

Anaikatti: To build or not to build?

Introduction

This document aims to demonstrate a way of thinking ecologically when introduced with an alluring promise of sustainable development whether in the form of townships, roads, or other projects.

A recurring question arises: how much development is enough and can it be done ecologically? Here, we aim to address these questions by shifting the focus from anthropocentric to an ecological point of view. Often economy is prioritised over ecology. They are perceived as being at odds with each other operating in separate silos. But can they be separated? This document explores these questions, grounding the discussion in science to uncover the answers.

Process

The strength of collaboration and the value of diverse perspectives were once again demonstrated during our task as RHATC fellows. We began with formulating a plan to establish a township in Anaikatti, a village located on the highway between Coimbatore (Tamil Nadu) and Palakkad (Kerala), we initially approached the challenge with a sense of trepidation. The area's unique location between Anaikatti South and North Reserve Forests heightened the complexity of human development with environmental conservation.

Our team, enriched by its varied expertise, quickly realized the advantage of having an architect among us. With Zeal stepping up to

lead the group, we divided responsibilities and began formulating a comprehensive plan. By conducting a literature review, we identified existing human settlements, undisturbed forested areas, potential construction sites, and the necessary infrastructural developments. Our initial plan sought to balance human needs and wildlife conservation, incorporating strategies such as marking areas for wildlife corridors, especially considering the presence of the elephant corridor and other biodiversity.

However, our human-centric approach fell short of understanding of ecology. We overlooked critical issues such as waste management and the far-reaching implications of constructing a township within a forested region. Sanjay Molur aptly pointed out that our plan, under the guise of sustainable development, would inadvertently lead to significant environmental destruction. His guidance challenged us to shift our perspective from mere planners to conservationists, using our skills to assess and mitigate environmental damage rather than contribute to it.

This eye-opener prompted us to rewire our approach. Through an extensive review of case studies and literature, we identified the long-term consequences of similar developments, both for human inhabitants and the surrounding ecosystem. We recognized that unchecked urbanization in sensitive areas like the Western Ghats has historically led to devastating outcomes for both people and wildlife. This realization inspired us to explore alternative

approaches to conservation, emphasizing public awareness about the critical role that ecology plays in sustaining life and the irreversible consequences of disturbing biodiversity.

This report presents our findings and recommendations, not as a plan to build a township but as a case for protecting Anaikatti's ecological integrity. It highlights the importance of fostering coexistence by preserving forest ecosystems and demonstrates how informed decisions can benefit both nature and humanity in the long run.

Anaikatti: Introduction

The terrain is characterized by undulating landscapes with seasonal waterfalls and serves as the watershed for the River Bhavani. The altitude varies between 560 meters and 1,600 meters. The climate is semi-arid, as the region lies in the rain shadow area of the southern Western Ghats. It is primarily composed of southern dry mixed deciduous forests (Anitha et al. 2010).

Ecoregions

As per Anitha et al. (2010), the west coast tropical semi-evergreen forests are found in relatively undisturbed regions at altitudes ranging from 950 to 1,500 meters. These forests are characterized by high humidity, cooler temperatures, a sparse shrub layer, fewer forest gaps, and thick leaf litter. The area is geographically marked by steep slopes and mountain folds, and it serves as the catchment for major rivulets.

- Southern moist deciduous forests are located at altitudes between 800 and 950 meters, while

southern dry mixed deciduous forests are found at altitudes ranging from 700 to 800 meters.

- Dry deciduous scrub and thorny scrub are situated at lower altitudes and experience significant levels of disturbance.

Soil composition

Anaikatti Hills consists largely of rocks of archaean origin. In most parts soil comprises hard gravel and in some places it is red loamy. In plains, soil is reddish-brown, clayey and is generally devoid of humus (Anitha et al. 2010).

Should new human settlements expand into Anaikatti or not?

Context:

In 2010, the world had 3.92 Gha of tree cover extending over 30% of its land area of which 28.3 Mha tree cover was lost by 2023. India had 31.3 Mha of natural forest recorded in 2010, extending over 11% of its land area and 134 Kha of natural forest was lost by 2023. From 2013–23, 95% of tree cover loss in India occurred within natural forest as per Global Forest Watch data.

The Western Ghats, which comprises of Anaikatti, is one of the four biodiversity hotspots in India. It has lost nearly 50 percent of forest cover since the early 1900s and the trend continues (Molur et al. 2011). Compared to the other hotspots, it has the highest human population per unit area >300 human/sq.km., making it that much more challenging to conserve (Molur 2009). This calls for all of us to collectively protect and conserve what we have left from further active exploitation than finding out alternative “sustainable” ways of development.

