



# CONCEPTUAL FRAMEWORK OF BIO DIVERSITY WITH EFFECTS OF URBANIZATION

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## Abstract

The conceptual framework of biodiversity in the context of urbanization involves understanding how the growth and development of urban areas impact the variety and abundance of living organisms and ecosystems. Urbanization refers to the process of population growth and the expansion of cities and towns, often resulting in changes to landscapes, infrastructure, and human activities. Before urbanization occurs, there exists a natural biodiversity baseline. This includes various ecosystems, such as forests, wetlands, grasslands, and aquatic systems, each with its unique array of species. Urbanization brings humans and wildlife into closer proximity. This can lead to both positive interactions, such as increased interest in conservation and environmental education, as well as negative interactions, like conflicts between humans and wildlife. Biodiversity supports various ecosystem services, including air and water purification, climate regulation, pollination of crops, and recreational opportunities. Urban planning that considers biodiversity can enhance the quality of life for urban residents. Balancing urban growth with biodiversity conservation is a key challenge. Sustainable urban planning, green infrastructure, and integrating biodiversity considerations into urban design are essential for mitigating negative impacts on biodiversity.

The main aim of the present paper to know more about conceptual framework of biodiversity and urbanization emphasizes the complex interplay between urban development and the diversity of life forms. Understanding these interactions is crucial for creating cities that support both human needs and the preservation of biodiversity.

**Keywords:** Biodiversity, Urbanization, Development, Eco system, Environment

## I. INTRODUCTION

Biodiversity is not just a scientific concept; it is a source of wonder, inspiration, and discovery. It holds cultural significance, enriching our lives through its sheer diversity of colours, shapes, and behaviours. From the captivating songs of birds to the delicate dance of coral reefs, biodiversity provides us with a sense of connection to the natural world and a reminder of our responsibility to be stewards of this precious gift. Biodiversity, short for biological diversity, refers to the variety of life forms that exist on Earth.<sup>1</sup> It encompasses the diversity of species, their genetic variation, and the ecosystems they form. Biodiversity is essential for the health and functioning of our planet and has both ecological and socio-economic significance. Imagine a world without the myriad species of plants and animals that provide us with food, medicine, clean air, and water. Picture a landscape where pollinators like bees and butterflies are absent, threatening the very foundations of our agriculture. Envision a future where the intricate web of life, carefully woven over millions of years, unravels due to human actions, leading to the loss of species at an unprecedented rate. Biodiversity is all the different kinds of life you'll find in one area the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world. Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life. Biodiversity supports everything in nature that we need to survive: food, clean water, medicine, and shelter.<sup>2</sup>

Biological diversity or biodiversity is that part of nature which includes the differences in genes among the individuals of a species, the variety and richness of all the plant and animal species at different scales in space, locally, in a region, in the country and the world, and various types of ecosystems, both terrestrial and aquatic, within a defined area.<sup>3</sup> Biodiversity, short for "biological diversity," refers to the variety and variability of life forms on Earth, encompassing all living organisms and the ecological complexes of which they are part. This includes diversity within species, between species, and of ecosystems. Biodiversity encompasses the full range of life, from microorganisms to plants, animals, and ecosystems.<sup>4</sup>

## II. MEANING & DEFINITION OF BIO-DIVERSITY

The word biodiversity was coined in the mid-1980s to capture the essence of research into the variety and richness of life on Earth. It is now widely used all over the globe by every environment related scientific or protesting community. Its rapid establishment in science and popular culture is an indication of the importance of the topic but still some have argued that "biodiversity" is too vague and trendy to be a useful word.<sup>5</sup> Biodiversity, a term derived from "biological diversity," is the intricate tapestry of life that paints our planet with a vast array of species, ecosystems, and genetic variability. It encompasses the incredible diversity of living organisms, from the tiniest microorganisms to the towering trees of ancient forests, from the depths of the oceans to the highest peaks of mountains. Biodiversity is a fundamental feature of Earth's natural heritage, shaping the beauty and functionality of our environment in ways that are both awe-inspiring and vital for our existence.

