustainable solutions for human-wildlife conflicts.

***Extension activity (optional):** If time permits, you can facilitate a panel discussion where students from different groups (different case studies) come together and discuss possible solutions for these conflicts.*

Here is some reading material for different case studies that teachers can provide to students. Encourage them to search for case studies on their own.

- Human-monkey conflict
  - https://wildlifesos.org/conservation-awarness/monkeys-and-cities-the-urban-wildlife-syndrome/
- Human-elephant conflict
  - https://www.conservationindia.org/articles/human-elephant-conflict
- Human-leopard conflict
  - https://www.conservationindia.org/articles/human-leopard-conflict-lessons-from-junnar-maharashtra
  - https://www.nature.com/articles/s41598-020-67980-w
- Human-snake conflict

    - https://environment-review.yale.edu/deadly-human-wildlife-conflict-india-more-12-million-people-have-died-snakebites-2000
- Human-dog conflict
    - https://ithinkbiology.in/book/text/a3-urbanscapes.html#a34-cities-and-public-health

Note: the articles provided here are for reference. Students require to do more elaborate research to gather more information.

What does this question make students do?
This activity will promote research and critical thinking. It will help in developing empathy by encouraging students to think from multiple perspectives.

A3.5 Nature Relatedness

Building Capacity: Bridging science, society and environment; Reading and Interpreting

Question
Do we have a relationship with nature?

Suggested Activity

We highly recommend you do the activities given in exercises A3.5 and A3.6.
The worksheets can be downloaded from:
Examining our Nature relatedness: https://ithinkbiology.in/downloads/a3-urbanscapes-exe-03-05.pdf
Nature-awareness booster: https://ithinkbiology.in/downloads/a3-urbanscapes-exe-03-06.pdf

Extension activity (optional): Encourage students to keep a nature journal. As per the students' availability, they can journal weekly, bi-weekly or monthly. They can explore any nearby green spaces easily accessible to them. This activity can be done individually or in groups.

Here are the key elements of keeping a nature journal:

- *Material required*: Always carry a notebook (journal) and pen/pencil with you. Make sure to note the date, time, place and weather.
- *Observing*: Ask students to take their time to observe their surroundings carefully. Ask them to notice different plants and organisms associated with them. Tell them to pay attention to the behaviour of organisms. Ask them to record what they see, feel and hear.
- *Writing*: Note down your observations, any questions you have or your thoughts. Include detailed descriptions of organisms and any behaviour you observe.
- *Sketching*: Create drawings of the things you observe. Don't worry about being artistic. Express yourself freely. The purpose of sketches is to focus on the details and enhance your nature observations.
- *Reflection:* Write and reflect on your experiences and feelings during your observations. How did being in nature make you feel?

Note: there is no right or wrong way of nature journaling. The focus should be on deepening your connection with nature.

What does this question make students do?

These activities will help students to understand their connectedness with nature, and the areas to boost their connections. This activity will deepen their understanding of the environment.

Annexure

Worksheet - 1

Suggested time: 20 minutes

Brainstorm with your partner and write down the similarities and differences between the natural and urban ecosystems.

Similarities between natural and urban ecosystems
Differences between natural and urban ecosystems

Worksheet - 2

Suggested time: 20 minutes

Statement: *Indians appreciate nature while turning a blind eye to its destruction.*

Reflect on your actions and attitude towards nature. Think of instances where you have personally contributed to or noticed the destruction of nature in your lives. These can be day-to-day instances or experiences from travelling. Write down your personal anecdotes and experiences in the worksheet below.
Write these experiences in the first person (this will help you to self-reflect and take ownership of your actions/experiences).

Appreciation	**Destruction (personal experience)**	**Action**

Worksheet - 3

Suggested time: 20 minutes

Brainstorm with your partners and jot down the similarities/connections between a city and a living cell. Be creative and come up with your own analogies.

Note: there are no right or wrong analogies, as long as you can explain the connections.

Parts of a cell	**The function of the organelle**	**Analogous to which component of the city and how?**
Nucleus	It is the control centre of the cell.	
Mitochondria	It is known as the powerhouse of the cell as it produces energy in the form of ATP.	
Endoplasmic reticulum	It is a network of membrane-bound tubules that are involved in protein synthesis, lipid metabolism and transport within the cell.	
Golgi bodies	It is a membrane-bound organelle made up of a series of flattened cisternae. It is involved in the sorting and transportation of proteins and lipids within or outside the cell.	
Lysosomes	These organelles are involved in the breakdown of waste and foreign material within the cell.	
Ribosomes	These organelles are involved in protein synthesis in a cell.	
Plasma membrane	It is the outer layer that surrounds the cells and regulates the entry and exit of substances.	
Actins and microtubules	Actin are thin protein filaments in a cell that provides mechanical support and contribute to cell movement. Microtubules are involved in cell division and	

	intracellular transport.	