What does all this loss mean for us humans? It means economic, livelihood losses, and health crisis in addition to ecological losses. Ecological losses are intrinsically linked to economic losses, hence, it is essential to study the correlation.

Land Use and Land Cover (LULC) changes

LULC changes are among the most pressing environmental concerns due to their profound negative impacts on ecology, climate, water resources, soil health, and ecosystem services. These changes not only drive climate change at local, regional, and global scales but also have significant implications for human health, the resilience of natural ecosystems, and the sustainability of human societies. In ecologically rich regions like Western Ghats, human settlements and associated land use changes have emerged as major drivers of environmental degradation.

Drivers of LULC change and its impacts:

Agricultural Plantations

Change in LULC patterns and its impact on various part of western ghats are good indicators to assess if the extent of change is alarming or not.

Like many tropical regions, the Western Ghats are undergoing rapid land-use changes, with forest lands increasingly transformed into agricultural areas and monoculture plantations. Additional factors, such as encroachment, hydroelectric projects, mining and the extraction of forest products, have further altered the landscape. Between 1920 and 1990, the deforestation rate in the Western Ghats was estimated at 0.57% annually (Menon & Bawa 1997; Jha et al. 2000; Kumar et al. 2010).

Significant portions of the Western Ghats have been converted for the cultivation of tea, coffee, rubber, and palm, as well as for livestock grazing. Commercial plantations, such as coffee, were introduced around the mid 1850s, replacing traditional crops like paddy. Tea and rubber plantations were initially established on an experimental basis in the early nineteenth century, followed by the expansion of coffee and palm plantations. As a result, evergreen forests, which were the predominant landscape, have largely been replaced by monoculture agricultural plantations. The extent of land covered by grasslands, agricultural plantations, urban areas, and mining operations increased notably, with their proportions rising from 2.73%, 28.26%, 0.37%, and 0.03% to 3.76%, 36.38%, 1.79%, and 0.06%, respectively (Ravishankar & Nagaraja 2020).

The spatio-temporal land use analyses decline of evergreen forest in Kodagu district from 40.47% to 27.14% primarily due to uncontrolled expansion of coffee plantations followed by built areas and other land-use changes. Coffee, rubber and other horticulture varieties cover 37% of the district (Ramachandra et al. 2019). The global trade of these crops influences the land-use demands, with significant consequences for local ecosystems (Meyfroidt & Lambin 2009). Jha et al. (2000) highlights that significant deforestation and land-use changes occurred in the southern Western Ghats between 1973 and 1995. It reveals a 25.6% loss of forest cover (2,729 km²) over 22 years. Dense forests have declined by 19.5%, while open forests have shrunk by 33.2%, leading to a 26.64% increase in degraded forest areas. Districts like Coimbatore and Palakkad

experience the highest deforestation rates, with an alarming annual loss rate of 1.16% majorly driven by agricultural expansion and plantation development. Coimbatore district which includes the Anaikatti region lost 275 km² of dense forest and 441 km² of open forest, while degraded forest increased by 613 km². Evidently, agricultural plantations are the most significant contributors to the loss of forests in Western Ghats. Township expansion into Anaikatti would further add to the already alarming loss of forest cover.

While these plantations provide short-term economic benefits, they come at the cost of long-term ecological and economic stability. In some areas of the Western Ghats, these land-use changes have been associated with an increase in climate extreme events.

Linear infrastructures

Studies have shown how infrastructure projects, particularly linear infrastructure like roads, railways, power transmission lines, canals, and pipelines, affect forests. Linear infrastructures causes habitat fragmentation that disrupts ecosystem functions, alters wildlife migration patterns, and increases mortality rates from poaching and roadkill (Laurance et al. 2014; Woodroffe et al. 2005). According to Mongabay India, researchers found that such infrastructure developments have resulted in a 6% increase in small forest patches and a 71.5% decrease in large forest patches (more than 10,000 km²). Fragmented forests result in smaller, more isolated habitats, limiting wildlife movement, particularly for large cats, and increasing extinction risks. Wildlife populations isolated by road-related fragmentation may experience

long-term declines due to decreased gene flow and habitat availability (Riley et al. 2006). In India, roads have severely disrupted the movement pathways of elephants, hoolock gibbons, and rhinoceroses, particularly in central India's tiger conservation landscape, which is divided by over 4,300 km of highways (Choudhury 1987; Joshi & Singh 2007; Gubbi et al. 2012). For example, highways built through protected tiger reserves in India have resulted in frequent vehicular collisions with endangered species such as the Bengal Tiger (Carter et al. 2012). In Karnataka and Assam, elephant corridor fragmentation has increased crop raids and human fatalities, emphasising such developments have both ecological and human costs (Sukumar 2006). According to a recent study, human-wildlife overlap will increase across 57% of Earth's terrestrial surface by 2070, particularly in densely populated areas such as India and China (Hansen et al. 2020).

