

SYNOPSIS

Title of the Thesis: ENVIRONMENTAL DEGRADATION IN POST-COLONIAL
SOUTHEAST ASIA: A HISTORICAL ANALYSIS OF ASEAN COUNTRIES

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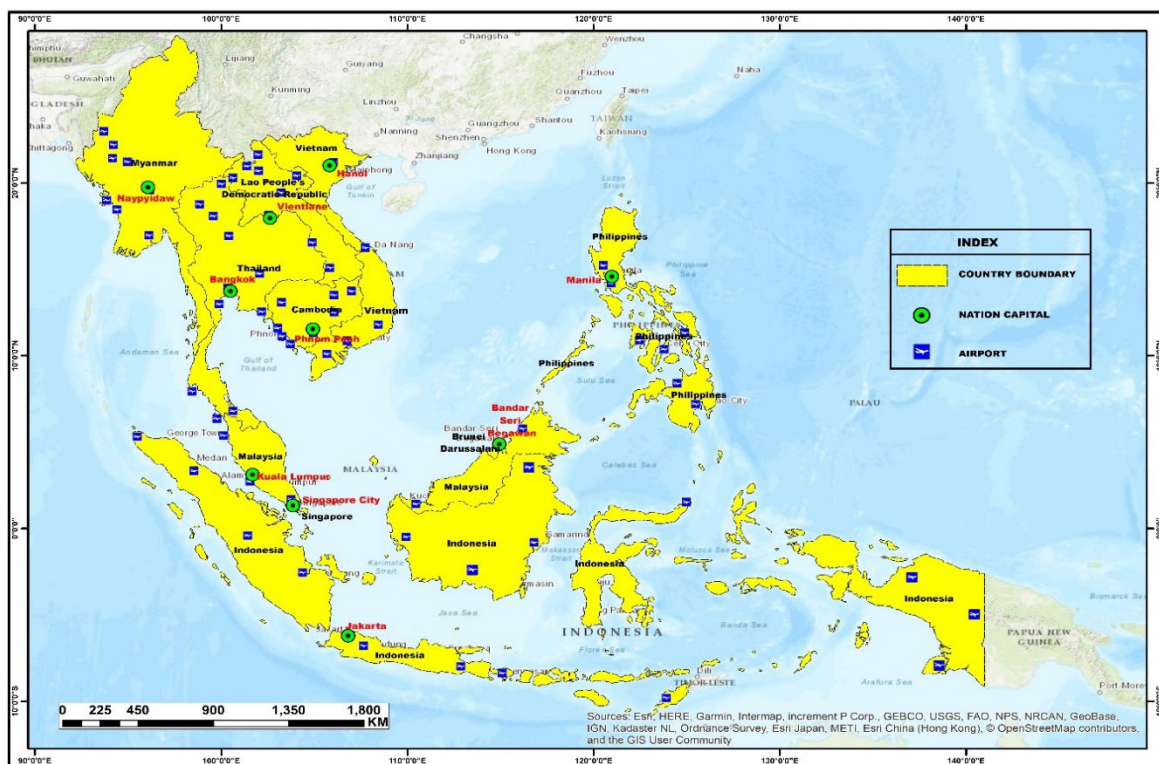
CHAPTER – 1: Introduction

1.1 Background of the Study

The Association of Southeast Asian Nations (ASEAN) was founded on August 8, 1967. It is a regional intergovernmental organisation aimed at promoting economic, political, security, military, educational, and sociocultural integration among its member states. ASEAN states have industrialized, urbanized, and grown economically during the post-colonial era, with an average 1980s growth rate of 5.4%, above the global average¹. From 1980 to 1995, per capita income in Singapore, Indonesia, Malaysia, and Thailand doubled, outpacing US economic growth. ASEAN, created on August 8, 1967, by five Southeast Asian nations, now represents 9% of the global population and 4% of global GDP². Net foreign direct investment in ASEAN countries rose 67.89% from 2010 to 2019, demonstrating strong economic growth. However, expansion has caused major environmental issues. Southeast Asia's fossil fuel-induced CO₂ emissions grew about 20% annually between 1990 and 2008 due to rapid urbanization³. Carbon emissions increased 17 fold since 1950 to 500 million metric tons in 2008. Post-colonial industrialization and export promotion increased the region's carbon footprint and economic growth⁴. Southeast Asia has the highest rate of tropical deforestation, threatening its biodiversity⁵. By 2100, 75% of natural forests and 42% of biodiversity may be destroyed. Deforestation is destroying the environment and eradicating over 50% of plant and animal species⁶. Eleven countries in the region struggle to balance economic expansion and environmental conservation. Vietnam had the second-highest primary forest deforestation rate in 2005, behind Nigeria, according to FAO research. Deforestation in Cambodia, Laos, and the Philippines has destroyed 90% of their rainforests⁷. Open Development Cambodia found that logging and local use reduced Cambodia's forest covering from 72.1% in 1973 to 46.3% in 2014. The 1970s saw fast deforestation in Indonesia, lowering forest cover from 84% in 1900 to under 100 million hectares by the late 20th century⁸. In 2008, scientists anticipated the near-total disappearance of its tropical rainforests within a decade, with 80% of logging illegal. Malaysia's forest cover fell 8.6% between 1990 and 2010⁹.

Thailand's forest acreage fell from 61% in 1945 to 34% in 1975, then 28% over the next 11 years, resulting in 3.1% annual deforestation¹⁰. Thailand's forest cover fell 43% between 1973 and 2009. Since 1819, Singapore has removed 95% of its greenery, removing 61 of 91 bird species¹¹. Since 1980, forest cover has decreased 90%, bird species have declined 67%, mammal species have declined 40%, and amphibian and reptile species have declined 5%. Brunei experienced less than 0.5% yearly deforestation from 2005 to 2010. Myanmar, with the largest tropical forest in mainland Southeast Asia, lost 19% of its forest cover between 1990 and 2010. Deforestation has reduced from 0.95% to 0.3% per year, but forest cover dropped from 70% at independence to 48% by 2014. Slash-and-burn agriculture, firewood extraction, coffee plantations, and animal grazing have removed approximately 90% of Timor-Leste's forest cover, even in high terrain.

With a particular focus on Southeast Asian countries, this study attempts to investigate the historical background and root causes of deforestation, environmental degradation, and climate change in the region. The analysis has focused on deforestation and carbon emissions, both of which are major factors contributing to environmental degradation. The study aims to pinpoint industrialization and urbanization as the primary factors responsible for the significant decline in forest coverage and the subsequent rise in carbon emissions since the post-colonial era. The study also examines the correlation between regional commerce and treaties within ASEAN and the process of industrialization, which in turn has resulted in deforestation. Additionally, the research assesses the influence of urbanization on the environment. Among the ASEAN region, the main emphasis of this study has been on Singapore, Malaysia, Indonesia, Vietnam, and Thailand.



Map 1: Political map of ASEAN member countries
(Source: Prepared using ESRI Arc GIS Desktop 10.8.2)

1.2 Review of Literature

The review of literature for the present study has been extensively done in order to identify the knowledge gaps, improve the research topic and furthering the study. Relevant materials have been explored to synthesize information and then critically evaluated to find knowledge gaps. Industrialization and its environmental impacts have been extensively examined since the 1972 Stockholm UN Conference on the Human Environment. However, environmental historians Roderick Nash, Richard White, Donald Worster, and Alfred Crosby rarely study ASEAN and Southeast Asia's developing states. Pre-postcolonial industrialization and urbanization were delayed in these locations. Due to the South China Sea dispute and China's regional dominance, transregional bodies like ASEAN have boosted Southeast Asia's geopolitical relevance. This literature review tackles the gap

by exploring ASEAN and Southeast Asia's developing states' industrialization, environmental impacts, and geopolitical dynamics in global environmental history. The assessment underlines the need to research these regions' recent industrialization, urbanization, and climatic impact due to their growing relevance in global politics and regional associations like ASEAN. It addresses a crucial research gap by studying how growth processes affect Southeast Asian climate dynamics. Numerous materials from secondary sources have been reviewed and used in the preparation of the literature review for the current topic. Several research papers, doctoral thesis, books, journals and magazines, online articles and materials have been obtained in both soft and hard copies and have been subsequently used.

