MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT AND ENGINEERING

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ENVIRONMENTAL SCIENCE

Project Report

on

"BIODIVERSITY DAMAGE DUE TO AIRPORT PROJECT"

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Biodiversity Damage Due to Airport Project

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1. INTRODUCTION

1.1 Striking a Balance: Airport Projects and Their Impact on Biodiversity

Airport projects, while vital for economic development and improved transportation, often raise concerns about their environmental impact, particularly on biodiversity. These projects involve extensive land development, which can disrupt and damage the ecosystems surrounding the airport site. Biodiversity damage associated with airport projects typically includes several key aspects such as habitat destruction, habitat fragmentation, noise and disturbance, pollution, invasive species, and collision hazards.

To address and mitigate the biodiversity damage associated with airport projects, environmental impact assessments are typically conducted. These assessments aim to identify the potential risks to biodiversity and develop strategies to minimize the impact. These strategies may include habitat preservation, wildlife corridors, noise and pollution control measures, and ongoing monitoring.

Sustainable airport development seeks to strike a balance between improving transportation infrastructure and protecting the environment. Collaboration between airport authorities, environmental agencies, and local communities is essential to ensure that airport projects are designed and managed in a way that minimizes their impact on biodiversity while meeting the growing demand for air travel and economic development.

Figure 1.1: Operational Airport Project

2. CAUSES OF BIODIVERSITY DAMAGE

2.1 Unravelling the Roots: Factors Contributing to Biodiversity Damage

2.1.1 Habitat Destruction:

Airport construction often requires clearing large areas of land, leading to the destruction of natural habitats such as forests, wetlands, grasslands, and other ecosystems. This process directly eliminates the homes and food sources for numerous plant and animal species, often with devastating consequences for local biodiversity.

2.1.2 Habitat Fragmentation:

The layout of an airport, including runways, taxiways, and terminals, can fragment and isolate previously continuous habitats. This fragmentation hinders the movement of wildlife, disrupts migration routes, and restricts gene flow among populations, all of which can lead to reduced biodiversity and a decline in species richness.

2.1.3 Noise and Disturbance:

Airports are characterized by constant noise from aircraft taking off and landing, as well as ground operations and vehicle traffic. This noise can have a significant impact on local wildlife, particularly on birds and mammals, disrupting their feeding, communication, and breeding behaviours. Prolonged exposure to such disturbance can cause stress and negatively affect species' reproductive success.

2.1.4 Air Pollution:

The emissions from aircraft and the associated infrastructure release pollutants into the atmosphere. These emissions can include greenhouse gases, particulate matter, and nitrogen oxides, which can have cascading effects on ecosystems. The deposition of pollutants on surrounding vegetation and water bodies can harm plant health and aquatic ecosystems, further impacting biodiversity.

2.1.5 Water Pollution:

Airports use de-icing agents and fuel, which can contaminate surrounding water bodies through runoff. These chemicals can harm aquatic life, disrupt the balance of local ecosystems, and affect water quality, thereby affecting aquatic biodiversity.

2.1.6 Invasive Species:

Airports often serve as gateways for the introduction of invasive species. Increased human activity, along with transportation networks, can unintentionally transport non-native species into the area. Invasive species can outcompete or prey upon native species, altering the composition and dynamics of local ecosystems.

2.1.7 Bird Strikes:

Airports are attractive to birds due to open spaces and potential food sources, such as insects or food waste. This attraction poses a risk for bird strikes, where birds collide with aircraft during take-off or landing. Bird strikes not only threaten aviation safety but also pose direct harm to bird populations, particularly for species that are already vulnerable.

2.2 Key impacts caused by airport and aviation activities.

KEY IMPACTS - Negative Impact + Positive Impact	**Terminal & Ground Operations**		**Flights**	**Airport Access**		**Associated Projects**	
	Construction	Operation	Operation	Construction	Operation	Construction	Operation
Air Pollution			-		-		-
Biodiversity Impacts	-	-	-	-	-	-	
Climate Change		-	-		-		
Employment And Economic Benefits	+	+	+			+	+
Heritage	-		-	-	-	-	
Land Take	-			-		-	
Landscape	-	-		-		-	-
Noise		-	-	-	-		
Risk And Public Safety Zones			-				
Social Costs to Nearby Communities	-	-			-		
Traffic	-	-		-	-	-	-
Water Pollution		-			-		
Water Use		-					-

3. EFFECTS ON BIODIVERSITY

3.1 *The Ripple Effect: Biodiversity Damage Consequences*

Biodiversity impacts refer to the impacts on plants and animals. These include reduction in the type and extent of habitats; bird strike and roadkill; disturbance from light pollution, noise, and aircraft/vehicle movements; and air pollution.

