Submission date: 20 of February 2025
Acceptance date: 10 of April 2025
Publication date: 20 of April 2026

FRIEDRICH ENGELS' PERSPECTIVE ON HUMAN–NATURE RELATIONS: IMPLICATIONS FOR ACHIEVING NET ZERO IN CONTEMPORARY VIETNAM

LA PERSPECTIVA DE FRIEDRICH ENGELS SOBRE LA RELACIÓN SER HUMANO–NATURALEZA: IMPLICACIONES PARA ALCANZAR EMISIONES NETAS CERO EN EL VIETNAM CONTEMPORÁNEO

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Suggested citation (APA, seventh ed.)

Cong, D. H. (2026). Friedrich Engels' perspective on human–nature relations: implications for achieving net zero in contemporary Vietnam. ***Universidad y Sociedad, 18***(2). e6008.

ABSTRACT:

The relationship between human beings and nature is inherently dialectical, characterized by continuous mutual interaction. In this relationship, human beings act as subjects who exploit natural resources to meet their needs; however, nature also exerts reciprocal influences on humans in various ways. These effects can be positive when human interventions in nature are carried out in a planned and scientific manner. Conversely, unplanned actions or those that ignore natural laws inevitably lead to negative consequences for human life. At present, Vietnam faces significant impacts from climate change, natural disasters, and environmental pollution, particularly in urban areas and large cities, which deteriorate quality of life and generate numerous health risks. These challenges reflect global issues, to which Vietnam has committed, through its pledge to achieve net-zero emissions by 2050, to balance greenhouse gas emissions. Therefore, this article, in addition to presenting the main perspectives on the relationship between human beings and nature formulated by Friedrich Engels, highlights the theoretical and practical implications of this relationship. On this basis, it proposes several recommendations aimed at contributing to the achievement of Vietnam's current Net Zero objectives.

Keywords:

Human being, Nature, Dialectics, Environmental pollution, Net-zero emissions.

RESUMEN:

La relación entre los seres humanos y la naturaleza es inherentemente dialéctica, caracterizada por una interacción mutua continua. En esta relación, los seres humanos actúan como sujetos que explotan los recursos naturales para satisfacer sus necesidades; sin embargo, la naturaleza también ejerce influencias recíprocas sobre los seres humanos de diversas maneras. Estos efectos pueden ser positivos cuando las intervenciones humanas en la naturaleza se llevan a cabo de manera planificada y científica. Por el contrario, las acciones no planificadas o aquellas que ignoran las leyes naturales conducen inevitablemente a consecuencias negativas para la vida humana. En la actualidad, Vietnam enfrenta impactos significativos del cambio climático, los desastres naturales y la contaminación ambiental, particularmente en las zonas urbanas y las grandes ciudades, lo que deteriora la calidad de vida y genera numerosos riesgos para la salud. Estos desafíos reflejan problemáticas globales frente a las cuales Vietnam se ha comprometido, mediante la promesa de alcanzar emisiones netas cero para el año 2050, con el fin de equilibrar las emisiones de gases de efecto invernadero. Por lo tanto, este artículo, además de exponer las principales perspectivas sobre la relación entre el ser humano y la naturaleza formuladas por Friedrich Engels, destaca las implicaciones teóricas y prácticas de dicha relación. Sobre esta base, propone varias recomendaciones orientadas a contribuir al logro de los objetivos actuales de Net Zero en Vietnam.

Palabras clave: Ser humano, Naturaleza, Dialéctica, Contaminación ambiental, Emisiones netas cero.

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INTRODUCTION

Vietnam is among the countries most severely affected by climate change, which has increasingly undermined human quality of life particularly in urban areas where population density is high, traffic volume is heavy, and green spaces and water bodies are critically insufficient. These conditions contribute to an oppressive and uncomfortable urban environment. At the same time, forests and lakes have been continuously reduced to accommodate economic development, further exacerbating ecological imbalance.

