Review

Economy

A Review on the Nature Economics

Charles Ray Hudson, Dennis Loo*
University of Texas at Austin, 2515 Speedway, Austin, TX 78712, USA
*: All correspondence should be sent to: Dr. Dennis Loo
Authors' Contact: Dr. Charles Ray Hudson, Ph.D., M.Sc., E-mail: crhudson-austin@gmail.com; Dr. Dennis Loo, Ph.D., E-mail: dennisloo@outlook.com
DOI: https://doi.org/10.15354/si.24.re1125
Funding: No funding source declared.
COI: The authors declare no competing interest.
AI Declaration: The authors affirm that artificial intelligence did not contribute to the process of preparing the work.

Understanding that environmental resources are crucial to economic prosperity, nature economics studies the complex interrelationships between the natural world and economic systems. Nature economics aims to promote a peaceful coexistence between human activity and the environment by incorporating sustainability, resource management, and ecosystem valuation ideas into conventional economic models. Examining the function of natural resources in economic systems, the effects of environmental externalities, and the necessity of sustainable development, and we will explore the core ideas of nature economics.

Keywords: Natural Resources; Sustainability; Economy; Environment; Development

Science Insights, 2024 December 31; Vol. 45, No. 6, pp.1681-1695.

Introduction

NATURE ECONOMICS is the examination of the ways in which environmental factors, including biodiversity, natural resources, and ecosystems, influence economic decisions and outcomes (Balmford et al., 2002). It entails the examination of the economic value of nature and the acknowledgment of the significance of preserving ecological equilibrium for long-term economic prosperity (Markandya, 2015). Nature Economics is a discipline that investigates the intersection of economics and nature, with a particular emphasis on the relationship between economic systems and the environment (Vermeij & Leigh, 2011). By comprehending the interdependence of economics and nature, we can devise strategies to safeguard our natural resources for future generations and advance sustainable development.

Nature economics is a developing discipline that aims to comprehend the interactions between the economy and natural ecosystems (Pan, 2018; Wang, 2014). It acknowledges that the health of the economy is inextricably linked to the health of the environment, as human societies depend on ecosystems to supply essential resources such as pure air, water, and food (Common & Stagl, 2005). The objective of the discipline of nature economics is to establish a more sustainable and equitable economic system that prioritizes and safeguards natural resources by combining the principles of ecology and environmental science with conventional economic theory (Neugarten et al., 2024).

The concept of ecosystem services, which refers to the advantages that ecosystems offer to humanity, is a fundamental component of nature economics (Bastien-Olvera et al., 2023; Farley, 2012; Lazo, 2002). These services may encompass climate regulation, water filtration, and pollination. Nature eco-

nomics aims to make sure that these services are appropriately considered in economic decision-making by acknowledging their value (Barbier, 2013; Day & Hall, 2016). This can assist in the prevention of the overexploitation of natural resources and the degradation of ecosystems, which can ultimately have a detrimental impact on human well-being (Braat, 2013; Lazo, 2002).

The notion of natural capital, which denotes the stock of natural resources and ecosystems that provide ecosystem services, is another critical component of nature economics (Barbier, 2018). Natural capital can be depleted if it is not managed sustainably, similar to financial capital (Gupta, 2020; "Nurturing Natural Capital," 2019). The objective of nature economics is to advocate for policies that safeguard and improve natural capital, thereby guaranteeing that future generations will have the necessary resources to flourish (Aronson et al., 2006; Mohamed et al., 2024; Neugarten et al., 2024). Societies can make more informed judgments about how to use and conserve their natural resources by valuing natural capital (Hanley, 2015).

The significance of acknowledging the interdependence of the economy and ecosystems is also underscored by nature economics (Johnson et al., 2023). Ecosystems can be significantly influenced by human activities, and the reverse is also true (Barbier, 2003; Bockstael et al., 2000). For instance, deforestation can result in soil erosion and the loss of biodiversity, which can subsequently affect water quality and cultivation (Aillery et al., 1996; McIntosh & Pontius, 2016). Nature economics can aid in the development of policies that support sustainable development and safeguard both the environment and the economy by comprehending these intricate relationships (Adhikari & Nadella, 2011; Knowler, 2004; Telles et al., 2013).

One of the obstacles in the field of nature economics is the integration of the value of ecosystem services into conventional economic models (Atkinson et al., 2012; Lazo, 2002; Turner et al., 1998). Quantifying the value of numerous ecosystem services in monetary terms can be challenging due to the fact that they are not purchased or sold in markets (Bockstael et al., 2000; Costanza et al., 1997; Sagoff, 2009). Nevertheless, there are new methods for valuing ecosystem services, such as the use of economic instruments like cost-benefit analysis and ecosystem valuation techniques (Braat, 2013; Tinch et al., 2019). By enhancing our comprehension of the economic value of nature, we can more effectively integrate it into decision-making processes and guarantee that the genuine costs and benefits of economic activities are considered.

Historical Perspective on the Relationship Between Nature and Economics

Throughout history, human societies have relied on nature for resources and economic activities (Balmford et al., 2002; Epstein et al., 2017). However, the industrial revolution and modernization have led to increased exploitation of natural resources, resulting in environmental degradation and biodiversity loss (Díaz et al., 2019). Understanding the historical relationship between nature and economics can help us learn from past mistakes and work towards a more sustainable future (Hou et al., 2018; Vermeij & Leigh, 2011).

For centuries, the relationship between the economy and nature has been a subject of debate. It is crucial to examine the historical context of the relationship between nature and the economy in order to comprehend its current state (Spash, 2006).