According to Edward Lee¹² in "*ASEAN: Growth in the Fast Lane*," ASEAN has experienced tremendous economic growth and urbanization since its 1967 founding. ASEAN countries became big exporters due to global protectionism and anti-China sentiments despite low resources. As manufacturing moves from China to Malaysia, Vietnam, and Singapore, the region will expand. According to the author ASEAN has consistently outperformed global growth from 1980 to 2013 primarily by becoming one of the top exporters in the world.

Jung Wang Lee and Tantatape Brahmasrene¹³ in their work "*Assessing the Dynamic Impact of Tourism, Industrialization, Urbanization, and Globalization on Growth and Environment in Southeast Asia*" shows a long-term equilibrium between carbon emissions and tourism, industrialization, urbanization, and globalization. Industrialization contributes to carbon emissions but has little effect on economic growth, necessitating environmental protection regulations. The study also highlights how Southeast Asian nations postulate policies to curb carbon emissions levels.

Toru Iwami¹⁴ in "*Economic Development and Environment in Southeast Asia*," links rapid industrialization, urbanization, and export growth to environmental deterioration. The "environmental Kuznets curve" idea proposes that economic expansion and growing incomes will reduce environmental degradation. Iwami stresses that market processes cannot solve environmental challenges and supports government intervention.

Jung Wang Lee¹⁵ in "*Lagged Effects of Exports, Industrialization, and Urbanization on Carbon Footprint in Southeast Asia*," explores how economic policies affect carbon emissions. The study reveals that exports, industrialization, and urbanization negatively impact carbon footprints in the short term. These parameters and carbon emissions balance over time, revealing the environmental cost of regional economic expansion.

Rajah Rasiah and Hing Ai Yun¹⁶ in "*Industrializing Southeast Asia*" explores import substitution and export promotion programs that rapidly industrialized Southeast Asian countries. Export promotion boosted electronics and wood-based product sales in some countries despite import substitution issues. The study finds that export-oriented policies have driven regional economic growth.

Werth and Avissar¹⁷ in "*The Local and Global Effects of Southeast Asian Deforestation*" uses a Global Climate Model to analyse precipitation effects. Deforestation reduces Asian precipitation and has local consequences, but large-scale winds spread the impact.

Barbier¹⁸ in "*The Economic Aspects of Tropical Deforestation in Southeast Asia*," explores tropical timber production's economic impact. He claims agricultural expansion and timber production cause excessive and economically unsustainable deforestation. The report recommends rethinking forestry and agricultural policy to sustain tropical forests.

Sodhi¹⁹ et al. in "Southeast Asian Biodiversity: An Impending Disaster," has warned of deforestation's impact. They forecast considerable biodiversity loss by 2100 and call for political, social, and scientific solutions.

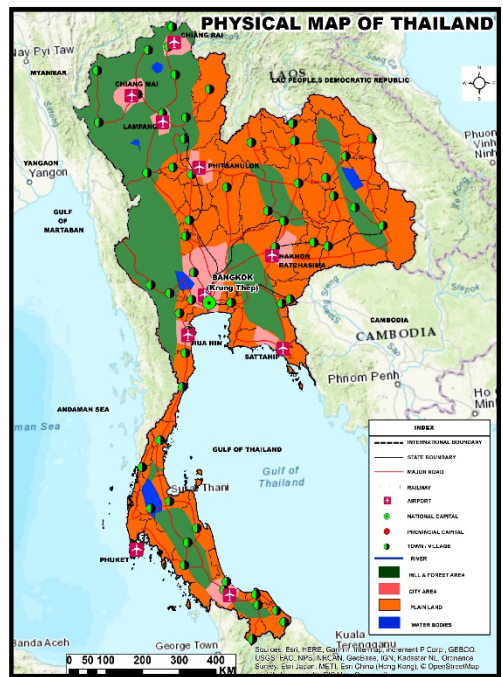
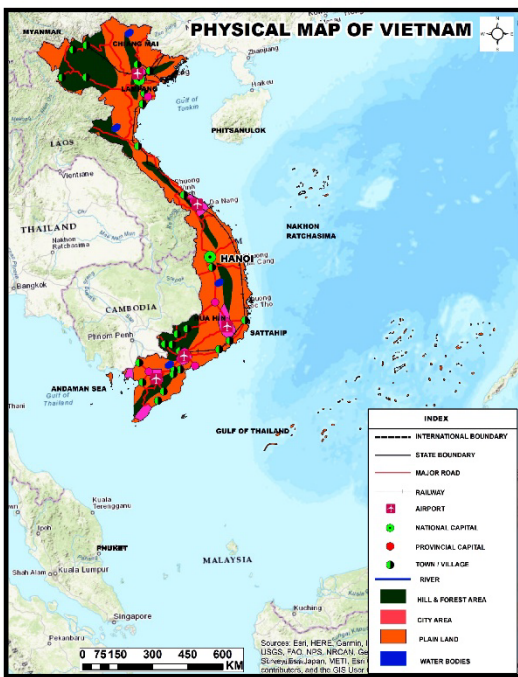
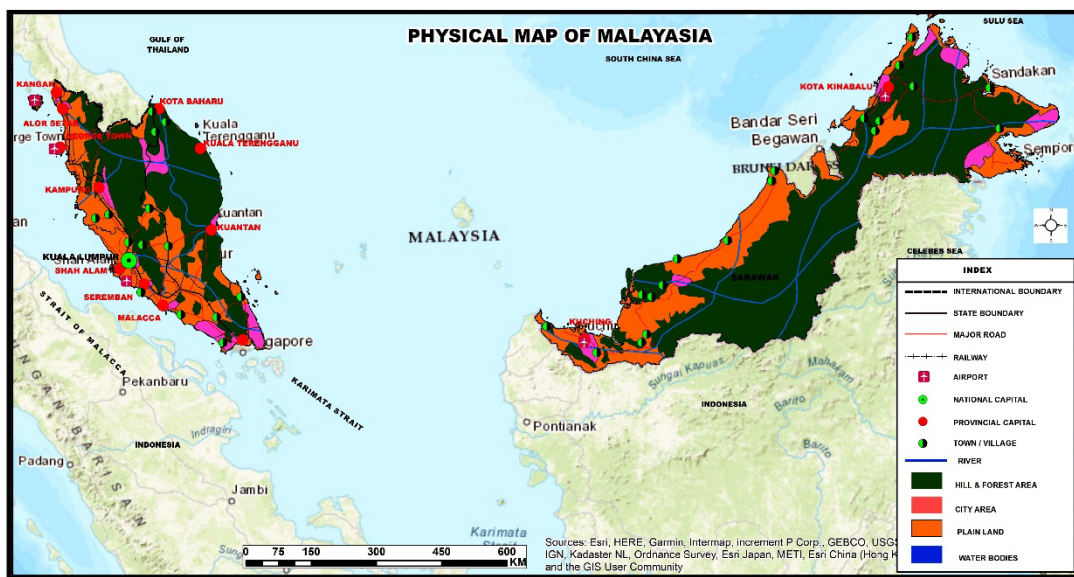
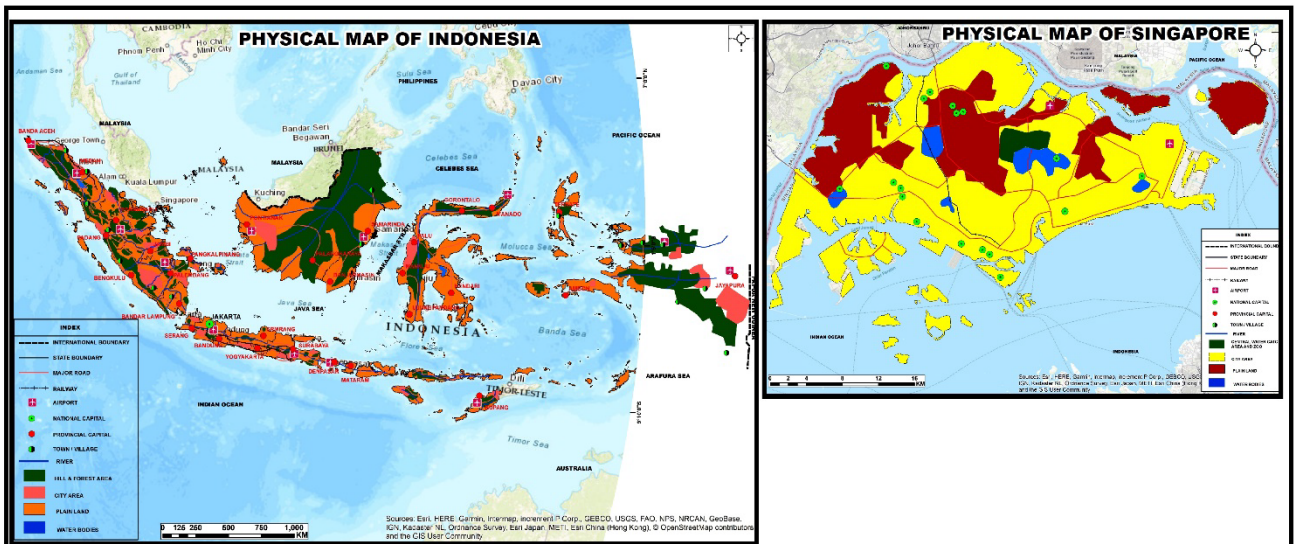
1.3 The Study Area