Today, nearly all major Vietnamese cities are experiencing strong environmental pressures, including rising temperatures, excessive emissions, and increasingly severe flooding. Coastal zones, mountainous regions, and major urban centers such as Hanoi, Hue, Da Nang, and Ho Chi Minh City are among the most vulnerable locations. The growing imbalance between humans and nature is evident in the escalating impacts of environmental degradation on public health and national economic performance over recent years. Without timely and effective solutions, residents, especially those living in major cities, will bear even greater consequences of climate change. *"Hanoi consistently ranks among the world's top 10 cities with the highest levels of air pollution. This level of pollution is classified as unhealthy and poses serious health risks"* (Global Air Quality, 2025).

Recognizing the significance of a healthy environment for human life, Vietnam has implemented numerous measures; however, air quality and emission levels have not improved substantially. In response to these pressing realities, the Vietnamese Government has pledged to the international community that it will achieve net-zero emissions by 2050. This commitment is not only essential for improving the living conditions of the Vietnamese people but also contributes to global efforts to reduce greenhouse gas emissions. Given these challenges, examining the human–nature relationship through the lens of Friedrich Engels' thought carries important theoretical and practical value. Such an inquiry helps enhance awareness, guide transformative action, and provide an urgent and necessary basis for improving human well-being in the context of climate change.

The relationship between humans and nature constitutes a profoundly important issue that directly affects human survival and development from the earliest stages of human existence to the present. Consequently, this relationship has been the subject of diverse reflections since ancient times. In the ancient East, harmony between humans and nature was emphasized, advocating a way of life aligned with natural principles, as seen in Laozi's doctrine of ***wuwei*** or Confucius' concept of the "unity of heaven and humanity" (***thiên nhân hợp nhất***). In contrast, Western thought traditionally highlights the dominant role of humans in exploiting nature to meet human needs. From antiquity to the present, the topic has been widely discussed across various intellectual domains, including social philosophy and environmental philosophy.

In recent years, global challenges such as global warming, sea-level rise, the greenhouse effect, ozone depletion, and emissions from domestic and industrial activities have severely affected human living environments, especially in urban centers. As a result, many scholars and organizations have examined the human–nature relationship from multiple perspectives.

In "On the Marxian View of the Relationship between Man and Nature*"* (Lee, 1980), the author describes Karl Marx's view that humans and nature exist in a reciprocal relationship. Humans originate from nature, yet under capitalism, the exploitation of nature has led to serious problems such as resource depletion and environmental pollution caused by production processes. This situation, Lee (1980) argues, requires a dialectical approach to establish a humane and rational social order while mitigating environmental degradation. The inherent interdependence between humans and the environment is fundamental, as the natural world is essential for human existence and development. The chapter "An Introduction to the Study of Man-Environment Relations in Asia*",* in the volume *Asian Perceptions of Nature*, provides important insights into Asian conceptions of nature and the cultural interplay between Asian and Western perspectives. While the authors identify certain areas of convergence, they also underscore significant cultural differences in how nature is conceptualized (Bruun & Kalland, 1995).

Similarly, Brady (2006), analyzes the human–nature relationship in rural contexts. She argues that this relationship is dialectical and historically grounded, but that integrating natural and aesthetic elements can enhance the cultural and environmental value of landscapes. Her discussion draws on the example of agricultural practices in England, where local communities construct hedges and stone walls around their settlements.

Further extending the analysis of human–nature relations, the article *Smart City: Interaction of Natural, Social and Production Systems* focuses on the harmonious interaction between humans, natural landscapes, and production systems in the development of increasingly modern urban environments. The authors contend that smart cities must be built on the foundations of human-centered governance, institutional capacity, energy systems, cutting-edge technologies, and advanced materials, alongside urban management information systems and the Internet of Things. At the same time, they emphasize that preserving natural landscapes is essential to ensuring long-term and sustainable urban development (Yamashkin & Yamashkin, 2019).