This expansion will increase pressure on natural habitats, making them global hotspots for human-wildlife conflict according to University of Michigan (2023). The Wildlife Conservation Trust (WCT) recorded death of 49 elephants on the railways in 2016–2018 (Bhatkhande 2023) and seven tigers killed by linear infrastructure in 2023 (Ghai 2023). These statistics highlight the deadly consequences of linear infrastructure encroaching on wildlife habitats. Species richness and abundance decline significantly at certain distances from roads (Boarman & Sazaki 2006; Coffin 2007; Ament et al. 2008; Bissonette & Rosa 2009). Furthermore, fragmented and isolated patches act as hotspots for zoonotic diseases like Ebola, Kyasanur Forest Disease (KFD), and Covid-19 (Rulli et al. 2017, 2021;



White 2020; Loiseau 2022). Roads serve as key pathways for invasive and non-native species to establish themselves in forest ecosystems. Changes in light availability and soil conditions along roads promote the growth of invasive species, which outcompete native flora and disrupt ecological balance (Meunier & Lavoie 2012; Godfrey 2015). Research indicates that the intensity and extent of forest fires are influenced by factors such as infrastructure (e.g., roads, pathways, and settlements), topography (Oliveira et al. 2012; Sachdeva et al. 2018), prolonged dry spells, high temperatures, reduced rainfall, and low humidity (Singh & Mal 2014; Jolly et al. 2015). Additionally, climatic phenomena like El Niño and La Niña (Mason et al. 2017), as well as lightning (Li et al. 2020), have significant effects on local, regional, and global fire patterns.

LULC change: Driver of Climate Change and Economy

In the Nilgiris, where deforestation and population growth are among the fastest in the Western Ghats, the consequences of land-use changes are particularly severe (Lakshumanan et al. 2012). Large-scale forest clearing for urbanization and commercial plantations has drastically reduced groundwater recharge and increased surface runoff. Built-up areas, dominated by impervious surfaces such as roads and buildings, exhibit the highest levels of surface runoff, reducing soil infiltration and heightening the risk of landslides and floods (Gregory 2006). The absence of a healthy and controlled sand-mining policy has led to the formation of artificial islands in riverbeds and dense jungle growth with large trees on these islands, causing significant blockages in river cross-sections. Encroachments and unscientific

constructions in the catchment areas of dams and high ranges resulting in loss of forest cover have further amplified the extent of damage during natural disasters. For instance, in 2005, a landslide destroyed the Government College in Idukki, which was reconstructed without conducting an environmental impact assessment (Hunt et al. 2020). The impacts of these changes are not limited to hydrology alone. It also drives soil loss, with erosion rates in the region steadily increasing over the past three decades. Chinnasamy & Honap (2023) reported that between 1990 and 2020, average soil loss rose from 32.3 tons per hectare per year to 62.7 tons per hectare per year, marking a 94% increase in soil erosion rates. Such high rates translate into a significant loss in the fertile top-soil, thereby making agriculture unfavourable.

An amphibian biologist K.V. Gururaja observed that in Karnataka, agricultural setbacks due to impacts of LULC like failing cardamom crops have driven farmers to sell their agricultural lands which were previously forests into tourism ventures. High soil erosion rates, accompanied by concentrated rainfall events are also contributing to erosion in downstream areas and increasing the soil sedimentation in rivers (Chinnasamy & Honap 2023). This threatens downstream human settlements with sudden flood events and has severe ecological impacts which is intrinsically linked to economic stability of our country. This demonstrates that the health of terrestrial ecosystems affects the freshwater ecosystems. All the ecosystems are intrinsically interlinked.

Efforts have been made to estimate the annual value of both direct and indirect services provided by wetlands worldwide, yielding varied results. The Millennium Ecosystem Assessment (MEA 2005) estimates that the total value of goods and services from global inland waters could reach up to USD 15 trillion. In contrast, another study places this value at approximately USD 70 billion (Schuyt & Brander 2004). Tropical inland fisheries, which include those in India, are valued at USD 5.58 billion annually (Neil & Bene 2008). In India, inland fisheries employ 5.5 million people, with women comprising 72% of the workforce (Dugan et al. 2010). This clearly indicates the correlation between loss of healthy freshwater ecosystems, i.e., ecology translates to loss of livelihoods and food security, i.e., economy.