In this section, within Chapter 1, the study area has been discussed in detail. There is various sub-section within this section that explains the reason for selection of five nations among the ten member states of ASEAN. Also, it explains the significance of ASEAN as well as the significance of the countries in the study area. The five countries namely Singapore, Indonesia, Malaysia, Thailand and Vietnam have been selected for this research work based on several parameters of environmental history, colonial background, tropical forest cover, and industrial growth witnessed in recent decades. Among them, Singapore, Indonesia and Malaysia are part of the maritime Southeast Asia while Thailand and Vietnam are part of the Mainland Southeast Asia covering both the geographical and topographical features of the ASEAN region. At the conclusion, the geo-political significance of the countries under the study area have been discussed in light of the existence and importance of regional socio-economic and political groups.

1.4 Objective of the Study

Based on the in-depth review of literature, it has been observed that very little research work has been done on environmental degradation in the study area using a historical approach. Keeping this in mind, the objectives of this research work has been designed. The following can be treated as objective of our study:

- (i) Understanding the concept of environmental degradation on a global scale over time
- (ii) Providing a historical analysis of the causes and impact of deforestation in the study area
- (iii) Assessing the gradual evolution and status of industrialization and urbanization in the study area
- (iv) Analysing the perception of the community members on environmental degradation of the study area
- (v) Historically analysing the regional climate in the study area
- (vi) Forwarding relevant guidelines towards improvement of the environment in the study area.



Map 2: Physical map of five countries under this study
 (Source: Prepared using ESRI Arc GIS Desktop 10.8.2)

1.5 Research Questions

The post-colonial environmental effects of industrialization and urbanization in Southeast Asia are the focus of this research. Due to regional alliances, fast industrialization and export promotion programs boosted economic growth. The 1972 UN Conference on the Environment raised worldwide climate change worries, making the study's timing essential. Research shows a gap in understanding Southeast Asian environmental degradation causes and effects. Previous studies have ignored the impact of intensive industrialisation and import substitution on climate change in this region during the post-colonial era. This research examines climate and environmental change causes and consequences on nations to close that gap.

In order to examine the environmental impact of industrialization and urbanization in Southeast Asia, the research question employs multiple approaches like the Comparative Approach, Exploratory Approach, Explanatory Approach and Evaluation Approach.

The following research questions have been formulated for the present research work:

- How Industrialisation, Urbanisation and Deforestation had progressed, propelled, propagated and transitioned throughout history within ASEAN and in the selected study area?
- What effect historically does Industrialisation, Urbanisation and Deforestation have on the environment and climate of ASEAN countries under this study during post-colonial era?
- What is the perception of local residents regarding climate change in the study area and their response regarding government initiatives on this matter?

1.6 Methodology

The present research work attempts to address the research questions by using a combination of several methods. The research is both exploratory and explanatory in nature where the causes of environmental degradation in the study area has been identified and also an attempt has been made to find out the underlying relation between the identified cause and effect. The present research work has been primarily done based on secondary data obtained from both online and offline resources. In online resources, different websites and e-library has been considered and in offline resources books, literature, journal, magazines and published articles on environment, climate and economics of Southeast Asia have been consulted. Secondary data collected from various governmental agencies like National Environmental Agency in Singapore, Department of Environment Malaysia, Pollution Control Department of Bangkok, Centre for Environmental Monitoring and Analysis in Vietnam and National Development Planning Agency of Indonesia have been used in parts of the research to identify effects and implementation of government policies and the degree of consciousness local residents possess regarding climate change. The current topic has been researched based on a *temporal study* where secondary historical data has been collected based on several points in time during the post-colonial era in order to witness the change, trend and pattern of deforestation, industrialisation and climate change that gradually began from the early 1960s. The research has a

fixed research design where based on certain parameters of industrialisation and deforestation, five ASEAN member countries have been selected for the study and collection of data. *Problem-State-Response (PSR) framework* has been used in this research work to analyse the major findings of this study in a comprehensive manner. By utilizing the PSR framework in a historical context, this methodology facilitates a comprehensive and nuanced comprehension of environmental deterioration in the research location. It offers vital lessons for future policy and management initiatives by providing insights into how historical events and responses have influenced the current environmental situation. Conclusion has been drawn based on the findings after analysing the data using qualitative methods and several recommendations and suggestions have been proposed based on the observations.

1.7 Chapter Division

This research work has been divided into total 7 chapters as well as a bibliography section. The brief details of the chapters are as follows:

Chapter 1 is the introductory chapter that consists of several sections and sub-sections. As sections, this chapter contains the background of the study, review of literature, study area details, objectives of the study, research question, methodology and the division of chapters. There are sub-sections within the study area that explains the physical, geographical and political aspects of the countries under the study area.

Chapter 2 is titled as Global Concept of Environmental Degradation. This chapter explains the global concept and history of the three identified contributors of environmental degradation namely deforestation, industrialisation and urbanisation. There are tropical as well as ASEAN perspectives discussed within this chapter.

Chapter 3 contains the title History of deforestation in the Study Area and this chapter explains the historical transition and context of deforestation in the five countries of the study area for two different time periods, the colonial and the post-colonial era and offers a brief comparison of both.

Chapter 4 is titled as Urbanisation throughout history in the study area and this chapter elucidates how urbanisation had progressed throughout history in the five selected countries and offers a glimpse on the urban transition of these areas from colonial to post-colonial era.

Chapter 5 contains the title Industrialisation throughout History in the Study Area and this chapter narrates how the five nations under the study became industrialised throughout their colonial history and finally, how the industrial scenario propelled further after attaining independence.

Chapter 6 bearing the title Environmental Degradation and Climate Change contains the Problem-State-Response (PSR) analysis which has been done to understand the local perception on degradation of the environment. Alongside, changes in the regional climate have also been historically analysed.

Chapter 7 is the concluding chapter where conclusion of the study has been drawn while mentioning historical regional disputes, environmental conservational efforts and suggestions.

CHAPTER – 2: Global Concept of Environmental Degradation

In chapter two, the global concept of environmental degradation has been discussed. The second chapter is divided in three major sections where deforestation, urbanization and industrialization as a global concept with emphasis on the historical background has been discussed. These have been discussed separately in detail in each of the three major sections. Each section has been divided into sub-sections. In the first section, we have discussed the concept and history of deforestation globally. In this section, two sub-sections have been made where the history of deforestation in the tropical region and the history of deforestation in the southeast Asian region have been discussed in detail. The history of deforestation has been discussed right from the pre industrial period when forests were mainly cut to make land for agriculture and for timber and fuel. However, during this period the rate of deforestation was not alarming rather it was quite slow. During the period of industrial revolution, the rate of deforestation increased due to increased demand of several forest products like timber.