In simpler terms, biodiversity is the variety of life that exists in different forms, functions, and interactions. It is a measure of the richness and complexity of the living world, reflecting the wide array of genetic, species, and ecosystem differences found across the planet. Biodiversity is crucial for the health and stability of ecosystems,

<sup>1</sup> What is biodiversity, also available at: <https://www.amnh.org/research/center-for-biodiversity-conservation/what-is-biodiversity#:~:text=This%20is%20more%20of%20a,and%20the%20rest%20of%20nature.>

<sup>2</sup> What is biodiversity and why does it matter to us?, also available at <https://www.theguardian.com/news/2018/mar/12/what-is-biodiversity-and-why-does-it-matter-to-us>.

<sup>3</sup> What is the meaning of Biodiversity in simple words? <https://www.jagranjosh.com/general-knowledge/meaning-of-biodiversity-1440148279-1>

<sup>4</sup> Flint, M. (1991) Biological Diversity and Developing Countries. Overseas Development Administration, London.

<sup>5</sup> Biodiversity: A Conceptual History, also available at: <https://plantlet.org/biodiversity-a-conceptual-history/>.

as well as for providing a multitude of ecosystem services that support human well-being, such as clean air and water, pollination of crops, climate regulation, and more.

### III. ORIGIN OF THE TERM BIODIVERSITY

The origins of term 'Biodiversity' are credited to two papers published in 1980 (Lovejoy 1980; Norse and McManus 1980). Lovejoy, working for the World Wildlife Fund in Washington DC, contributed to The Global 2000 Report to the President of the United States, reviewing global environmental topics such as energy, human population and economics. Examining the extent of global forestry resources, Lovejoy reviewed two consequences of forest exploitation: changes to global climate and to biological diversity. Estimates of extinctions based on different forest loss rates were given. Lovejoy wrote of biological or biotic diversity defined as simply the total number of species.<sup>6</sup>

Norse and McManus were ecologists on the White House Council on Environmental Quality during Jimmy Carter's presidency and in 1980 contributed a chapter to the Eleventh Annual Report of the Council on Environmental Quality entitled Ecology and Living Resources: Biological Diversity. The chapter examines global biodiversity which is defined as two related concepts, genetic and ecological diversity. The snappy abbreviation biodiversity is credited to Walter Rosen, working for the American Natural Research Council/National Academy of Sciences, as a co-director for the 1986 Conference 'The National Forum on Biodiversity', held in Washington, DC.<sup>7</sup>

### IV. CONCEPTUAL HISTORY OF BIODIVERSITY

The diversity of life on Earth has been a central theme of the natural sciences but it also touches on many other areas. The Bible credits Adam with the job of naming the animals, a fundamental task for facing those quantifying biodiversity. The same approaches to classifying life are apparent in ancient and modern societies. Western culture has repeatedly revised its understanding of the variety and nature of life. The Greek philosopher Aristotle recognised between 500 and 600 species, echoing modern folk classifications which typically recognise 300 to 600. Slavish copying of classical texts was abandoned during the sixteenth and seventeenth centuries, spurred by technological advances and the spread of ideas through printing. Classification increasingly focused on the species. The nineteenth century saw the final abandonment of the folk biology principle that lumped species together by broad type (in favour of biodiversity described by detailed structure and relatedness. Our attitudes to life continue to change: the twenty-first century is dominated by our understanding of evolution, which is a powerful theory. The richness of life has been central to human society and science but the term biodiversity is an upstart.<sup>8</sup>