The Western Ghats provide significant climate resilience to southern India. However, as the soil quality deteriorates, and natural vegetation is lost, the resilience of the forest ecosystems is reduced. In the Annamalai Hills, for example, establishment of plantations have made natural habitats highly heterogenic, leading to an increase in wildlife species richness compared to undisturbed forests. However, this disturbance fosters higher parasite diversity in wild animals, with eight parasite taxa recorded exclusively in disturbed plantation areas (Chakraborty et al. 2019). These findings underscore how human-driven changes create conditions that alter the ecological balance, often with unforeseen consequences.

Climate change compounds these impacts by altering rainfall patterns and intensifying extreme weather events. The Cauvery

basin water bodies have also experienced a considerable decline, primarily due to encroachments and reduced environmental flows (Ravishankar & Nagaraja 2020). In the Bharathapuzha and Varrar river basins, reduced rainfall has decreased annual runoff by up to 106 mm in upper and middle regions, while the frequency of dry and very dry years has increased by 21% (Chandu et al. 2022). Raman (2023) states that erratic monsoon rains, driven by climate change, combined with decades of deforestation like the unchecked rise of homestays and resorts in regions, have created conditions ripe for landslides and flash floods.

The devastating 2018 landslides in Kerala, which claimed over 400 lives and affected millions, serve as a stark warning. LULC change driven by an increasing human population is a primary cause for the increase of forest fires which is then intensified by climate change. Both primary and secondary forest systems face significant threats (Parashar & Biswas 2003; Cobb & Metz 2017). India, which holds just 1% of the world's primary forests defined as native, natural and undisturbed forests, is the second most vulnerable country to forest fires in South Asia (Reddy et al. 2019). The occurrence of intense forest fires has surged tenfold, with a 52% increase over the past two decades (Mohanty & Mithal 2022). Approximately 36% of India's forest cover is classified as fire-prone (ISFR 2019), with 65% of its deciduous forests particularly susceptible to fires, causing an estimated annual economic loss of USD 104 million (Ashutosh et al. 2019). Forest fires also adversely affect human health, as studies indicate a clear correlation between reduced anthrax outbreaks in humans and increasing

distances from forest fire hotspots (Sagar et al. 2024).

It is worth noting that, climate change and land-use and land-cover (LULC) changes are deeply interconnected and often work in a feedback loop, creating a cycle that intensifies environmental degradation. This feedback loop is particularly dangerous because the effects of each process reinforce the other. For example, the conversion of forests to agricultural land or urban areas contributes to the warming of the climate (through the release of carbon and the reduction of carbon sequestration), which in turn worsens conditions like drought, flooding, and temperature extremes.

LULC Change: Human Wildlife interactions

Human-wildlife interactions become severe by the rapid expansion of human settlements into forested areas, which is primarily caused by habitat fragmentation, deforestation, and increase in human-wildlife proximity (Treves & Karanth 2003). These negative interactions are especially common in areas where human settlements and infrastructure encroach on forest habitats, increasing interactions between wildlife and humans (Woodroffe et al. 2005). Such interactions often result in serious consequences, including financial losses, human injuries, and deaths. For example, human settlements near forests in India have disrupted elephant corridors, resulting in crop raiding and human casualties (Sukumar 2006). The forced movement of wildlife into human-occupied areas in search of resources such as food and water increases conflicts and frequently results in retaliatory killings of animals (Fahrig 2003; Distefano 2005). Similarly,

urban settlements near forests worsen human-wildlife interactions by allowing opportunistic species like leopards and monkeys to exploit human resources, resulting in property damage and attacks (Athreya et al. 2013). Rivers and water bodies used by humans and animals become competition zones, especially during dry seasons, disrupting wildlife behaviour and imposing financial losses on local communities (Graham et al. 2010).

Arikomban – A case study on implications of human settlement expansion on human-wildlife interactions

The Booluvampatti-Attapadi elephant corridor, also known as the Anaikatti corridor, is located between 11.0833–11.1167 N and 76.7667–76.8000 E in the western region of Coimbatore District. It is bordered to the north by Gobanari RF, to the south by Thadagam RF, to the east by human settlements in Veerapandi Village, and to the west by the Anaikatti group of villages. The Booluvampatti-Attapadi corridor is extensively used by 50–75 elephants during their annual seasonal migration. It supports over 50% of the elephant food species within its overall vegetation. Additionally, this corridor is connected to the Silent Valley National Park in Kerala and the Kallar-Gandhapallam corridor (Ramakrishnan & Ramkumar 2007).

The major land use changes in this area include civil constructions, brick industries, and the conversion of private barren lands into agricultural fields. These activities have led to the narrowing of the corridor at several points, which were extensively used by elephants until recently. As a result, elephants are now forced to move into nearby agricultural lands

and human settlements, causing increased crop damage and economic losses for farmers (Ramakrishnan & Ramkumar 2007).