The utilization of forests underwent significant transformations during the process of industrialization²⁰. Industrialization led to a shift in priorities towards the production of raw resources such as wood, industrial crops, energy, and minerals. This transition also resulted in a change in demand from hardwood species, which were formerly used for fuel and animal feed, to softwood species, which were more sought after for building and paper manufacturing. Agrarian communities have frequently faced pressure to provide raw resources that facilitates the industrial growth of other nations. The changing forest area in the world during last four decades from 1990 to 2020 have been represented diagrammatically with data collected from the FAO main report of Global Forest Resources Assessment 2020. The forest area of the world has significantly decreased over the last four decades. The yearly decrease in forest area loss decreased from 7.84 million hectares between 1990 and 2000, to 5.17 million hectares between 2000 and 2010, to 4.74 million hectares between 2010 and 2020. The primary reason for the decrease in net forest loss over the last decade was mostly attributed to a decrease in the rate of forest acquisition, which includes afforestation and the natural expansion of forests. The deforestation rate in the world during last four decades have been discussed and represented diagrammatically with the help of data collected from FAO main report of Global Forest Resources Assessment 2020.

From 1990 to 2020, about 420 million hectares of forest were destroyed due to deforestation²¹. Nevertheless, the pace decelerated within the given timeframe. Between 1990 and 2000, the pace of deforestation was 15.8 million hectares per year. This rate decreased to 15.1 million hectares per year between 2000 and 2010, and further decreased to 11.8 million hectares per year between 2010 and 2015. From 2015 to 2020, the rate of deforestation was 10.2 million hectares per year. The tropical domain accounted for almost 90 percent of deforestation between 1990 and 2020. The annual deforestation rate in the tropical area was 9.28 million hectares between 2015 and 2020, which is considerably lower than the average rate of 13.8 million hectares per year between 1990 and 2000.

The deforestation rate in the continents of the world during last four decades have been represented diagrammatically with data from the FAO main report of Global Forest Resources Assessment 2020.

The rate of deforestation based on climatic domain of four periods during 1990 to 2020 have also been represented and discussed with data collected from the Global Forest Resources Assessment 2020 Main report by FAO. Destruction of forests, woodlands and related flora and fauna has a number of adverse repercussions on the surrounding ecosystem²² which may include loss of biodiversity, local climate change, soil erosion, disruption in water cycle and economic impacts. The history of deforestation in the tropical region has been discussed in the sub-section where the deforestation history, causes and effects have been discussed. The deforestation rate in the tropical region have been discussed and represented diagrammatically with data from FAO Main report of Global Forest Resources Assessment 2020. The majority of the Earth's rich biodiversity is concentrated in forests, namely tropical forests. The Amazon and other moist tropical forests have the highest densities of animal and plant species among all land-based ecosystems. The majority of Earth's species only inhabit these woods. Deforestation has the capacity to lead to the extinction of a growing number of these species. A significant portion of the land that has been cleared of trees is found on steep mountain slopes in tropical areas. In the tropical areas massive deforestation has occurred since 1990 to 2020. In the decade 1990-2000, the rate of deforestation was the highest and it gradually decreased at a very slow rate. The world's biodiversity is threatened by deforestation. Tropical rainforests hold over half of all the species of plants and animals on Earth, and many of these species can only be found in small areas within the rainforest²³. Illicit logging and forest fires have the potential to drive a lot of these species towards potential extinction. Deforestation destroys the habitat of these species, making them vulnerable to extinction. Deforestation is responsible for the extinction of an estimated 137 species every single day throughout the globe.

The history of deforestation in the southeast Asian countries have been discussed in the following sub-section. In the majority of South-eastern Asia until the late eighteenth and early nineteenth centuries, the main cause of forest removal was shifting agriculture. The influence of colonialism led to a rise in commercial activity, commerce, and population. Additionally, deforestation progressively accelerated. During the late nineteenth and early twentieth centuries, forests were extensively used for certain tropical wood species and destroyed to make way for the cultivation of other crops, including oil-palm and rubber. Approximately 40 million hectares of forest were deforested, mostly for the sake of commercial agriculture. Deforestation and forest degradation persist as ongoing issues in several nations in South-eastern Asia²⁴. This area is considered a prominent worldwide hotspot for biodiversity. Nevertheless, the immense population of nearly 600 million individuals living in the area exerts significant stress on the biodiversity. The need for urban areas has risen due to the growing human population. Consequently, governments have implemented strategies to clear more land in order to meet the increasing demand, resulting in greater deforestation and its subsequent

environmental consequences. The changes in forest area in the South and Southeast Asian countries shows that there has been progressive reduction in the forest area from 1990 to 2020 over a period of 30 years. The changes in forest area in south and south east Asia spanning from 1990-2020 with data from Global Forest Resources Assessment 2020 Main report by FAO have been discussed and represented diagrammatically. The causes of deforestation in the ASEAN nations have been discussed which indicated that Expansion of Agriculture, Infrastructure Development and Issues with Land Tenure and Governance were among the major causes. The major impacts of deforestation in the ASEAN have also been discussed.

In the second part of this chapter, the global concept and history of industrialisation has been discussed where the various phases of industrialization have been discussed in detail with emphasis on the transformational phase, which started in the late 18th century, saw the shift from artisanal and rural economies to massive mechanical production. Industrialization propelled humanity into the modern era by bringing about a period of tremendous growth, urbanization, and innovation. In addition to revolutionizing production and trade, this drastic change sparked significant social, political, and environmental developments that still have an impact on the world today. The second stage of industrialisation, following the transformational phase spans throughout the middle of 19th century to the early 20th century²⁵. This era witnessed notable progress in technology, manufacturing methods, and industrial structure. Sectors such as steel, oil, chemicals, and telecommunications witnessed substantial expansion during this timeframe. Furthermore, novel sectors such as automobile manufacturing, aviation, and electronics arose and thrived. This era left a significant and far-reaching influence and an indelible mark worldwide.

The notion of a "third phase" of industrialization lacks a universally established definition or recognition, unlike the first and second stages. Nevertheless, several academics and experts have employed the word to denote a stage of industrial progress marked by more technological breakthroughs and changes in the worldwide economy. Although there is no specific timeframe for this phase, it is commonly linked to the latter part of the 20th century. The third phase of industrialization is characterised by swift progress in technology, namely in the domains of computer technology, biotechnology, nanotechnology, and renewable energy²⁶. These advancements have completely transformed the methods of producing goods, exchanging information, and engaging with technological devices. There is currently no universally accepted definition or consensus about the existence of a "fourth stage" of the industrial revolution. Nevertheless, several academics and experts have put forth the concept of a fourth industrial revolution, commonly known as Industry 4.0, to characterise the continuous process of digitising industries and economies. Industry 4.0 is an evolution that builds upon the progress made in past industrial revolutions. Further in this section, both the positive and negative impacts of industrialization have been discussed. In a separate subsection, the history of industrialization in the tropical region have been discussed. The status of

industrialization in the colonial era and the beginning of industrialisation have been discussed with emphasis on the causes, impact of industrialization during this period. The end of colonial rule and the beginning of post-colonial industrialization phase have been discussed in detail. The development of Tropical Industries in the Later Part of the 20th Century has been discussed also. Transitions Towards Sustainable Industrialization and Economic Diversification in the tropical region has been analysed and discussed. The effect of industrialisation in the tropical region have been discussed in detail.

In the next sub-section, the history of industrialisation in the South East Asian Countries have been discussed. A complete account of the history of industrialisation in the Southeast Asian region has been provided, beginning with the colonial era and ending in more modern times. The time period covered will range from the early 1900s to the present day. Then in a separate sub-section the effects of industrialisation in the South East Asian Countries have been discussed.