In the global effort to foster green, clean, and livable environments and to achieve Net Zero emissions to protect human living conditions and improve quality of life, the article ***Net-Zero Cities: A Comparative Analysis of Decarbonization Strategies in Urban Planning***, published in the International Journal of SDG's Prospects and Breakthroughs (Raghav & Vikas, 2023), offers a thorough analysis of urban decarbonization strategies aimed at reaching net-zero emissions in major cities worldwide. Focusing on Amsterdam (the Netherlands), Singapore, and Vancouver (Canada), the authors examine key solutions such as green infrastructure, electric mobility, and the circular and sustainable economy. The study underscores the crucial role of government policy, integrated planning, and community participation in generating positive outcomes for carbon-emission reduction. From these findings, the authors propose a set of criteria and methodological approaches to support other cities aspiring to achieve net-zero emissions.

Sharing the broader concern of harmonizing the relationship between humans and nature especially within urban environments, which now constitute a global rather than merely national issue the article ***Towards Achieving Net Zero by 2050 in the UK – Stakeholder Perspectives in Integrated Urban Planning*** (Mazumdar et al.,2023) analyzes the negative impacts of extreme environmental phenomena such as global warming, natural resource depletion, excessive emissions, and the greenhouse effect. These challenges pose serious threats to human life and well-being, prompting the United Kingdom to commit to achieving Net Zero greenhouse gas emissions by 2050. However, the authors argue that this commitment presents significant challenges for the government, necessitating reforms in urban and environmental governance, planning, and management. Based on identified barriers and constraints, the study proposes several recommendations to help cities across the UK move toward balanced emissions by 2050.

In addition to international scholarship, numerous Vietnamese studies in recent decades have also examined relationship issues related to the human–nature and humans' interaction with their living environment. For instance, the article Friedrich Engels's thoughts on the relationship between humans and nature in the dialectic of nature (Nguyen et al., 2024) provides an in-depth analysis of the reciprocal interaction between humans and nature, highlighting the practical significance of this relationship for human life.

Humans and the natural environment always have a reciprocal relationship, every impact on nature affects humans themselves, because this is a dialectical relationship, in the work Bang (2004) mentioned the issues of human attachment to nature, environmental pollution, the impact of the natural environment on humans and some solutions to prevent environmental pollution today. And in the work. Quy (2000) analyzed the interaction between humans and nature, and on that basis, philosophies for developing Vietnamese society in the current context were proposed. It can be seen that humans and nature have a close, inseparable relationship and interact dialectically with each other. Although humans control nature, nature also has a strong impact on human life, which can cause many harms to human health, the economy, and social politics in general. In addition to the above works, there are currently many articles and articles published in specialized journals and on official state websites.

Recent research highlights the complexity of human–nature relationships and the multiple ways in which people experience and value natural environments. Beery et al. (2023) emphasize that disconnection from nature is not merely a physical separation but involves social, cultural, and psychological dimensions. Their study shows that human–nature relations are diverse and context-dependent, shaped by everyday practices, perceptions, and social interactions. By examining multiple case studies, they demonstrate how engagement with nature can enhance well-being, foster environmental stewardship, and support cultural and ecological values across different communities. This approach broadens our understanding of the human–nature relationship beyond simple contact with nature, highlighting the importance of relational, participatory, and value-based perspectives.

Similarly, Nguyen et al. (2025) explore how ideas of human nature in ancient philosophy have influenced modern philosophical approaches, highlighting the continuity of thought regarding humans' moral and ethical responsibilities toward the natural world. Their work underscores the importance of integrating these philosophical insights into contemporary discussions on environmental sustainability and the ethical management of natural resources.

Duong & Pham (2019) provide a comprehensive assessment of environmental pollution in Vietnam, highlighting the severity of air, water, and soil degradation, particularly in rapidly urbanizing and industrializing areas. Their study identifies key drivers of pollution, including accelerated industrial growth, uncontrolled urban expansion, increasing vehicular emissions, and inadequate waste management systems. Importantly, the authors emphasize the structural tension between economic development and environmental sustainability, arguing that Vietnam's rapid growth has intensified ecological pressures. They also point out significant limitations in existing environmental policies, particularly in terms of enforcement, monitoring, and institutional capacity. To address these challenges, the study proposes a range of solutions, such as the adoption of cleaner technologies, strengthening regulatory frameworks, promoting renewable energy, and enhancing environmental awareness. Overall, the article

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underscores the urgent need for a more sustainable development model that effectively balances economic progress with environmental protection.