### V. IMPORTANCE OF BIODIVERSITY

The importance of biodiversity cannot be overstated. It is the foundation of resilient ecosystems that provide us with essential services, such as regulating our climate, filtering our water, and supporting the very foundation of life. Recognizing the urgent need for conservation, many individuals, organizations, and governments are working tirelessly to protect and restore biodiversity, embracing sustainable practices and advocating for the preservation of our natural heritage. Biodiversity is essential for the processes that support all life on Earth, including humans. Without a wide range of animals, plants and microorganisms, we cannot have the healthy ecosystems that we rely on to provide us with the air we breathe and the food we eat. And people

<sup>6</sup> What does biodiversity mean, also available at: <https://biodiv.de/en/biodiversitaet-infos/standardlayout.html>

<sup>7</sup> On the Law of Biodiversity and Ecosystem Management, also available at: <https://core.ac.uk/download/pdf/217207662.pdf>

<sup>8</sup> Prioritizing India's landscapes for biodiversity, ecosystem services and human well-being, also available at: <https://www.nature.com/articles/s41893-023-01063-2>

also value nature of it.<sup>9</sup> Biodiversity is indeed, very important to the well-being of Planet Earth.<sup>10</sup> The importance of healthy ecosystems and rich biodiversity can be underscored by the following points.

**Increase ecosystem productivity** —Each species in an ecosystem has a specific role to play. Most of these are interdependent on each other for their survival.

**Support number of plant species** – This results in a greater variety of crops.

**Protect freshwater resources-** Biodiversity protects freshwater resources and keeps them clean.<sup>11</sup>

**Promote soils formation and protection** – The greater variety of plants helps in formation of soil and makes it rich in nutrients.

**Provide for nutrient storage and recycling** – Plants store nutrients, these are consumed by animals and are finally given back to the environment when they die.<sup>12</sup>

**Aid in breaking down pollutants** – Plants utilise carbon dioxide for photosynthesis. More the greenery in an area, lesser is the pollution level in the air.<sup>13</sup>

**Contribute to climate stability-** The presence of plant and animal species provides climate stability as global warming is reduced.

**Provide more food resources** – Greater variety of plants and poultry animals results in more food resources in a nation.

**Provide pharmaceutical drugs** – Medicinal property of plants is important for the pharmaceutical industry.<sup>14</sup>

## VI. CAUSES OF FAILURE OF BIODIVERSITY

Unfortunately, human activities greatly contribute to the loss of biodiversity. Natural resources like land and water are indiscriminately exploited by humans. According to the Convention of Biological Diversity, direct and indirect human activities have a detrimental effect on biodiversity. Direct human drivers include changes in local land use, species introductions or removals, harvesting, air and water pollution, and climate change. Indirect human drivers include demographic, economic, technological, and cultural and religious factors.<sup>15</sup> The growth in population is a major factor in fuelling the demand for natural resources. It also leads to greater waste generation, which is also a major cause of pollution. Human needs and the increased use of technology to meet them play a major role in climate change, which continues to be a big threat to biodiversity. Increased atmospheric concentration of carbon dioxide causes climate change.<sup>16</sup> Due to large-scale cutting of trees every year, carbon dioxide cannot be absorbed and its concentration in the air increases. Climate change has resulted

<sup>9</sup> Why is biodiversity important also available at: <https://royalsociety.org/topics-policy/projects/biodiversity/why-is-biodiversity-important/>

<sup>10</sup> Biodiversity and Health, also available at: <https://www.who.int/news-room/fact-sheets/detail/biodiversity-and-health>

<sup>11</sup> The Importance of Biodiversity to Human Life, also available at: <https://courses.lumenlearning.com/suny-biology2xmaster/chapter/the-importance-of-biodiversity-to-human-life/>

<sup>12</sup> Nutrient Recycling, also available at: <https://alevelbiology.co.uk/notes/nutrient-recycling/>

<sup>13</sup> Biodiversity Critical to Maintaining Healthy Ecosystems, also available at: <https://www.usgs.gov/news/biodiversity-critical-maintaining-healthy-ecosystems>