In the next section, the global concept and history of urbanization have been discussed where the concept of urbanization has been discussed in detail. The definition of urbanization followed by major countries and organizations have been discussed. This part provides a succinct but thorough explanation of the stages of urbanization, charting their development from prehistoric times to the present. In a separate sub-section, the trend and pattern of global urbanization since 1950 have been shown. The world's urban population increased from an estimated 0.8 billion in 1950 to an estimated 4.2 billion in 2018, a more than fourfold increase and this has been shown diagrammatically with data collected from World Urbanization Prospect, 2018 by United Nations Department of Economic and Social Affairs/Population Division. The average annual rate of change in the world total, urban and rural population have been represented diagrammatically with data from the World Urbanization Prospect, 2018 by United Nations Department of Economic and Social Affairs/Population Division. In the next sub-sections, a detailed history of the urbanization in the tropical region has been discussed. In another sub-section, the history of urbanization in the Southeast Asian countries have also been discussed.

CHAPTER – 3: History of Deforestation in the Study Area

The third chapter has been divided into two major sections. The first section deals with the causes of deforestation in the study area in the colonial period. In this section we have discussed in detail, the causes of deforestation in the colonial period in the five selected countries which are members of the ASEAN. In this section firstly the causes of deforestation in Singapore in the colonial period has been discussed. The colonial era in Singapore was a crucial period in its history since it saw a rapid urbanization and economic expansion²⁷. These improvements, meanwhile, had a severe negative impact on the island's natural ecosystem. This chapter examines the factors that led to deforestation in Singapore during the colonial period, which lasted from the year of Sir Stamford Raffles' founding

the city-state in 1819 until its independence in 1963. It has been explained that how the stages of deforestation have changed the island's landscape using historical records and statistical data. It can be seen that there were four stages in which deforestation occurred in Singapore throughout the colonial era. The initial phase was the agricultural expansion during early 19th century²⁸. By mid to late 19th century, Singapore approached the phase of infrastructural development. Thereafter by the early 20th century the rubber boom took place, working as a propellant to deforestation. Afterwards, during the last phase of colonial control, Singapore and its environment had to bear the impact and effects of the World War II.

The causes of deforestation in the colonial period in Indonesia has also been discussed. During the colonial era, deforestation in Indonesia was a serious environmental problem that still has an effect on the ecosystem and biodiversity of the nation today. Forests were extensively cleared throughout the colonial era, which lasted from the 17th to the early 20th century. This was primarily motivated by economic factors and the exploitation of natural resources. Subsequently, the causes of deforestation in Malaysia in the colonial period has been discussed. Deforestation, or the widespread loss of forests, has historically been a problem for Malaysia's ecology²⁹. The country's forests were significantly impacted by the colonial period, which spanned the 16th to the mid-20th century and was characterized by foreign dominance. The primary five reasons can be identified to have been promoting deforestation in Malaysia during the colonial era are extraction of resources along with exploitation, rapid expansion of plantations, infrastructure development, poor management of forest and related resources along with rapid growth in urbanisation, all of which have been discussed here that aided to deforestation.

The environment and ecosystem of Thailand were greatly influenced by deforestation during the colonial era. The complex origins of Thailand's widespread deforestation during the colonial period have been explored, highlighting the socioeconomic, political, and cultural elements that fuelled this ecological deterioration. During the early days of industrialisation, throughout the first and second phase, there had been colonial dominance over Southeast Asian region or on ASEAN group nations. Though Thailand remained as a buffer state, there had been four key factors during this time like socioeconomic, political, agricultural and development related factors which had driven up the exploitation of natural resources. During the colonial era, deforestation in Vietnam was a complicated process that was influenced by a confluence of political, economic, and environmental forces. Vietnam saw an extended and turbulent period of colonization under French dominion, commencing in the mid-19th century. The complex factors that contributed to deforestation in Vietnam at this pivotal time, illuminating the effects it had on the country's ecosystem and socioeconomic structure have been discussed. In the second part of this chapter, the causes of deforestation in the post-colonial period in the study area has been discussed intricately. For a variety of reasons, including timber exploitation, urban development, and rubber plantations, the lush tropical rainforests were removed.

Extensive deforestation has substantially changed the terrain by the time Singapore attained independence in 1965. Focusing on the ecological, economic, and social ramifications of deforestation in Singapore during this critical period after and beyond the colonial rule, this section tries to investigate the historical causes of further deforestation in Singapore since and beyond 1965³⁰. The post-colonial period in Indonesia, spanning from the mid-20th century until the present, witnessed a significant escalation in deforestation rates. The causes of deforestation in post-colonial Indonesia are complex and intertwined, driven by economic development, natural resource exploitation, infrastructure development, and land conversion for agriculture. The timber and palm oil industries, along with weak governance and land tenure issues, exacerbated the problem, leading to widespread environmental degradation and loss of biodiversity. Understanding these underlying causes is crucial for devising effective conservation strategies and sustainable land use policies to mitigate the impacts of deforestation in Indonesia and preserve its invaluable natural heritage. During the post-colonial era, deforestation has been a significant environmental problem in Thailand. Following gaining independence from colonial powers, the country had considerable changes in land usage, forest management, and economic development. The post-colonial era saw massive deforestation in Vietnam, a nation with a rich natural heritage³¹. The wildlife, climate, and communities of the country have all been negatively impacted by this occurrence. Making effective plans to lessen the negative effects of deforestation requires an understanding of its underlying causes. In this part the main causes of deforestation in post-colonial Vietnam have been discussed and looks at the political, social, economic, and historical elements that have influenced this problem.

CHAPTER – 4: Urbanization throughout History in the Study Area

In the first part of this chapter, historical analysis of urbanization in the ASEAN nations have been done intricately. Urbanization is an international phenomenon that has drastically altered the landscapes of many nations. This pattern is prevalent throughout the Association of Southeast Asian Nations (ASEAN) region. An overview of the current state of urbanization in ASEAN nations is intended in this chapter, with a focus on Singapore, Indonesia, Thailand, Vietnam, and Malaysia in particular. Cities have grown quickly since the second half of the 20th century, particularly in Southeast Asia (SEA). Larger agglomerations have developed from sprawling metropolitan areas, and some mega-urban districts with populations in the tens of millions have also appeared. Southeast Asia saw a significant de-urbanization process in the eighteenth and nineteenth century³². The region's major cities were in decline, and several had all but vanished. The dynamics of the rural-urban population, however, changed with the start of the 20th century, and the area underwent urbanization. At that time, urbanization was characterized by its uneven distribution, with at least one city emerging in each nation that stood out from others in terms of population growth and economic activity. These cities included Manila in the Philippines, Bangkok in Thailand, Singapore in Malaysia, and Rangoon

in Burma. All the aforementioned cities were the largest in the region and prominent within their respective nations.

In the first sub-section of this chapter, the status of urbanization in the study area in the colonial period has been discussed by analysing the urbanization causes, trends and consequences in each of the selected countries which comprises the study area of this research work. Singapore has undergone tremendous urbanization over the course of its history, especially during the colonial era. Singapore saw substantial urbanization developments during the colonial era. The city-state developed from a sleepy trade post into a thriving metropolis. Singapore's urban environment and infrastructure were greatly influenced by the British colonial authority³³. Singapore rapidly modernized and urbanized while under British administration. The colonial authorities made investments in Singapore's growth because they understood the strategic value of Singapore as a commercial centre. To accommodate the expanding population and stimulate the economy, they implemented urban planning measures. a number of interrelated causes contributed to Singapore's urbanization throughout the colonial era.

Political stability, social advancements, and economic opportunities all had a big impact on how the city became a thriving metropolitan hub. The strategic position encouraged trade and business, which helped lay the groundwork for Singapore's development. This was followed by a benevolent legal system and government policies. Urbanization trends were further strengthened by migration, industrialization, and the delivery of critical services. Understanding the historical setting and the elements that drove urbanization during the colonial era offers important insights into how Singapore became the vibrant global city it is today. Singapore's urbanization progressed significantly during the colonial era. The British government implemented urban planning regulations, made infrastructure investments, and dealt with the problems posed by fast population expansion. These initiatives paved the way for Singapore's future as an urbanized, modern city-state and prepared the groundwork for additional growth in the post-colonial era.