In recent years, in the context of climate change, air pollution has become increasingly severe, especially in large cities such as Hanoi and Ho Chi Minh City, where emission levels consistently exceed permitted limits and rank among the highest in the world. Consequently, this issue has attracted significant scholarly attention. For example, Duyen & Duong (2023) highlight legal challenges in the implementation of green development, noting that the absence of adequate policy mechanisms hinders the achievement of the Vietnamese State's commitment to reaching Net Zero by 2050. Therefore, strengthening the legal framework to establish a regulatory environment that compels businesses to adopt green transformation is an urgent priority.

Towards the implementation of the Net Zero target in Vietnam Diệu Anh (2024) analyzed and presented the experiences of some countries such as the UK, South Korea, China in dealing with urban environmental pollution, from which the author proposed some recommendations for Vietnam's policies. The article, "International experience in green transformation and suggestions for Vietnam" (Hue, 2025), presented the green transformation experiences of some countries in the world, such as Germany, Nordic countries, South Korea, Denmark, Singapore, China, etc., thereby the author suggested the current green transformation in Vietnam, etc.

From a critical theoretical perspective, Arboleda (2025) revisits Friedrich Engels's conception of the relationship between development and nature, proposing an ecological reinterpretation of Marxist thought that moves beyond Western frameworks. This perspective underscores that environmental degradation is not simply a contemporary policy failure, but a structural consequence of historically rooted models of economic expansion that disrupt the metabolic interaction between humans and nature. Through a review of the literature, it becomes evident that numerous studies have addressed the human–nature relationship and the need to protect the environment in the current era of escalating air pollution.

However, in the Vietnamese context, there remains a notable absence of research that explicitly engages with Engels's perspective to derive both theoretical and practical implications for achieving the Government's Net Zero target. This gap provides the foundation for the present study, which seeks to analyze these dimensions and offer recommendations aimed at fostering a cleaner and more sustainable natural environment in Vietnam.

MATERIALS AND METHODS

To address the research problem, this article adopts an interdisciplinary approach, particularly drawing from philosophy, environmental science, economics, and public policy. This enables a comprehensive analysis of the intrinsic relationship between humans and nature as well as the influence of policy. In addition, the article employs both logical and historical approaches to elucidate Friedrich Engels' views on the human–nature relationship in the nineteenth century and to demonstrate the continued relevance of these ideas in contemporary contexts. A systems–structural approach is also utilized to reveal the interconnectedness among humans, nature, and Việt Nam's pursuit of the Net Zero target—showing these elements as components of a historical.

Furthermore, the article applies a praxeological approach, meaning that the analysis does not stop at the theoretical level but also highlights the practical significance of Engels' ideas in solving environmental problems.

To achieve the objectives of the study, the author employs the following fundamental methods:

Secondary document analysis: This is the principal method used to examine Engels' foundational views on the human–nature relationship; to analyze Việt Nam's official documents on Net Zero; and to review Government decisions and the Communist Party of Việt Nam's viewpoints on environmental protection and Net Zero implementation.

Analytical–synthetic method: This method is applied to analyze Engels' arguments on the dialectical relationship between humans and nature, especially his warnings regarding nature's "revenge" when humans act contrary to natural laws. It also helps clarify that maintaining ecological balance, particularly in urban environments, is an objective requirement for achieving Việt Nam's Net Zero goals in the coming years. The synthetic component is used to highlight the harmonious interconnection between humans and nature, as well as the coherence and consistency of Việt Nam's policies toward nature in pursuit of Net Zero.

Comparative–contrastive method: This method contributes to clarifying Engels' warnings about nature's counter-reactions and the current reality of climate change and air pollution in Việt Nam's urban areas. Through comparison, the study proposes appropriate recommendations to harmonize the human–nature relationship. It also identifies pathways toward green economic development and sustainable economic growth.