3.1.1 Habitat Loss:

It occurs when previously 'green' areas are built on, destroying the habitats of the plans and animals that live there. Habitat fragmentation happens when a larger area of habitat is split into smaller areas, for instance if it is split by a road or fence. This can make it difficult for animals to forage for food, breed and migrate.

Animals with very consistent food patterns (such as badgers) or breeding patterns (such as flies) can continue to move from one habitat fragment to another and can be hit by cars. Some animal species have large land requirements and may be affected by habitat loss or fragmentation, even if these reduce the animals' habitat slightly.

3.1.2 Habitat Degradation:

It reduces the attractiveness of the habitat for the plants and animals on it. This could result, for instance, from the ground being churned up and/or compacted, vegetation clearance, replacement of one type of vegetation by another (e.g., herb-rich grassland by turf), storage or disposal of rubble on the site, litter, or land contamination.

3.1.3 Bird Strikes:

Bird strikes occur when aircraft hit birds during take-off and landing. Roughly 85% of bird strikes involve aircraft below 800 feet, and up to 40% of bird strikes take place beyond the airport perimeter (CAA, 2001).

The number of birds strikes at a given airport is dependent on:

- *The number of birds near the airport*: airports in an area of high bird density are likely to have more bird strikes than airports in areas of low bird density.

- *The types of birds near the airport:* the likelihood of a bird being struck by an aircraft depends in part on the height at which it flies and its flight patterns. For instance, oystercatchers and starlings are much more likely to be hit by an aircraft than pheasants and grey herons (DfT, 2006a).

- *The number of aircraft landings and take-offs at the airport*: the greater number of aircraft movements, the greater the likelihood of a bird strike.

The Civil Aviation Authority (2006) suggests that, in the UK, 1000 air traffic movements lead, on average, to roughly 0.54 bird strikes. In 2001, the CAA predicted that the risk of a catastrophic accident due to bird strike would be 2.5 times higher in 2010 than 2000 due to a large increase in the population of large flocking birds and the forecast growth in air traffic (CAA, 2001).

Because birds pose a significant threat to aircraft, many airports use control measures to reduce bird strikes. These measures may include landscaping, waste management measures, the use of noise and flare weapons, and the use of hawks. The general purpose of these measures is to disturb birds - there is a clear contradiction between flight safety and large bird populations.

3.1.4 Roadkill:

Roadkill occurs when animals get hit by vehicles, for instance on access roads to airports. No formal data are collected on roadkill numbers, but evidence suggests that they can be significant. For instance, Naturewatch (2007) suggests that more than 10% of the badger population is killed on Britain's roads each year; and Mead (1997) suggests that 10-30% of many bird species are killed by cars each year, with owls being particularly badly affected. Roadkill due to airport traffic is unlikely to be a major impact over and above existing levels of roadkill but could be major if the airport requires a new road.

3.1.5 Light Pollution

Light pollution from airports and roads can attract animals either directly or indirectly (e.g., they attract insect prey which, in turn, attract bats and birds – and their predators). This can affect migration patterns where animals travel off-course because they are attracted to light. Once they arrive at the light source, birds may circle the source, become disoriented and exhausted, and collide with structures or other disoriented birds. Light pollution can also affect animals' rhythms of waking, sleeping and hibernation (Rich and Longcore, 2006).

3.1.6 Climate Change

Airports and aviation generate greenhouse gases in three main ways:

- Flights are by far the largest source. Aircraft emit large quantities of CO2 and NOx during flights, particularly during take-off and landing.
    - NOx emissions at altitude react to either increase ozone concentrations or decrease methane concentrations in the atmosphere.
    - While this leads to global warming and cooling respectively, the two occur in different regions and latitudes and do not cancel each other out.
    - Water vapour from combustion also contributes to the formation of contrails, and persistent contrails are also thought to cause additional

cirrus cloud formation (although the scientific certainty of the precise impact is less compared to other greenhouse gases).