<sup>14</sup> Ibid.,

<sup>15</sup> **Primary Drivers of Biodiversity Loss,**

<https://www.britannica.com/study/learn-about-the-causes-of-biodiversity-loss>

<sup>16</sup> Biodiversity loss: what is causing it and why is it a concern?, also available at: <https://www.europarl.europa.eu/news/en/headlines/society/20200109STO69929/biodiversity-loss-what-is-causing-it-and-why-is-it-a-concern>.

in increased land and ocean temperature, change in precipitation and rise in the sea level.<sup>17</sup> The change in climate has an inimical impact on species. The major factors that contribute to the loss of biodiversity include the following-

1. **Destruction of Habitat:** The natural habitat of animals is destroyed by man for the purpose of settlement, agriculture, mining, industries, construction of highways, and so on. As a result of this, the species must either adapt to the changes in the environment or move to other places. If not, they become target to predation, starvation, disease and eventually die.<sup>18</sup>
2. **Hunting:** Hunting of wild animals is done for the commercial utilisation of their products. These include hides and skin, fur, meat, tusk, cosmetics, perfumes, pharmaceuticals, and decoration purposes. In recent years, 95% of the black rhino population in Africa has been exterminated by poachers for their horn.
3. **Exploitation of Selected Species:** Exploitation of medicinally important plants results in their disappearance from their natural habitat. Examples of the plants which are ruthlessly collected for laboratory and other works are the pitcher plant, *Nepenthes khasiana*, *Drosera* sp., *Psilotum* sp. *Isoetes* sp etc.<sup>19</sup>.
4. **Habitat Fragmentation:** An “unnatural separation of expansive tracts of habitats into spatially segregated fragments” that is too limited to maintain their different species for the future, is known as habitat fragmentation. The landmass is broken into smaller units which eventually lead to the extinction of species.
5. **Collection for Zoo and Research:** Animals and plants are collected for zoos and biological laboratories. This is majorly done for research in science and medicine. Primates such as monkeys and chimpanzees are sacrificed for research because of their anatomical, genetic and physiological similarities to human beings.<sup>20</sup>
6. **Introduction of Exotic Species:** A species which is not a natural inhabitant of the locality but is deliberately or accidentally introduced into the system is termed as an exotic species. Due to the introduction of exotic species, native species have to compete for food and space.
7. **Pollution:** Pollution makes survival difficult for the species as it alters their natural habitat. Water pollution is injurious to the biotic components of coastal ecosystems. Toxic wastes entering the water bodies disturb the food chain. In addition, materials like insecticides, pesticides, sulphur and nitrogen oxides, and acid rain also adversely affect the plant and animal species.<sup>21</sup>
8. **Control of Pests and Predators:** Generally, non-target species that are a component of balanced ecosystem may also get killed in the predator and pest control measures.
9. **Natural Calamities:** Floods, draught, forest fires, earth-quakes and other natural calamities sometimes take a heavy toll of plant and animal life. These trap a large number of animals while frittering away soil nutrients.<sup>22</sup>
10. **Other Factors:** Other Ecological Factors that contribute to the loss of biodiversity include:
  - a) **Distribution range** – The threat of extinction increases as the size of distribution range becomes smaller.
  - b) **Degree of specialization** – specialized organisms are more vulnerable to extinction as compared to the non-specialized ones.

<sup>17</sup> Ibid.,

<sup>18</sup> The Global Impacts of Habitat Destruction, also available at: <https://blog.nationalgeographic.org/2019/09/25/the-global-impacts-of-habitat-destruction/#:~:text=Habitat%20destruction%2C%20defined%20as%20the,not%20always%2C%20human%2Dcaused.>

<sup>19</sup> Causes for Biodiversity Loss - Environment Notes, also available at: <https://prepp.in/news/e-492-causes-for-biodiversity-loss-environment-notes>

<sup>20</sup> See supra 16.