RESULTS-DISCUSSION

Friedrich Engels (1820–1895) was a prominent German philosopher, political theorist, and revolutionary activist of the nineteenth century. As a close collaborator and lifelong companion of Karl Marx, Engels made significant contributions not only to the intellectual life of his time but also to later generations. Among his influential ideas is his conception of the relationship between humans and

nature, most clearly articulated in ***Dialectics of Nature***. Although this work remained unfinished, it nevertheless reveals Engels' profound intellectual commitment and deep insights into this relationship. His perspective can be examined through several key dimensions outlined below.

Engels' Conception of the Unity Between Humans and Nature

Humans and nature are bound by an inherent, reciprocal relationship, an assertion recognized across numerous scientific disciplines, including philosophy. Undoubtedly, humans originate from nature and are products of the natural world. However, unlike other animals that rely solely on nature for food, water, and the means of survival, humans transcend this basic dependence by engaging in labor to produce material goods. Through productive labor, humans sustain themselves and, more importantly, emerge as social beings.

Material production constitutes the fundamental basis of human life and existence as a species. It is through production that humans actively transform nature, creating new conditions for their survival and rising above the purely instinctual characteristics of other species to become the highest form of living organism. In this sense, the organic, inseparable unity between humans and nature becomes evident.

On the one hand, nature provides humans with the essential conditions of life: habitat, food, water, and energy, without which human existence and development would be impossible. On the other hand, humans reshape the natural environment, transforming its primordial form into one imbued with human purpose and meaning. Labor serves as the crucial mediating link in this relationship. Thus, the connection between humans and nature is one of mutual dependence, enabling both to exist and to evolve.

However, in the early stages of human evolution from animals, humans remained entirely dependent on nature and subject to its forces "still exposed to the blind action of powers not yet controlled" (Marx & Engels, 2002, p. 477). In other words, nature continued to dominate and determine human life. Over time, however, as human needs increased, the search for food compelled humans to gradually create tools of labor, enabling them to begin conquering nature and compelling it to serve their essential requirements. This marks a fundamental distinction between humans and animals.

Friedrich Engels criticizes the view that:

only nature acts upon humans, and that natural conditions alone everywhere determine the historical development of humankind; such a view is one-sided, for it forgets that humans also act upon nature, transform nature, and in doing so create new conditions of existence for themselves" (Marx & Engels, 2002, p. 720).

This demonstrates that humans and nature form a unified and interdependent relationship: while humans rely on nature for survival, nature also requires human intervention to be improved and developed.

Engels writes:

Animals destroy the vegetation in a certain region without understanding what they are doing. Humans, however, clear vegetation to use the land, thus freeing the land to sow grain or plant trees or vines, knowing in advance that, at harvest time, these cultivated plants will yield many times more than the seeds originally sown. They carry useful plants and domesticated animals from one region to another and thereby transform the flora and fauna of entire continents. Moreover, through the method of artificial selection, the hand of humans has so profoundly altered certain animal and plant species that their original forms can no longer be recognized. (Marx & Engels, 2002, p. 652).

While affirming the human capacity to conquer and transform nature to serve human purposes, Friedrich Engels also issued a profound warning about the unforeseen consequences that arise when humans intervene in nature in an unplanned and unconscious manner. He argued:

We should not, however, flatter ourselves overmuch on account of our human victories over nature. For each such victory, nature takes its revenge on us. Each victory, it is true, in the first place yields the results we expected, but in the second and third places it has quite different, unforeseen effects which only too often cancel out the first. (Marx & Engels, 2002, p. 654).

These are cautionary words for those who exploit or intervene in nature in a disorderly and irresponsible way. Engels continues:

If after thousands of years of labor we have succeeded in learning to some extent to calculate the more remote natural consequences of our production activities, we have still a long way to go before we learn to understand the more remote social effects of these activities. (Marx & Engels, 2002, p. 655–656).