The case of Arikomban highlights the consequences of habitat loss on human-wildlife interactions. Expansion of human settlements and infrastructure will likely increase human-elephant interactions and such interactions may escalate conflicts, prompting translocation or culling measures, which disrupt elephant movement and compromise their survival.

Attempts to translocate elephants from such corridors, as seen in previous cases like Arikomban in Kerala, are costly and largely ineffective. Arikomban’s relocation required INR 15.85 lakh and over 150 personnel, only for the elephant to be recaptured after it moved into neighboring areas, creating further conflicts. Similarly, translocated elephants like Thanneer and Belur Makhna often return to their original ranges, resulting in repeated interactions with humans, fatalities, and escalated costs. These operations also impose significant disruptions on local communities, with curfews, school closures, and heightened stress during elephant capture and release efforts (Kedlaya 2024).

Past translocations across southern India show that relocating elephants doesn’t solve the problem—it simply shifts it elsewhere. In the case of Arikomban, the bull elephant was moved from Chinnakkanal in Kerala to the Periyar Tiger Reserve. However, since wildlife doesn’t recognize borders, the elephant ended up causing issues in nearby areas of Tamil Nadu. This forced Tamil Nadu to spend time and resources to capture and relocate the elephant again to another area within the



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state. Clearly, translocation doesn't resolve the conflict but merely moves it from one place to another. There are chances of the translocated animals coming back to their original habitat, especially in case of elephants. And we have several examples of the same. The case of Arikomban serves as a powerful example of the consequences of habitat destruction and human-wildlife conflict. Developing a township in the Anaikatti area, which forms part of the elephant corridor, will undoubtedly worsen the existing human-elephant negative interactions in the region. The expansion of human settlements and population is likely to intensify these interactions further. Moving forward with the township plan would be highly detrimental, as it could eventually force the government to make difficult choices between protecting human lives and conserving wildlife.

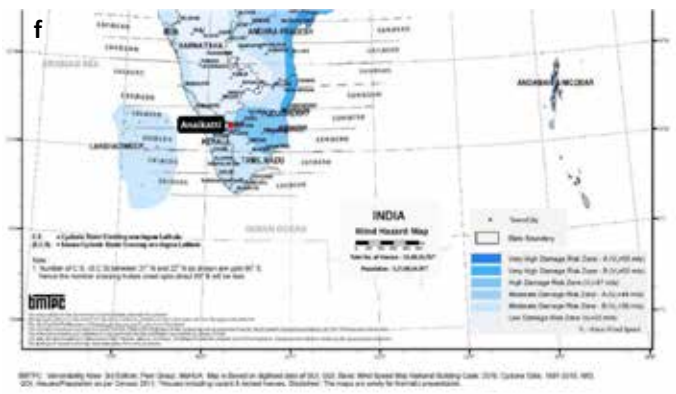
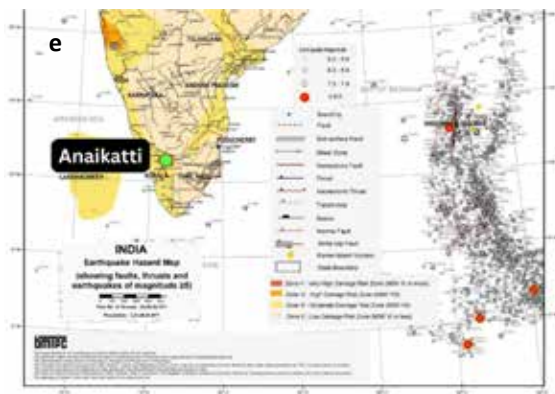
Building a township in the Anaikatti area will shrink the natural spaces between humans

and wildlife. This closer contact can lead to more interactions between people, livestock, and wild animals, increasing the chances of diseases spreading from animals to humans. These changes in the environment can make it easier for diseases to spread, raising the risk of outbreaks that affect human health.

Lavasa – a case study on range of conflicts due to introduction of a township

The Lavasa project, inspired by an Italian city, Portofino, led by Ajit Gulabchand. It is India's first privately developed city, located a four-hour drive from Mumbai. Lavasa was granted Special Planning Authority (SPA) status in 2007, Lavasa Corporation controlled essential services like power, water, and waste management. However, allegations of power misuse by the corporation led to the revocation of SPA status in May 2017 after numerous resident complaints about governance issues.

a



Map: |a|– Thunderstorm, |b|– Cyclone occurrence, |c|– Landslide incidence, |d|– Flood, |e|– Earthquake and |f|– Wind.