In this section the factors that contributed to Indonesia's urbanization during the colonial era have been discussed along with discussion on the status of urbanization in the country during the said period. During the colonial era, urbanization in Indonesia was a complicated process that was affected by many different variables. Urban growth was significantly influenced by the economic need to utilize resources, the creation of trade hubs, and infrastructure³⁴. The process was hastened further by political choices taken by the Dutch colonial authority, including forced labour and administrative centralization. The appeal of cities to migrants was also influenced by social variables, such as metropolitan pull factors and cultural variety. In contemporary Indonesia, one may still see the effects of colonialism on urbanization. Numerous significant towns and cities that grew during this time period are now important hubs of social, political, and economic activity in the nation. Understanding the historical drivers of urbanization is crucial to understanding the opportunities and difficulties Indonesia has now. In Malaysia, urbanization during the colonial era was an important and

transformational process that transformed the social, economic, and political landscape of the nation. Due to the economic and political objectives of the colonial powers, it signified the shift from traditional rural cultures to more modern metropolitan centres. During this time, towns and cities were formed, infrastructure was developed, demographics changed, and numerous industries grew, all of which had a lasting effect on Malaysia's urban fabric. The Dutch arrived in Malaysia later, in the 17th century, although their influence on urbanization was mostly restricted to important port cities like Malacca. The Portuguese arrived in Malaysia first in the 16th century. During the 18th and 19th centuries, Malaysia's urban development was significantly influenced by the British. The late 18th-century start of British colonial authority, which continued until 1957, when Malaysia attained independence, was a major factor in the transformation of the nation's urban environment³⁵.

Several factors, including colonial administration, trade, commerce, mining, plantations, infrastructure development, migration, labour demand, accessibility to healthcare and educational resources, and feelings of security and governance, all had an impact on urbanization in Malaysia during the colonial era. These elements combined to define the urban environment and create the conditions for Malaysia's metropolitan centres to continue expanding and developing after winning independence. Urbanization was a fundamental trend that changed Thailand's socioeconomic environment during the colonial era. Urban centres developed as a result of both internal and external events, including the invasion of foreign powers and their influences. The abundance of natural resources in Thailand, particularly cash crops like sugarcane and rubber, helped to create large-scale plantations, which in turn attracted rural residents to surrounding urban centres in pursuit of work opportunities. During this time, industrialization was also essential to the urbanization trend. With the entry of colonial powers came the development of the infrastructure and advances in technology, including the building of roads and railroads. These developments made it easier to move people and goods, which helped industrial centres develop in metropolitan areas. Apart from this, several social and political factors played important roles in ushering urbanization in Thailand during the colonial period.

The urbanization of Vietnam during the colonial period was driven by a confluence of economic exploitation, centralized administration, social dynamics, and infrastructural investments orchestrated by the French colonial authorities. The legacy of this urbanization process is evident in the modern urban landscape of Vietnam, where cities like Hanoi and Ho Chi Minh City continue to be central to the country's socio-economic fabric. Understanding these historical factors provides crucial insights into the development trajectories and urban challenges faced by Vietnam in the contemporary era. In the second sub-section of this chapter, the status of urbanization in the post-colonial period in the study area have been discussed with special emphasis on the factors driving urbanization and the consequences of it in the study area. The status of growth of urban population in Singapore has been analysed by dividing the post-colonial period into three smaller periods. Similarly, the urbanization

status in Indonesia have been discussed in detail by dividing the post-colonial period into four periods. The causes and consequences of urbanization in each of these phases have been discussed in detail in this part of the chapter. The trend of growth of urban and rural population in Indonesia since 1970-2010 with data compiled from Population Censuses, 1971, 1980, 1990, 2000 and 2010 have been represented diagrammatically. The trend of growth of urban and rural population in Indonesia since 1970-2010 with data from Population Censuses, 1971, 1980, 1990, 2000 and 2010 have been shown with the help of diagrams. In Indonesia, urbanization has risen gradually over time. Even in 1971, only 17% of the population resided in urban areas, rising to 22% in 1980. The fundamental changes in the nature of Indonesian economy and society can be attributed to the massive increase to about 50% of population living in the urban areas in 2010 from 17% in 1971. Indonesia's urbanization has been influenced by a variety of variables during the course of these stages, including industrialization, rural-to-urban migration, governmental initiatives, and demographic changes. Urbanization has raised a number of social, economic, and environmental issues that need careful planning and control for future sustainable development³⁶, even while it has helped the economy thrive and raised living conditions for many.

Thailand's stages of urbanization from the post-colonial era, from the middle of the 20th century to the present has been analysed. Thailand's urbanization has been a dynamic process driven by a wide range of variables, including societal norm changes, economic development, migratory trends, and governmental regulations. To ensure sustainable urban growth and development in the future, policymakers and urban planners must have a thorough understanding of the various stages of urbanization in Thailand. The post-colonial era in Thailand, which started in the middle of the 20th century following the end of World War II, was a pivotal stage in the urbanization of the nation. Thailand had mostly been a rural, agrarian society before this time³⁷. But as modernization and globalization spread, the urban environment started to change significantly. Vietnam has undergone tremendous urbanization since obtaining independence from French colonial authority in 1954, changing from a predominately agrarian civilization to a fast urbanizing one. Vietnam's urbanization started in the middle of the 20th century, during the post-colonial era. After obtaining independence from French colonial authority in 1954, Vietnam began its post-colonial urbanization project, which has been a complex and dynamic process. Political, economic, and social considerations have caused considerable changes in the nation's metropolitan environment. Since winning its independence from British colonial authority in 1957, Malaysia has undergone a stunning and profoundly changing process that can be characterized as urbanization. With a sharp turn toward urban areas, the nation has seen enormous changes in its social, economic, and spatial landscapes. The main drivers, trends, and effects of urbanization in Malaysia from the post-colonial era to the present are examined in this section. The causes and consequences of urbanization in each of the stages of development during the post-colonial period have been discussed along with representation in the form of diagrams.

CHAPTER – 5: Industrialisation throughout History in the Study Area

In chapter five, two sub-sections have been made which historically explains the status of industrialization in the colonial period and post-colonial period in the study area. In the introduction of this chapter, the history of industrialization globally has been discussed in detail. The process of industrialization has been an essential driving factor in the formation of the modern world. It has had a profound impact on economies, society, and technology, resulting in enormous advancements as well as a wide range of issues. As we move forward, the world is still struggling to establish a balance between industrial development and environmental sustainability while also ensuring equal progress for all nations and people. This is a challenge that will continue as long as we move forward. Briefly, the history of industrialization in Southeast Asia has been discussed. The process of industrialization in Southeast Asia has been a revolutionary one, one that has had a tremendous effect on the landscape of the region's economy and society. Throughout most of its history, Southeast Asia has been predominantly an agricultural civilization; but, over the course of the last few decades, the region has experienced tremendous industrialization as well as economic growth³⁸. The process of industrialization was not without its share of difficulties. The expansion of industrial activity has led to a rise in a number of environmental problems, including pollution and the depletion of resources. In addition, income inequality and conflicts about workers' rights have surfaced as governments attempt to strike a balance between economic growth and social welfare.

In the first sub-section, of this chapter the status of industrialization in each of the countries of the study area in the colonial period have been discussed. In Singapore, during the colonial period the progress of industrialization took place in four stages. The condition of industrialization in each of these stages have been discussed in detail. Then the factors contributing to industrialization, the challenges faced and the impact of industrialization in Singapore during the colonial period have been discussed. In the next part, the industrialization in Indonesia during the colonial period has been discussed. During the time that Indonesia was under colonial rule, there were substantial shifts made to the country's economic environment. European countries, particularly the Dutch, played a significant role in the transformation of the United States from an agricultural civilization to an industrialized nation.

During the time period that Indonesia was under colonial rule, in this chapter we have examined the historical process of industrialization and its many different stages which have been discussed in detail. The history of industrialization in Indonesia during the colonial era was characterized by a mix of economic exploitation, technological progress, and social turmoil. The pursuit of riches from natural resources by the Dutch colonial administration was a driving force behind the process of industrialization, which ultimately resulted in profound changes to Indonesian society. Nevertheless, during this time, the Indonesian people displayed resiliency and resistance, which laid the groundwork for subsequent fights for independence and economic self-determination.