Engels' insights highlight the dialectical character of the human–nature relationship: every attempt to dominate nature without knowledge, foresight, or planning may ultimately bring about destructive repercussions. His warnings remain strikingly relevant today, especially in the context of climate change, environmental degradation, and ecological crises that contemporary societies, including Vietnam, are confronting.

Friedrich Engels provided illustrative examples from Mesopotamia, Greece, Asia Minor, and elsewhere: "When people destroyed the forests to obtain arable land, they

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little suspected that by doing so they were creating the present sources of misfortune in those countries, for by destroying the forests they destroyed the reservoirs and regulators of water" (Marx & Engels, 2002, p. 654).

He also cited the case of Italy:

The mountain inhabitants of Italy, when they deforested the pine woods on the southern slopes of the Alps while those on the northern slopes were carefully protected did not imagine that in doing so they were destroying highland cattle-raising in their own country; still less did they suspect that they were causing the mountain springs to dry up for most of the year, and that in the rainy season the torrents from those mountains would therefore pour down with even greater violence and flood the plains. (Marx & Engels, 2002, p. 655).

These practical examples offered by Engels reveal that the relationship between human beings and nature is an organically unified, reciprocal relationship. Thus, while recognizing the vital role of humans in conquering and transforming nature to create material wealth, Engels stressed that such interventions must be conducted consciously and systematically. If humans act upon nature without planning or exceed nature's capacity for resilience, nature will inevitably react, and these reactions are often unpredictable, potentially destroying everything previously gained through human exploitation. This serves as a reminder that humankind must never exploit nature recklessly or regard it as an inexhaustible resource.

Friedrich Engels criticized those who exploited nature solely for profit and short-term interests without considering long-term consequences. He illustrated this with a striking example of nature's backlash:

When the forests on the mountain slopes are burnt down, and the ashes provide fertilizer for one generation of coffee trees yielding an immense harvest, what need have the Spanish plantation owners in Cuba to consider that afterwards the tropical downpours will strip the unprotected soil and leave behind only bare rock?. (Marx & Engels, 2002, p. 658). This example shows that the fundamental driving force behind such exploitation is profit; profit becomes the only motive compelling humans to act in disregard of natural laws and the inevitable retaliation of nature. By pursuing profit, investors and plantation owners show little concern for how the ecological environment will be transformed in the future.

Although ecological degradation during Engels's time had not reached the alarming level observed today, the repercussions of nature's response to human actions were already evident in several regions of the world. In this context, Engels issued a warning that can be regarded as a visionary prediction. Today, as human interventions in nature intensify, natural systems have been pushed beyond their limits, resulting in rapid environmental changes: extreme weather events, greenhouse effects, and increasing emissions have become more frequent, exerting significant impacts on economies, human health, and causing substantial economic losses.

Human exploitation and transformation of nature to meet human needs is an objective requirement of development, for nature constitutes an indispensable condition of existence, and human life cannot be separated from the natural world. However, human intervention in nature must be grounded in scientific understanding, based on knowledge of and adherence to natural laws. Such intervention must be planned and rational, ensuring that nature serves human needs most optimally. This is fundamentally different from animals, which act upon nature blindly, driven solely by immediate benefits. Lacking any awareness of the consequences of their actions, animals may deplete natural resources without understanding what they have done.

Friedrich Engels's warnings serve as a reminder that humans must not exploit or intervene in nature blindly or irresponsibly. Instead, natural resources must be used in a scientific manner so that nature can support human development more effectively. This does not mean that humans should become antagonists of nature, causing its depletion, degradation, and eventual inability to recover—conditions that inevitably lead to nature's "revenge," with negative impacts on human life. Rather, humans should cultivate a deeper sense of harmony with nature, actively improving and developing it in ways that enhance its regenerative capacity.

As Engels emphasized:

In reality we learn to understand more and more precisely these laws, and to know both the immediate and the more remote consequences of our positive interventions in the normal course of events in nature… thus humans not only increasingly feel, but also increasingly understand, that they and nature are one. (Marx & Engels, 2002, p. 655).