<sup>21</sup> Ibid.,

<sup>22</sup> Id.,

- c) **Position of the organism in the food chain** – the higher the position of the organism in the food chain, the more susceptible it is.<sup>23</sup>

## VII. EFFECTS OF FAILURE OF BIODIVERSITY

The negative effects of the loss in biodiversity from a healthy stable state include dramatic influence on the food web and chain. Even reductions in only one species can adversely affect the entire food chain which further leads to an overall reduction in biodiversity. Reduced biodiversity leads to immediate danger for food security by reducing ecosystem services and for humankind also.<sup>24</sup> The effects of extinction of animal and plant species are widespread. Here are six significant problems caused by loss of biodiversity:

1. **Monetary Implication of Lost Biodiversity:** The economic cost of biodiversity around the world tops the list. We will have to pay for costs of pollination, irrigation, soil reclamation and other functions if nature is unable to take care of them. The estimated value of global biodiversity is in the trillions. Deforestation costs around \$2-5 trillion annually worldwide.
2. **Threat to existing species:** The introduction of new species is happening on farms, too, where natives are pushed out because of imported foreign breeds of cattle. The effect of this is the narrowing of the world's livestock population. They are also becoming more susceptible to disease, drought, and changes in climate.<sup>25</sup>
3. **Increased Contact with Diseases:** The loss of biodiversity has two major effects on human health and the spread of disease. Firstly, it increases the count of animals carrying disease in local populations. As habitats reduce in size, these animals become common, winning out the species that do not generally transmit disease.
4. **More Unpredictable Weather:** Indeed, unseasonable weather and extreme weather is a huge problem which leads to destruction and displacement. Research has shown that loss of species causes more unpredictable weather.<sup>26</sup>
5. **Loss of Livelihoods:** Biodiversity is essential for maintaining livelihoods. Taking an example, when ocean ecosystems collapse, entire communities built on the plenty they provide lose their means of employment as well. The cause can be pollution, overfishing, or a combination of these. Humans are always affected by the downfall of the ecosystem surrounding them.<sup>27</sup>
6. **Losing Sight of Nature:** The worth of nature to humanity is far beyond the utility of it. The physical deflation of nature certainly does affect humans. People always tend to find solace in nature. It also provides a recreation spots for us to take a break from our busy lives. But loss of biodiversity threatens to take away the value that man finds in nature.<sup>28</sup>

## VIII. BIOLOGICAL DIVERSITY ACT, 2002<sup>29</sup>

India saw a transformation of its closed economy into an open economy, post-1990. Bio piracy thereafter, stood unguarded with no stringent legislation protecting the overexploitation and piracy of resources. This

<sup>23</sup> Id.,

<sup>24</sup> biodiversity loss, also available at: <https://www.britannica.com/science/biodiversity-loss>

<sup>25</sup> **Biodiversity loss, a risk for the environment and for humanity, also available at:** <https://www.iberdrola.com/sustainability/biodiversity-loss>

<sup>26</sup> [https://www.fairplanet.org/story/causes-effects-biodiversity-](https://www.fairplanet.org/story/causes-effects-biodiversity-loss/#:~:text=Loss%20of%20ecosystem%20stability%3A%20Biodiverse,the%20risk%20of%20ecosystem%20collapse.)

[loss/#:~:text=Loss%20of%20ecosystem%20stability%3A%20Biodiverse,the%20risk%20of%20ecosystem%20collapse.](https://www.fairplanet.org/story/causes-effects-biodiversity-loss/#:~:text=Loss%20of%20ecosystem%20stability%3A%20Biodiverse,the%20risk%20of%20ecosystem%20collapse.)