An investigation by the Ministry of Environment and Forests revealed that the Lavasa project caused environmental damage in the ecologically sensitive Western Ghats, a UNESCO World Heritage site. The construction proceeded without necessary environmental clearances, violating the Environment (Protection) Act, 1986. On June 10, 2011, the Union Environment Ministry directed the Maharashtra Government to act against Lavasa Corporation. Subsequently, Environment Minister Sanjay Devtale, initiated preparations to file legal action against the

corporation. Ministry of Environment and Forests found Lavasa to be violating the rules and regulations under the Environment protection act 1986. According to MOEF, LCL (Lavasa Corporation Ltd) is in violation of the EIA Notification, 1994; the EIA Notification, as amended in 2004; and the EIA Notification of 2006.

The article "The Invisible Victims of an Unfinished City" by Mayank Aggarwal on Mongabay highlights several issues faced by the

people affected by the Lavasa project. Villagers from areas like Dudhwan, whose land was acquired for the project, struggle with basic amenities such as roads and drinking water. Many villagers were displaced, and their land was taken without adequate compensation. The Lavasa Corporation faced numerous legal challenges and financial issues, leading to the project's abandonment and leaving the area as a ghost town. The affected villagers feel neglected by the administration and politicians, who do not address their needs due to their small population.

The Lavasa project, as explained by Suniti S.R. of the National Alliance of People's Movement, had a significant impact on hundreds of farmers and tribal people in the area. A total of 1.08 TMC of water was allotted to Lavasa for their Lake City Project, even during a drinking water shortage in Pune. The Varasgaon Dam, a significant source of water supply for Pune City dried up

during the hot summer months leading up to the monsoon, causing concerns about water availability. There were allegations that water from the dam had been diverted to Lavasa, a planned hill city, which raised fears of potential disruptions in Pune's water supply.

Farmers lost fertile agricultural land, which was leased to Lavasa for 'public purpose'. Many farmers' lands were taken fraudulently, and there were numerous environmental irregularities. Lavasa's special planning authority was cancelled due to violations of town planning and environmental laws.

The case of Lavasa brings about the conflicts that occur at different scales like conflict between Pune and Lavasa due to diversion of water, corporations and environment minister, locals and the township that eventually leads to loss of economy and ecology of an eco-sensitive zone.



Natural Disaster: study on Anaikatti

According to the wind hazard map, Anaikatti remains in the "48–63 zone" on a maximum sustained map indicates consistent exposure to sustained values within this range, often associated with moderate intensity for parameters like wind speed or rainfall, posing a threat to infrastructure and human safety. Also, it lies in close proximity to areas that are prone to flooding, further exacerbating the vulnerability of any proposed development.

The region is also categorized under moderate damage risk zone (MSK VII) for seismic activity, which increases the risk of structural damage during earthquakes. The area experiences an annual rainfall ranges 501–1,000 mm, which contributes to the already heightened risk of flooding and landslides. Furthermore, Anaikatti is situated near landslide-prone zones, making it particularly vulnerable to soil erosion and mass wasting, especially during intense rainfall events.

Given these environmental challenges, building a township in Anaikatti would not only jeopardize the safety of the people living there but also lead to the destruction of vital forest cover that plays a crucial role in stabilizing the ecosystem. The land, which supports both human and animal life, needs to be preserved to protect the community and the unique biodiversity of the region. Instead of pursuing urban development, we must focus on safeguarding this land to ensure the well-being of both the residents and the surrounding wildlife.

Biodiversity loss: impacts on ecology and humans

In the Western Ghats, amphibians exhibit the highest level of endemism at 78%, followed by reptiles at 62%, fish at 53%, plants at 34%, mammals at 12%, and birds at 4% (CEPF 2007; Kumar et al; Nameer et al. 2001; 2002; Molur 2008). The endemism percentage highlights the critical importance of conserving the rich biodiversity of the Western Ghats. It underscores the need to raise awareness among people about the unique species and ecosystems surrounding them and the vital role they play in sustaining life. A decline in biodiversity will inevitably have far-reaching consequences, directly impacting the lives and livelihoods of the communities that depend on these ecosystems. Therefore, preserving biodiversity is not just an environmental responsibility but a necessity for human well-being and sustainability.

Amphibians

Amphibians exhibit unique traits that make them particularly vulnerable to environmental disruptions compared to other wildlife (Rowe et al. 2003). These characteristics provide valuable insights into ecological processes and the impact of human-induced changes on the environment (Hopkins et al. 2007). Research on amphibian-chytrid interactions has advanced understanding of disease ecology and raised critical concerns about the emergence of diseases affecting both wildlife and humans (Daszak et al. 2001, 2003).

Reptiles

Reptiles, such as Varanids in Australia, Asia, and Africa, function as scavengers by consuming carrion (Shine & Harlow 1998; Dalhuijsen et al.