Thus, Friedrich Engels's view on the relationship between humans and nature has shown that this is a dialectical relationship, with mutual influence, in which humans' impact on nature to exploit nature to serve their needs for existence and development, but at the same time, nature also impacts humans in positive or negative directions. Therefore, the impact of nature on humans is considered a warning of great significance in the current socio-economic development process in general.

An examination of Friedrich Engels' views on the relationship between humans and nature allows this study to draw several theoretical and practical implications for Vietnam's pursuit of its Net Zero objective.

First, contributing to raising public awareness and transforming mindsets from a "conquering mentality" to a

"living-in-harmony" mentality with nature. Friedrich Engels did not deny the necessity of human intervention in nature, nor did he oppose the exploitation of natural resources. Rather, he emphasized that such exploitation must be grounded in a sound understanding of natural laws; that is, resource use must be calculated, scientifically informed, and aligned with the inherent functioning of nature so that it can best serve both immediate and long-term human interests. From this standpoint, Engels warned us not to be overly proud of what we consider "victories" over nature, for nature will ultimately "take revenge".

This warning underscores the need to abandon a mindset of economic development at any cost, pursuing short-term gains without regard for nature's inevitable counter-effects on human life. This is especially relevant today in major urban centers such as Hanoi and Ho Chi Minh City, where human activities, emissions from motorbikes, cars, and fuel-driven engines, household waste, industrial waste, and construction debris have severely degraded and polluted the natural environment.

Accordingly, it is essential to shift from the view that humans conquer and dominate nature to the understanding that humans are an integral part of nature and cannot exist apart from it. Humans must live in harmony with natural systems. At the same time, policy and legal frameworks must be reoriented: instead of prioritizing domination and unchecked exploitation of nature, they must promote research and development of renewable energy sources, thereby minimizing human impacts while ensuring sustainable socio-economic development.

Second, transforming perceptions in formulating socio-economic development guidelines, policies, and laws. Studying Friedrich Engels' views on the human–nature relationship helps policymakers adopt a long-term perspective on nature's counter-effects on human activities, particularly issues such as air pollution, solid-waste pollution, and wastewater in urban areas. Without a shift in mindset that ensures policies and laws harmonize human development with natural systems, severe consequences will follow not only for the present generation but also for generations to come.

Socio-economic development strategies, urban planning, enterprise development, and waste-treatment processes must be concretized through legal instruments so that citizens from urban centers to rural areas can fully recognize their role in protecting the environment. Ensuring a clean natural environment is essential to safeguarding human well-being.

Third, reshaping awareness in scientific and technological development. Engels emphasized the need to understand natural laws so that human interventions are conscious and informed. Therefore, scientific and technological advancement must prioritize environmentally friendly technologies, circular production models, and green technologies now widely embraced across the globe to gradually eliminate outdated, environmentally harmful technologies. These issues are especially relevant for air, soil, and water environments, all of which have direct and sensitive implications for human health.

However, technological development must be aligned with national conditions. Priority should be given to electrical technologies in transportation manufacturing, solar energy, wind energy, and biotechnology capable of absorbing CO_2, among others.

Fourth, enhancing awareness and responsibility among all citizens. Transforming society's overall perception, both within the political system and the general population, regarding human impacts on nature is critical for national economic development. To ensure broad and effective participation, the political system must support livelihood transitions for workers in sectors heavily impacting the natural environment, enabling them to shift toward greener industries. For example, workers and enterprises involved in producing fuel-powered motorbikes and cars should be supported in transitioning to the production of electric vehicles and clean-energy technologies, thereby ensuring sustainable livelihoods.

Moreover, achieving the Net Zero target is the responsibility of the entire population, not solely that of the Government or state agencies. Every citizen must cultivate a sense of responsibility in production and consumption practices to minimize unconscious or harmful impacts on nature. This collective awareness is crucial to realizing Vietnam's national Net Zero objective.