<sup>27</sup> Ibid.,

<sup>28</sup> Loss of Biodiversity: Meaning, Causes, Effects and Solutions Also available at: <https://infinitylearn.com/surge/study-materials/english/environmental-issues/loss-of-biodiversity-meaning-causes-effects-and-solutions/>

<sup>29</sup> THE BIOLOGICAL DIVERSITY ACT, 2002 ACT NO. 18 OF 2003, An Act to provide for conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith or incidental thereto.

further saw the formation of a civil society group appointed to formulate a National Biodiversity strategy and plan. However, this wasn't accepted and the government itself articulated a legal framework and draft known as the Biodiversity Bill, 2000, based on which this Act was passed by the Lok Sabha on 2nd December 2002 and Rajya Sabha on 11th December 2002.<sup>30</sup> It had finally received the Presidential assent on 5th February 2003. The Biological Diversity, as federal legislation, was a mere attempt of India to uphold the objectives put forth by the giving immense importance to the rights of a state over its resources.<sup>31</sup> This Act broadly sets forth to protect and conserve the biological diversity, control the utilization of resources, and maintain equality in the distribution of its resources and benefits arising from it.<sup>32</sup>

## IX. AUTHORITIES UNDER BIODIVERSITY ACT, 2002

The provision of the establishment of the National Biodiversity Authority at the national level<sup>33</sup> whereas the same for state biodiversity boards at the state level.<sup>34</sup> Further it does not allow the State Biodiversity Board to be constituted for a Union territory.<sup>35</sup> The National Biodiversity Authority shall exercise the powers and perform the functions of a State Biodiversity Board for that Union territory: Provided that in relation to any Union territory, the National Biodiversity Authority may delegate all or any of its powers or functions under this sub Section to such person or group of persons as specified by the Central Government.

The chairperson of the National Biodiversity Authority presides over the meetings and all questions are decided by the votes of all members present and voting.<sup>36</sup> As per the National Biodiversity Authority can form a number of committees as required for the effective and efficient discharge of its duties and functions under the Act.<sup>37</sup> Such a committee should also choose people who are not the members of the National Biodiversity Authority, as they might have the right to attend the meetings of the committee and take part in the proceedings but shall not have the right to vote.

<sup>30</sup> CII Recommendations on Issues Associated with Biodiversity Law and Its Compliance, also available at: <https://ciipharma.in/pdf/Biodiversity-Law-and-Its-Compliance-Booklet.pdf>.

<sup>31</sup> [United Nations Convention on Biological Diversity \(CBD\) 1992](#).

<sup>32</sup> Ibid.,

<sup>33</sup> Section 8 Establishment of National Biodiversity Authority.—(1) With effect from such date as the Central Government may, by notification in the Official Gazette, appoint, there shall be established by the Central Government for the purposes of this Act, a body to be called the National Biodiversity Authority. (2) The National Biodiversity Authority shall be a body corporate by the name aforesaid, having perpetual succession and a common seal, with power to acquire, hold and dispose of property, both movable and immovable, and to contract, and shall by the said name sue and be sued. (3) The head office of the National Biodiversity Authority shall be at Chennai and the National Biodiversity Authority may, with the previous approval of the Central Government, establish offices at other places in India. (4) The National Biodiversity Authority shall consist of the following members, namely:— (a) a Chairperson, who shall be an eminent person having adequate knowledge and experience in the conservation and sustainable use of biological diversity and in matters relating to equitable sharing of benefits, to be appointed by the Central Government; (b) three ex officio members to be appointed by the Central Government, one representing the Ministry dealing with Tribal Affairs and two representing the Ministry dealing with Environment and Forests of whom one shall be the Additional Director General of Forests or the Director General of Forests; (c) seven ex officio members to be appointed by the Central Government to represent respectively the Ministries of the Central Government dealing with— (i) Agricultural Research and Education; (ii) Biotechnology; (iii) Ocean Development; (iv) Agriculture and Cooperation; (v) Indian Systems of Medicine and Homoeopathy; (vi) Science and Technology; (vii) Scientific and Industrial Research; (d) five non-official members to be appointed from amongst specialists and scientists having special knowledge of, or experience in, matters relating to conservation of biological diversity, sustainable use of biological resources and equitable sharing of benefits arising out of the use of biological resources, representatives of industry, conservers, creators and knowledge-holders of biological resources.