2015). They help remove flesh from carcasses, reducing disease spread and enhancing energy flow in trophic cascades. While squamate reptiles exhibit high cropping rates (Natusch et al. 2016), several species have gone extinct, including *Varanus priscus*, eliminated in Sahul during human colonization (Molnar 2004). Similarly, the matsiid snake family, represented by the five-meter-long *Wonambi naracoortensis* and other large species like *W. barriei* and *Yurlunggur camfieldensis*, vanished after aboriginal settlement (Flannery 2002).

The Nile crocodile scavenges ungulate carcasses during river crossings, curbing disease spread and improving water quality (Subalsusky et al. 2017). Additionally, the Green Turtle (*Chelonia mydas*) grazes heavily on seagrass, particularly *Thalassia testudinum*, positively influencing its productivity and composition through grazing (Moran & Bjorndal 2005).

Freshwater Fishes

Urban and commercial expansion is impacting various freshwater fish species, including *Botia striata* (EN), *Garra bicornuta* (NT), *Monopterus indicus* (VU), *Neotropius khavalchor* (DD), *Puntius sharmai* (EN), *Eutropiichthys goongwaree* (DD), and *Monopterus flossorius* (EN). In cities, tourism and recreational water activities near rivers adversely affect endemic species like *Garra surendranathanii* (EN), *Horabagrus nigricollaris* (EN), *Hypseobarbus periyarensis* (EN), *Osteochilus longidorsalis* (EN), *Parapsilorhynchus elongatus* (EN), *Puntius tambraparniei* (EN), and *Travancoria elongata* (EN). Many of these fish species are consumed regularly as part of local diets (Dahanukar et al. 2011).

City development often requires the construction of dams to provide water and mitigate floods. However, dams block fish migration and severely impact species like *Anguilla bicolor* (LC), which swims upstream to breed. Kerala's major rivers, including Periyar and Chalakkudy—home to numerous threatened fish species—have been extensively dammed, resulting in the disruption of fish migration and endangerment of native species (Raghavan et al. 2008a). Across Kerala, approximately 53 reservoirs have been created due to dam construction (Harikumar & Rajendran 2007).

Habitat alteration from widespread deforestation and conversion of forests into tea, coffee, rubber, and cardamom plantations has significantly impacted freshwater fish. Kerala experienced an annual forest cover decline of 0.9% between 1961 and 1988 (Prasad et al. 1998). The loss of forest cover at such alarming rates affect many riverine fish in the region since they rely on external food resources.

Plants

India boasts a wealth of natural resources and is home to approximately 15% (3,000–3,500) of the world's 20,000 medicinal plant species. About 2,000 of these plants are known for their medicinal properties and are utilized across traditional systems like Ayurveda, Unani, Siddha, and Homeopathy. Tribal and rural communities in India heavily rely on these plants for their healthcare needs, including treatments for livestock. The Western Ghats, renowned for its rich biodiversity, unique vegetation, and high levels of endemism, serves as a significant reservoir of medicinal plants (Raghupathy & Newmaster 2009; Sasi et al. 2011).

A study conducted in Anaikatti hills surveyed remote rural villages, interviewing two to three local herbal healers per village to gather firsthand information on plant-based remedies. The study identified 85 plant species from 48 families, many from *Solanaceae*, *Asteraceae*, and *Amaranthaceae*, commonly used for ailments like fevers, stomach aches, respiratory issues, skin diseases, joint pain, hair loss, dysentery, diarrhea, snakebite, jaundice, and malaria. Some plants addressed complex conditions like heart disease, kidney disorders, cancer, and diabetes. Additionally, 20 plant species from 17 families and 18 genera were specifically noted for treating heart and kidney conditions. The Irula community selectively utilize 19 plant species from 15 families, including *Amaranthaceae*, *Asclepiadaceae*, *Cucurbitaceae*, *Lamiaceae*, *Fabaceae*, *Malvaceae*, *Menispermaceae*, and *Nyctaginaceae*. If we decide to construct a city in the name of development, this decision may lead many endemic and medicinal plants towards extinction and will also increase more pressure on the existing edible plants by the city people, exploiting the plant resources (Ganesan et al. 2015).

Mammals

Forest elephants are vital ecosystem engineers, significantly shaping their habitats through their behaviors. Their size plays a crucial role; merely by walking, they alter the environment, and when moving in herds, their impact increases manifold. Although their activities may seem destructive, they create conditions for large trees to establish deep roots and grow to towering heights, thus shaping the forest canopy. Without elephants, competition for

light and nutrients would intensify, slowing tree growth and limiting their maximum potential size. Additionally, elephants clear vast areas of the forest floor, creating spaces for new seedlings to germinate. Seeds that pass through their digestive systems benefit from improved germination rates and faster growth.