First, promoting solutions aligned with natural development. As Friedrich Engels emphasized, humans must understand the laws of nature to intervene in and transform it from a primitive state into a humanized natural environment.Therefore, identifying and implementing solutions that harmonize with natural development and ecological restoration in Vietnam's pursuit of Net Zero carries significant practical relevance. Instead of relying solely on costly advanced technologies, enhancing upstream forests, expanding mangrove ecosystems, and increasing urban green coverage, especially in major cities, are highly practical measures. Trees not only absorb carbon but also reduce ambient temperatures and improve air quality. These solutions require minimal financial investment and offer high feasibility, making them particularly suitable for a developing country like Vietnam.

Second, developing a circular economy and improving the efficiency of natural resource use. Establishing clear guidelines, policies, and legal frameworks to promote the circular economy is vital for contemporary economic development. This approach enables greater utilization of recyclable materials while reducing industrial waste

pollution. Although many environmentally friendly technologies exist today, attention must be paid to production cycles to ensure they do not disrupt ecological balance.

Furthermore, every human intervention in natural resources generates certain counter-effects. Engels' warnings remind us that resource exploitation must be planned, efficient, and mindful of long-term sustainability. Many natural resources take millions of years to form; thus, exploitation must be accompanied by conservation measures. Priority should be given to the sustainable use of renewable resources, ensuring their regeneration and strengthening the resilience of natural systems.

Third, creating sustainable livelihoods for workers affected by changes in natural resource use. Communities whose livelihoods depend on exploiting natural resources such as forestry, agriculture, fisheries, and aquaculture may face disruptions when Net Zero measures restrict access to land, forests, and naturally available flora and fauna. To avoid undermining their livelihoods, resource-use practices must shift from short-term extraction to planned, sustainable, and long-term exploitation. Natural resources should serve both as protective ecosystems and as sources of essential materials for human life.

At the same time, education and vocational retraining must be strengthened for workers who lose employment opportunities as natural-extraction activities are restricted. This ensures that affected populations can transition into more sustainable and adaptive livelihoods.

Fourth, prioritizing the development of environmentally friendly technologies. With strong political commitment to balancing immediate and long-term interests without compromising future generations, Vietnam must prioritize attracting domestic and foreign investment in the production of low-emission goods and services. Focus should be placed on adopting green, eco-friendly technologies; providing incentives for enterprises pioneering advanced technological solutions; and supporting businesses involved in waste and emissions treatment to reduce carbon output.

CONCLUSIONS

Friedrich Engels' perspectives on the relationship between humans and nature are crucial for Vietnam's efforts to achieve its Net Zero target by 2050. Engels emphasizes that humans depend on nature and must transform it in accordance with natural laws, as reckless intervention ultimately affects humanity itself. Today, human activities in Vietnam—such as motorized transport, waste generation, and deforestation—exceed the thresholds of natural resilience, severely impacting health and quality of life, particularly in cities like Hanoi and Ho Chi Minh City, among the most polluted urban areas globally.

To advance toward Net Zero, it is essential to integrate knowledge of the human–nature relationship into Vietnam's education system, from early childhood to higher education. This approach fosters sustainable and ethical thinking, promotes daily practices of environmental respect, and strengthens public awareness of the reciprocal impacts of human activity on the natural environment.

Strengthening environmental policies and legal frameworks is also critical. Updated regulations should reduce emissions, promote green industries and renewable energy, improve waste management, and protect forests. These measures must connect conservation with sustainable livelihoods for local communities, ensuring both immediate results and long-term benefits.

Concrete actions and urban planning are equally necessary. Key measures include energy transition, replacing fossil-fuel vehicles with electric alternatives, expanding green spaces, and installing automated irrigation systems to reduce dust and pollutants. Public disclosure of these plans ensures that citizens, organizations, and businesses can participate, cooperate, and help achieve the country's environmental objectives.

Engels provides a theoretical and practical framework that supports public awareness and effective action in Vietnam, combining education, policy, and environmental practices to protect the natural environment and meet the Net Zero 2050 goal.

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