<sup>34</sup> [Section 22](#)

<sup>35</sup> Section 22(2)

<sup>36</sup> Section 10 Chairperson to be Chief Executive of National Biodiversity Authority.—The Chairperson shall be the Chief Executive of the National Biodiversity Authority and shall exercise such powers and perform such duties, as may be prescribed

<sup>37</sup> Section 13. Committees of National Biodiversity Authority.—(1) The National Biodiversity Authority may constitute a committee to deal with agro-biodiversity. Explanation.—For the purposes of this sub-section, “agro-biodiversity” means biological diversity of agriculture related species and their wild relatives. (2) Without prejudice to the provisions of sub-section (1), the National Biodiversity Authority may constitute such number of committees as it deems fit for the efficient discharge of its duties and performance of its functions under this Act. (3) A committee constituted under this section shall co-opt such number of persons, who are not the members of the National Biodiversity Authority, as it may think fit and the persons so co-opted shall have the right to attend the meetings of the committee and take part in its proceedings but shall not have the right to vote. (4) The persons appointed as members of the committee under sub-section (2) shall be entitled to receive such allowances or fees for attending the meetings of the committee as may be fixed by the Central Government.

The Act puts forth that any person wanting to obtain any biological resource originating in India or information relating to it,<sup>38</sup> for research or for commercial purposes or transfer the results of such research related to biological resources occurring or obtained from India, are required to make an application and payment of prescribed fees. Also as per any person applying for patent or intellectual property protection whether in India or outside India based on any invention, research, knowledge, or study originating in India have to make an application to the biodiversity authority and wait for its approval.<sup>39</sup>

## X. FUNCTIONS OF CENTRAL BOARDS AND STATE BOARDS UNDER THE ACT<sup>40</sup>

The functions are:

1. Prohibiting a person claiming a patent over biodiversity or related knowledge, study, or research without prior approval and permission of the Indian Government.
2. The State Biodiversity Board advises the State Government, according to any guidelines issued by the Central Government, on matters relating to the conservation of biodiversity, sustainable use of its components, and benefit-sharing.
3. The State Biodiversity Board performs functions as required by the Act or prescribed by the State government.<sup>41</sup>
4. Conservation of sustainable use of biological resources including habitat and species protection of projects, integration of biodiversity, formulating plans, and policies of various Departments and Sectors.
5. The National Biodiversity Authority has to regulate activities in accordance with the Act.<sup>42</sup>
6. The National Biodiversity Authority, on behalf of the Central Government, could take steps for opposing granting of intellectual property rights in any country outside India related to any biological resource obtained from India or knowledge about such biological resource.

## XI. BIODIVERSITY IN THE CONTEXT OF URBANIZATION

It involves understanding how urban areas and their development impact the diversity of species, ecosystems, and natural resources. Urbanization, which involves the growth of cities and the expansion of human settlements, often leads to significant alterations in the environment. It highlights the complex interplay between urbanization and biodiversity. While urbanization can pose threats to biodiversity, well-planned and sustainable urban development can also contribute to biodiversity conservation by integrating natural elements into the urban fabric. Balancing urbanization with biodiversity preservation is a critical aspect of creating resilient and liveable cities for both humans and the natural world.

**Baseline Biodiversity Assessment:** Establish a baseline of the existing biodiversity in the area before urbanization. Identify key species, ecosystems, and habitats that contribute to the local biodiversity.

<sup>38</sup> Section 19

<sup>39</sup> 19(2) Any person who intends to apply for a patent or any other form of intellectual property protection whether in India or outside India referred to in sub-section (1) of section 6, may make an application in such form and in such manner as may be prescribed to the National Biodiversity Authority.