- Ground traffic is the second largest source. Vehicles (including construction vehicles) travelling to and from the airport, and around the airport generate CO2.

- Airport buildings require electricity and heating. Unless this comes from sources that do not use fossil fuel (e.g., hydro or wind power), the energy production will generate greenhouse gases.

4. STRATEGIES FOR BIODIVERSITY DAMAGE MITIGATION

4.1 Minimizing intrusion:

This refers to the practice of designing and building airport facilities to reduce the impact of their intrusion into natural habitats. This may involve careful location selection to avoid critical wildlife areas or migration corridors. In addition, features such as noise barriers and vegetation buffers can be used to minimize the spread of noise and other disturbances to surrounding ecosystems.

4.2 Habitat transfers, restoration, and creation:

The transfer involves the transfer of wildlife from areas affected by the development of airports to appropriate alternative habitats. Restoration efforts include restoration of ecosystems affected by construction, such as forest or wetlands restoration. Creating new habitats within or near airports can also be a compensatory measure, offering alternative habitats for displaced species to flourish.

4.3 Rescue of important species:

In some cases, rare or endangered species may exist near airports. Airport projects may involve the capture and transfer of these species to safer places. This is particularly important when development otherwise leads to habitat destruction or fragmentation.

4.4 Replacement and Refurbishment of Ponds:

If ponds or wetlands are affected by airport construction, they can be replaced or refurbished elsewhere to maintain important aquatic ecosystems. These features provide essential habitat for various species, from amphibians to waterfowl.

4.5 Restoration and improvement of hedges:

Hedges, shrubs, and vegetation provide shelter, food, and nesting places for many species. Restoration and improvement may include planting native species, maintaining existing hedgerows or improving their quality to support local wildlife.

4.6 Design of River channels to minimise hydrological and ecological changes:

Airport projects that affect water bodies or river channels should be designed to minimize ecological and hydrological disturbance. This may include maintaining natural flow patterns, preserving river vegetation and implementing erosion control measures to prevent sedimentation and contamination of waterways.

4.7 Mitigation of the loss of mature trees due to height restrictions:

Height restrictions are often imposed around airports to ensure air safety. When mature trees have to be removed or cut to meet these restrictions, mitigation measures can include planting smaller trees and shrubs that do not pose a threat to aircraft. The thickening of the hedge can also create a natural barrier without affecting the safety of the airport.

These measures are essential elements of the airport's environmental management plans aimed at protecting and maintaining local ecosystems while enabling the development of the necessary infrastructure. The effective implementation of these measures requires close cooperation between airport authorities, environmental organizations, and biodiversity conservation experts to ensure that airports and nature can coexist harmoniously.

5. CONCLUSION

In conclusion, the assessment of biodiversity damage and the proposed measures to mitigate the impact of airport projects represent a crucial step towards the integration of infrastructure development and the conservation of our natural environment. Although airport projects are essential to regional connectivity and economic growth, they inherently pose challenges to the ecosystems in which they live.

Several factors contributing to biodiversity degradation, such as habitat destruction, fragmentation, noise, pollution, and invasive species, emphasize the need for comprehensive environmental planning and management. The measures laid down in the airport master plan and environmental declaration show commitment to addressing these challenges, including minimizing intrusion, relocation, restoration, and habitat creation, saving important species, replacing ponds, rebuilding hedges and other strategies. These measures aim to achieve a balance between human progress and biodiversity protection.

The protection of biodiversity against the development of airports is a complex and ongoing process. It not only requires the adoption of best practices and the integration of environmental factors into planning and implementation of airport projects, but also active cooperation between airport authorities, environmental organizations, and local communities. This collaborative approach is essential to ensure the sustainability of airport projects while minimizing the impact on local ecosystems and protecting species that depend on them.

In the end, the success of these mitigation measures will be reflected in the ability to maintain the delicate balance between progress and nature, and to promote a world where economic growth coexists with the conservation of the precious biodiversity of our planet. It is our collective responsibility to ensure that the heritage of airport projects not only improves transport and economic development, but also maintains the health and vitality of the ecosystems in which they are located.

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