Elephants consume over 500 plant species and aid in the seed dispersal of at least 43 species in Central Africa. Many fruiting plants depend on animals for widespread seed dispersal, and some, like the navel fruit trees of the *Omphalocarpum* genus, rely solely on elephants. These trees produce large, hard, trunk-growing fruits (cauliflorous) with thick husks, which only elephants can eat and disperse. The loss of elephants could lead to the decline of such plant species.

Poulsen (2018) highlights that forests without elephants often develop dense understories and middle layers filled with thorny vines and herbaceous vegetation, making visibility and movement difficult. In contrast, elephant-inhabited forests resemble open parks with clear visibility and well-worn trails. He also suggests that beyond deforestation, the loss of elephants could reduce forests' ability to store carbon.

Tropical forests play a critical role in global carbon storage, and forest elephants are essential for the growth and survival of large trees. Their decline would result in reduced carbon sequestration by African forests, contributing to global warming (Clark 2018).

Birds

The diversity of bird species is a strong indicator of ecosystem health. Many birds are highly sensitive to pollution, making them effective indicators of potential human health risks from environmental contaminants. Unfortunately, bird populations are declining due to factors such as climate change, habitat loss, and fragmentation (Ceballos et al. 2017). In India, research has identified over 290 bird species involved in pollination and seed dispersal, with sunbirds and mynas among the most significant pollinators (Balasubramanian et al. 2012). Birds play a crucial role in maintaining biodiversity and supporting ecosystems and agroecosystems through their pollination behaviors (Kellermann et al. 2008). They also act as primary seed dispersers for approximately 80,000 angiosperm species, facilitating reforestation in deforested areas and reducing reforestation costs. This, in turn, helps mitigate climate change and benefits humanity in the long term (Mahendiran et al. 2015; Wunderle et al. 1997).

Birds contribute significantly to pest control, with studies showing they can reduce invertebrate populations by 20–70% in natural and agricultural areas, leading to decreased plant damage and mortality. This reduction can result in up to a 60% increase in crop yield or fruit production (Jedlicka et al. 2014; Whelan et al. 2015). Birds also play a key role in waste management; for instance, vultures in the Serengeti consume hundreds of pounds of carcasses per kilometer annually, while those in Yemen remove up to 25% of urban organic waste (Gangoso et al. 2013). The decline of scavenger populations can increase the spread of diseases in humans, livestock, and wildlife,

as vultures efficiently dispose of carcasses and prevent infections. For example, the decline in vulture numbers has been linked to a rise in rabies cases, resulting in approximately 48,000 human deaths (Markandya et al. 2008). These examples highlight the critical role of birds in supporting human health and ecosystems.

Additionally, birds contribute to agriculture, with studies showing that their droppings, rich in nutrients such as potassium, nitrogen, and phosphate, act as natural fertilizers. These nutrients convert to ammonia, enriching soil nitrogen content and promoting plant growth. Birds are estimated to provide a 38% global contribution to agriculture through this natural fertilization process (Clay et al. 2004).

Key Conclusion:

The cumulative effects of human disturbance on forests in eco-sensitive areas like the Western Ghats are alarming. Over time, the continuous pressure from activities such as deforestation, agriculture, urbanization, and infrastructure development has led to significant degradation of the region's natural ecosystems. Carefully managing agricultural and urban expansion are critical to mitigating these cascading impacts. Biodiversity loss poses an existential threat to human survival and existence by undermining ecosystems that provide essential services, support economies, and safeguard health. Addressing this crisis requires transformative changes across sectors. Conservation and restoration of ecosystems are essential to protect biodiversity, while sustainable production and consumption practices can reduce environmental pressures. Integrating biodiversity into policies for food systems,

TO BUILD? OR NOT TO BUILD?

WHAT IF WE BUILD A TOWNSHIP?

Forest loss, biodiversity declines.

WHAT IF HABITATS ARE DESTROYED?

Wildlife enters human spaces, causing conflict, more chances of disease outbreaks

WHAT IF FOREST IS CLEARED?

Soil erosion, landslides and forest fires increase.

WHAT IF WARNINGS ARE IGNORED?

Disasters worsen, climate impacts escalate affecting livelihood.

WHAT IF WILDLIFE CORRIDORS ARE PROTECTED?

Free animal migration, reduced human-wildlife conflict.

WHAT IF VEGETATION STAYS INTACT?

Stronger climate resilience, fewer floods and landslides.

WHAT IF SOIL REMAINS UNDISTURBED?

Better groundwater recharge, fertile lands.

LOSS IN ECOLOGY = LOSS IN ECONOMY

Made by Dupati Poojitha

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