<sup>40</sup> Biological Diversity Act, 2002, also available at: <https://byjus.com/free-ias-prep/biological-diversity-act-2002/#:~:text=Functions%20of%20SBBs,use%20or%20sharing%20equitable%20benefits.>

<sup>41</sup> Section 18. Functions and powers of National Biodiversity Authority—(1) It shall be the duty of the National Biodiversity Authority to regulate activities referred to in sections 3, 4 and 6 and by regulations issue guidelines for access to biological resources and for fair and equitable benefit sharing. (2) The National Biodiversity Authority may grant approval for undertaking any activity referred to in sections 3, 4 and 6. (3) The National Biodiversity Authority may— (a) advise the Central Government on matters relating to the conservation of biodiversity, sustainable use of its components and equitable sharing of benefits arising out of the utilisation of biological resources; (b) advise the State Governments in the selection of areas of biodiversity importance to be notified under sub-section (1) of section 37 as heritage sites and measures for the management of such heritage sites; (c) perform such other functions as may be necessary to carry out the provisions of this Act. (4) The National Biodiversity Authority may, on behalf of the Central Government, take any measures necessary to oppose the grant of intellectual property rights in any country outside India on any biological resource obtained from India or knowledge associated with such biological resource which is derived from India.

<sup>42</sup> Sections 3, 4, and 6



**Urbanization Drivers:** Identify the factors driving urbanization, such as population growth, economic development, and infrastructure expansion. Analyze the spatial extent and intensity of urbanization.

**Direct Impacts of Urbanization on Biodiversity:** **Habitat Loss and Fragmentation:** Urban development often results in the destruction and fragmentation of natural habitats, leading to loss of biodiversity.

**Pollution:** Urban areas generate various forms of pollution (air, water, noise, light), which can harm both terrestrial and aquatic species.

**Altered Hydrology:** Changes in land use and construction can disrupt natural hydrological cycles, affecting wetlands, rivers, and aquatic ecosystems.

**Invasive Species:** Urban areas can provide suitable conditions for non-native species to thrive, outcompeting native species.

**Indirect Impacts of Urbanization on Biodiversity:** **Climate Change:** Urban areas often experience the "urban heat island" effect, contributing to local climate changes that may affect species distribution and behaviour. **Changes in Food Web Dynamics:** Urban environments may support different food sources, altering interactions between species. **Altered Human-Wildlife Interactions:** Urbanization can lead to increased interactions between humans and wildlife, affecting both positively and negatively.

**Mitigation and Conservation Strategies:** **Urban Planning:** Design cities with green spaces, wildlife corridors, and sustainable infrastructure to mitigate habitat loss and fragmentation. **Protected Areas and Reserves:** Establish and manage protected areas within or near urban regions to conserve critical habitats and species.

**Sustainable Practices:** Promote environmentally friendly practices like waste management, green building designs, and reduced light pollution.

**Public Awareness:** Educate residents about local biodiversity, fostering a sense of stewardship and responsible behavior.

**Restoration and Reforestation:** Rehabilitate degraded urban areas by planting native species and restoring natural habitats.

**Monitoring and Adaptive Management:** Regularly monitor biodiversity changes in urban areas to assess the effectiveness of conservation efforts. Adjust strategies based on new data and lessons learned.

## XII. CONCLUSION

The process of urbanization produces an inversion of landscape patterns which become dominated by anthropic habitats. This entails a reduction and fragmentation of natural habitats, and the emergence of strong barrier effects that hinder or even prevent the movement of organisms and ecological connectivity. In addition, food sources become more artificial, disturbances increase, and different types of pollution including chemical, light and sound become more frequent. These changes have important implications for natural communities, the most prominent of which are the reduction of the phylogenetic and functional diversity, the creation of more homogeneous communities dominated by a few anthropophilic species, and the proliferation of invasive species.