The legacy of industrialization under colonial rule continues to have a significant impact on Indonesia's economy and society even today³⁹. The period of colonial rule in Indonesia was essential in laying the groundwork for the later process of industrialization in the country. Under the Cultivation System, the exploitation of resources and use of forced labour were two factors that stifled the expansion of local industry. Even though there were some attempts made under the Ethical Policy and the post-independence years, there was still only a little amount of industrialization until the 1960s. Further, the causes and impact of industrialization during the colonial period in Indonesia have been described in detail. The industrialization status in Thailand during the colonial period have been discussed through five stages. The era of time when Thailand was under colonial rule was a pivotal one in the country's journey toward industrialization⁴⁰. Early interaction with European commerce helped to lay the framework for modernity, while the presence of colonial powers sped up the process of modernization. Thailand was able to maintain its independence in the face of obstacles and exploitation, and it is now making slow but steady progress toward industrialization. Following the end of colonial rule, the process continued to develop, so laying the groundwork for the nation's continuous economic expansion and diversification in the years to come. The causes and impact of industrialization during the colonial period have also been discussed.

During the time that Vietnam was under colonial rule, the process of industrialization was laborious, difficult, and fraught with obstacles. Multiple colonial powers took advantage of Vietnam's large workforce, natural resources, and strategic location to establish their footholds in the country's economy. Each of these nations left a distinct imprint on Vietnam's current business climate. This chapter examines the history of industrialisation in Vietnam and the stages that it went through from the middle of the 19th century to the middle of the 20th century, when the country was under colonial rule by the French. The status of industrialization in the colonial period have been discussed in detail by analysing the different stages namely: The Early Years of Industrialization Under French Colonial Dominion (1858-1918), The rise of labour-intensive industries from 1919 to 1940, The Second World War and the Occupation by the Japanese from 1940 to 1945, Nationalist Movements and the Development of the Post-War Period (1945–1954) during industrialization occurred⁴¹. Further, the causes and impact of industrialization in Vietnam have also been discussed.

The colonial era in Malaysia, which began in the late 18th century and lasted until the middle of the 20th century, was crucial in the process of Malaysia's industrialization and played a significant part in its development. In this chapter, the historical setting of Malaysia's emergence into an industrial nation under colonial authority, as well as the stages of that development have been examined. The Portuguese, Dutch, and British colonial powers of the time left an indelible mark on the economic landscape of the country, which paved the way for Malaysia's ultimate transition into an industrialized nation. These colonial powers had influenced the political landscape of the country and therefore the causes and impact of industrialization during this era have been discussed in detail.

In the next portion, the status of industrialization, during the post-colonial period in the study area has been discussed in detail. After achieving its independence in 1965, Singapore was immediately confronted with a number of severe obstacles, the most notable of which were the country's limited natural resources, its small domestic market, and its economy's heavy dependency on entrepôt commerce⁴². The city-state, on the other hand, was able to convert itself into a thriving centre for manufacturing, technological advancement, and innovative thinking as a result of having visionary leaders and an emphasis on economic diversification. The status of industrialization in Singapore as well as the stages of the country's development during the post-colonial era are both discussed in this section.

Then the causes and impact of industrialization in the post-colonial period have been discussed. The post-colonial era in Indonesia was defined by a substantial shift in the economic landscape of the country, with an increasing emphasis on industrialisation. This movement occurred throughout the time period of independence from colonial rule. Following its liberation from Dutch colonial authority in 1949, Indonesia set out on a path to foster the growth of its industrial sector and lessen the country's reliance on agriculture as its primary economic activity. This section takes a look at the current state of industrialization in Indonesia as well as the country's progression through the various stages of development since the end of colonial rule. Further, the causes and impact of industrialization have been discussed in detail. During the post-colonial era, Thailand, historically referred to as Siam, went through a period in which considerable changes occurred in its economic environment⁴³. The path that the nation took towards industrialisation was littered with obstacles as well as potential possibilities. This section has examined the condition of industrialization in Thailand following its colonial era and outlines the stages of development that the nation went through on its way to becoming an industrialized economy. The causes and impact of industrialisation in Thailand in the post-colonial period have been explained in detail.

The transition from French colonial control into Vietnam's independence in 1954 marked the beginning of the post-colonial era in the country, which was also a crucial turning point in the economic landscape of the country. As the newly independent nation worked toward achieving economic growth and development, it made the objective of industrialization a primary focus of its efforts. This was done with the intention of escaping the nation's agricultural heritage. This section has examined the current state of industrialization in Vietnam as well as its progression through the stages of development since the end of French colonial rule. The causes and impact of industrialization in the post-colonial period in Vietnam have been discussed in detail. After achieving independence from British colonial authority in 1957, Malaysia immediately began an industrialisation process that would ultimately have a profound impact on the country's society as well as its economy⁴⁴. This section has examined the many stages of growth that post-colonial Malaysia went through, as well as the current state of industrialization in the country. When Malaysia

first became an independent nation, its economy was primarily dependent on traditional commodities such as palm oil, tin, and rubber. Nevertheless, the administration acknowledged the requirement to broaden the scope of the economy and lessen its reliance on fundamental commodities. During the early years of independence, the industrial sector was relatively modest and focused on import substitution industries. Industrialization was considered the essential step toward achieving economic growth, technological progress, and improved living standards for the general populace at the time. Further, there has been a detailed discussion on the causes and impact of industrialization during post-colonial period.

CHAPTER – 6: Environmental Degradation and Climate Change

The sixth chapter of this thesis is primarily analytical in nature where the analyses is based on the discussions that have been made in the previous chapters. This chapter is explanatory in nature and is divided into three parts. The first part of this chapter deals with the analysis of the perception of the community members⁴⁵ of the respective countries of the study area on environmental degradation and climate change. Initially the concepts of environmental degradation and climate change have been discussed in detail in this chapter. Then the perception of the community members of the study area on environmental degradation in the study area have been analysed. This has been done based on secondary data collected from various reports and surveys conducted by the various governmental agencies like National Environmental Agency (NEA) in Singapore, Department of Environment (DOE) Malaysia, Pollution Control Department of Bangkok, centre for Environmental Monitoring and Analysis (CEMA) in Vietnam and National Development Planning Agency of Indonesia. In this section, country wise, the perception of the community members has been analysed historically and it has been discussed how the perception of the community members has changed over the years. The factors which have influenced the perception have also been delved with in this part of the thesis.

In the second part of the chapter, a historical analysis of the changes in the regional climate has been discussed. Regional climate pertains to the enduring patterns of temperature, precipitation, humidity, wind, and other atmospheric factors that define a particular geographic region. Regional climate refers to the distinct weather patterns and dynamics that occur within a specific geographical area, as opposed to global climate which encompasses the climatic system of the entire globe. In this section the changes in regional climate over the years in the study area starting with Singapore, followed by Malaysia, Thailand, Indonesia and Vietnam has been discussed along with detailed analysis of the causes and the roles of deforestation, industrialisation and urbanization behind this from the colonial period till present times.

In the third part of this chapter, we have put forward a Problem-State-Response Framework (PSR)⁴⁶ analysis of environmental degradation and climate change in the Study Area based on the discussions of the chapter three, four and five. In this present study, we have analysed and identified

the various aspects of environmental degradation and climate change since the post-colonial period in Singapore, Malaysia, Thailand, Vietnam and Indonesia- all of which are ASEAN countries. In this part, we have done a Problem-State-Response (PSR) framework to show the major findings of our study.

The Problem State and Response (PSR) framework is an analytical tool employed to organize and comprehend intricate matters in study. The framework facilitates examination of the present condition of the issue, and comprehensive sketching of prospective replies or remedies. The PSR framework is highly beneficial in disciplines such as environmental science, public health, and social sciences, where complex issues necessitate methodical examination. The Problem-State-Response (PSR) framework is a well-established paradigm in the field of environmental studies and policy analysis. It is utilized to organize and comprehend the intricate interaction among environmental problems, their present conditions, and the actions taken to control or alleviate these concerns. An important use of the PSR framework in historical contexts is to examine the effects of land use changes on the environment throughout time.

The Problem State Response (PSR) framework is an effective analytical instrument for assessing a country's approach to and control of its environmental concerns across the years. The concept can be divided into three primary elements: Problem (the environmental challenges encountered), State (the present state of the environment), and Response (the measures implemented to tackle the difficulties). In this part a detailed PSR framework of the study area since the post-colonial period has been discussed. In this part of the chapter, for each of the countries of the study area, historically the problems of each country regarding environmental degradation and climate change with emphasis on the factors that led to environmental degradation and climate change in that country have been discussed minutely. Then the present condition of each of the country of the study area have been discussed which comes under State of PSR framework. Ultimately, under response of PSR framework, the responses taken by the respective countries in the form of various governmental policies and initiatives to combat environmental degradation and climate change over the years have been discussed.

CHAPTER – 7: Conclusion and Recommendation

Chapter 7 is the concluding chapter of this study and in this chapter, the conclusion of this thesis work have been done along with forwarding of relevant suggestions to combat environmental degradation and climate change. The process of urbanization and industrialization has had both positive and negative consequences for the countries of the study area. Firstly, it is important to acknowledge that they have had a significant role in stimulating economic expansion, enhancing the quality of life, and mitigating the prevalence of poverty. Conversely, they have resulted in heightened pollution, development of waste, and depletion of resources. The swift urban growth in places such as Bangkok,

Kuala Lumpur, and Jakarta have worsened the levels of air and water pollution, while industrial operations have added to the release of greenhouse gases and other harmful substances. Urban regions frequently experience uncontrolled expansion that surpasses the progress of necessary infrastructure, leading to ineffective waste management and increased environmental strain.

The Chapter is divided into three sections where the first section holds the conclusion of the study along with diagrammatic explanation of historical loss of vegetation. The following section explains the historical context of foreign policies, political unrest and conventions concerning these countries. This is followed by a separate section that gives relevant suggestions and recommendations based on the present study. Deforestation continues to be a pressing concern, especially in Indonesia and Malaysia, where the high demand for palm oil and lumber has resulted in widespread deforestation of rainforests. This not only poses a threat to the variety of life forms on Earth but also disturbs the natural process of carbon exchange, so adding to the phenomenon of climate change. Deforestation intensifies soil erosion, disturbs water cycles, and amplifies the occurrence and intensity of natural calamities like floods and landslides. The consequences have a wide-ranging influence, impacting both rural and urban communities by decreasing agricultural output and increasing susceptibility to climate-related effects. These countries face a substantial peril from climate change, which is seen in the escalation of sea levels, more frequent occurrences of extreme weather events, and alterations in agricultural patterns. The coastal regions of Vietnam and Thailand are especially susceptible to the rise in sea levels, posing a significant risk to the local communities' livelihoods, food security, and infrastructure. The region's reliance on agriculture, which is extremely susceptible to fluctuations in climate, worsens both food shortages and economic instability.

Community people in these nations are increasingly seeing and understanding the negative effects of environmental deterioration⁴⁷. Nevertheless, there exists a discrepancy between the degree of worry and the corresponding measures implemented. Within highly urbanized regions, there exists a heightened consciousness and desire for sustainable practices and policies, which is influenced by education and exposure to worldwide environmental discussions. Rural communities, although they have a keen understanding of how environmental changes directly affect their means of living, frequently lack the necessary resources and assistance to adopt sustainable practices. The efficacy of governmental programs and initiatives is often scrutinized, prompting demands for more rigorous enforcement and greater community engagement.

The environmental issues encountered by Singapore, Malaysia, Thailand, Vietnam, and Indonesia are intricate and interconnected with their socio-economic development paths. To tackle these difficulties, it is necessary to adopt a comprehensive strategy that strikes a balance between promoting economic growth and ensuring environmental sustainability. Crucial measures include the implementation of policies that promote sustainable urban planning, the enforcement of stronger industrial laws, and the implementation of vigorous conservation activities. Ultimately, despite the

difficulties involved, there is an increasing acknowledgment of the necessity for collaborative endeavours to alleviate ecological deterioration and adjust to the impacts of climate change to achieve sustainable development. It is crucial to effectively control the impacts of urbanization, industrialization, and deforestation to guarantee a sustainable and resilient future for the Southeast Asian nations.

In the second section of this chapter, the historical geo-political activities including major disputes, peace accords⁴⁸ and international conventions that either took place or concerns the countries of the study area have been briefly discussed. Brief historical context of each of the events have been portrayed with their effects on the countries socio-economic and political health, by analysing which, it would be better understood where the priorities of these countries would be following the period of unrest. Illustrative tables explain the details of the peace accords and conventions relating to the countries under this study. In the last section of this portion of the chapter, relevant suggestions have been forwarded to combat environmental degradation and climate change. To successfully prevent environmental degradation and combat climate change in Singapore, Malaysia, Thailand, Vietnam, and Indonesia, it is crucial to adopt comprehensive and strategic measures that target the underlying causes while simultaneously encouraging sustainable development. In the following section we shall discuss the suggestions that could be followed:

(i) Coordinate environmental standards throughout the region to establish uniform regulations, facilitating the management of environmental challenges that span across borders. Augment the capabilities and jurisdiction of environmental protection authorities to effectively enforce legislation, guaranteeing that industries adhere to pollution control standards and sustainable practices. Implement a well-balanced system of incentives and penalties to promote the adoption of sustainable practices by firms.

(ii) Encourage the development of cities in a way that is environmentally friendly and can be maintained throughout time. Invest in green infrastructure, such as parks, green roofs, and permeable pavements, to improve the ability of urban areas to withstand and recover from environmental stresses, and to decrease the phenomenon of increased temperatures in cities known as the heat island effect. Enhance public transportation systems to decrease dependence on personal vehicles, thus mitigating air pollution and greenhouse gas emissions.

(iii) Promote the adoption of greener production processes and technology in industry to minimize waste and emissions. Advocate for energy efficiency initiatives and the adoption of renewable energy sources in industrial processes to minimize carbon emissions. Promote the adoption of a circular economy model, in which waste resources are systematically reused, recycled, or repurposed, thereby decreasing the need for new raw materials and limiting the environmental consequences.

(iv) Enact and uphold stringent measures to combat unlawful logging and deforestation, safeguarding the remaining forests and advocating for sustainable land utilization. Implement

extensive restoration and afforestation initiatives to rehabilitate damaged areas and improve the absorption of carbon dioxide. Foster active participation of local communities in initiatives aimed at conserving forests, while simultaneously offering them alternate means of livelihood that diminish reliance on forest exploitation.

(v) Encourage the use of climate-resilient agricultural methods, such as cultivating drought-resistant crops and implementing sustainable water management techniques, in order to protect and ensure food security. Enhance disaster preparedness and response mechanisms to safeguard susceptible communities from climate-induced hazards such as floods and storms. Deploy coastal defence strategies, such as the regeneration of mangroves and the construction of sea walls, to safeguard against the impacts of rising sea levels and coastal erosion.

(vi) Incorporate environmental education into school curricula and community programs to enhance knowledge of the significance of sustainability. Promote active engagement of the public in environmental decision-making procedures, guaranteeing that the perspectives and opinions of the community are acknowledged and considered during the formulation of policies. Employ media campaigns to emphasize the consequences of environmental degradation and climate change, fostering proactive attitudes among both individuals and corporations.

(vii) Enhance regional cooperation by implementing joint efforts that tackle cross-border environmental concerns, such as haze pollution and river management. Create venues for exchanging optimal approaches and groundbreaking solutions between nations, so strengthening the collective ability to address environmental obstacles. Facilitate the acquisition of regional and worldwide funding to bolster environmental initiatives, guaranteeing the availability of both financial and technical resources for efficient execution.

By implementing these suggestions, Singapore, Malaysia, Thailand, Vietnam, and Indonesia can strive towards a sustainable future that harmonizes economic development with environmental conservation. To effectively implement these policies, it is crucial for governments, corporations, communities, and foreign partners to collaborate and prioritize the preservation of Southeast Asia's environmental integrity for future generations.

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