The economy has been significantly influenced by nature throughout history. In the earliest civilizations, individuals were significantly dependent on nature for their survival (Chausson et al., 2024; Ciccantell & Smith, 2007; Ponting, 1990). They utilized the land to cultivate crops, pursued animals for sustenance, and utilized natural resources as building materials (Niroumand et al., 2013; Smyntyna, 2003). People recognized the significance of coexisting in harmony with nature in order to maintain their way of life, as the economy was inextricably linked to the natural world (Hughes, 1977; Neale, 2023; Somma, 2009).

The relationship between nature and the economy became more intricate as civilizations began to develop and expand (Guo, 2011; Yilin, 2013). The exploitation of natural resources became more prevalent with the rise of industrialization and globalization (Barbier, 2003; Barbier, 2005; Majeed et al., 2022). This resulted in the devastation of habitats and environmental degradation, which had adverse effects on both the economy and nature (Das, 2007; Offiong, 2016).

The Industrial Revolution of the 18th and 19th centuries was a significant turning point in the relationship between the economy and nature (Barrett, 1999; Burnete & Pilasluck, 2015). The mass production of products was facilitated by the rapid advancements in technology (Fremdling, 1996); however, this came at the expense of environmental degradation and increased pollution (Marasová et al., 2018). This period also witnessed the emergence of capitalism, which placed a high value on economic development and profit, frequently at the expense of the environment (Pérez, 2015).

Throughout the 20th century, there was an increasing recognition of the influence that human actions were having on the natural world (Lovins, 2001; Williams, 1998). This resulted in the establishment of environmental movements and regulations that were designed to safeguard the environment and encourage sustainable practices (Posłuszna, 2015). The relationship between the economy and nature began to change, with a greater emphasis on responsible resource management and conservation (Sisaye, 2012). The relationship between the economy and nature has become even more pronounced in recent years (Nahman et al., 2010; Wang, 2014; Weick, 2016; Stigson, 1999). The world is currently confronted with a number of urgent environmental concerns, including deforestation, climate change, and biodiversity loss (Neugarten et al., 2024; Salih, 2003). In order to safeguard the environment and guarantee the welfare of future generations, there is an increasing necessity for sustainable practices as the global economy expands (Arora et al., 2018; Imppola, 2020).

The concept of sustainable development has emerged as a critical framework for comprehending the interplay between the economy and nature. It underscores the importance of maintaining a balance between economic development, environmental conservation, and social equity. We can guarantee that the requirements of both people and the planet are met in a sustainable manner by adopting a holistic approach to development.

The Role of Natural Resources in Economic

Systems

All economic activities are predicated on natural resources (Barbier, 2003). They are raw materials that are utilized to manufacture products and services, and their absence would result in the cessation of economic activities (Ertimi et al., 2021; Saleh et al., 2020). For instance, the production of energy is contingent upon the availability of minerals such as oil and gas (Cooper, 1975; Coria & Sterner, 2010; Poudel, 2014), while the production of sustenance is dependent on agricultural resources such as water and land (Morgan, 1976; Schulz & Briskey, 2003). Without these resources, economies would be unable to sustain themselves and expand (Bunker, 2005).

The comparative advantage of a nation in the global economy is also significantly influenced by the availability and accessibility of natural resources (Barbier, 2003; Cai & Leung, 2007; Guo, 2017). In certain industries, such as energy production and extraction, countries with an abundance of natural resources, such as oil, gas, and minerals, have a competitive advantage (Liu, 2022; Shine, 1996). This has the potential to result in economic growth, employment creation, and increased government revenues. Conversely, nations that are devoid of natural resources may encounter difficulties in certain sectors and may be obliged to import these resources, which can be expensive and have a detrimental impact on their economic competitiveness (Berry, 2008; Frankel, 2010; Gylfason & Zoëga, 2006; Reinman, 2015).

In addition to contributing to economic growth, natural resources also have a significant impact on the development of society and the environment (Coria & Sterner, 2010; Usman & Balsalobre‐Lorente, 2022). For instance, the extraction and utilization of natural resources can result in substantial environmental consequences, including habitat devastation, water pollution, and deforestation (Aikins, 2014; Sibi, 2018). In order to guarantee the long-term well-being of society and the environment, it is imperative that nations responsibly manage their natural resources. This frequently necessitates the coordination of environmental conservation, social responsibility, and economic development (Salih, 2003).

The geopolitical landscape of the world is also significantly influenced by natural resources (Theodore, 2017). Countries that possess valuable resources such as oil and gas frequently exercise substantial influence within the international community (Barr & Sharp, 2006). This can result in geopolitical tensions, conflicts, and alliances as countries vie for access to these resources. Conflicts and wars have resulted from the control of natural resources in certain instances, such as the resource wars in the Middle East and Africa (Billon, 2001; "Dark Age: The Political Odyssey of Emperor Bokassa," 1997; Olanrewaju et al., 2020). To prevent conflicts and guarantee peace and stability, it is crucial that nations collaborate to manage and distribute natural resources in a fair and sustainable manner.

Relying on natural resources for economic development presents a challenge due to their finite and non-renewable nature (Lestari et al., 2020; Rudra & Jensen, 2011). Countries may encounter economic obstacles and environmental degradation as resources are exhausted (Ertimi et al., 2021). This is why it is essential for nations to diversify their economies and allocate resources to sustainable practices and renewable energy sources (Dinçer, 2000; Ellabban et al., 2014; Panwar et al., 2013). Countries can guarantee the long-term prosperity of their citizens and safeguard the environment for future generations by transitioning to a more sustainable economic model (Huang & Chang, 2022; Wang et al., 2022).

In developing countries, poverty alleviation and economic development are also significantly influenced by natural resources (Barbier, 2019; Gylfason & Zoëga, 2006). Natural resources are the primary source of income and employment for millions of individuals in numerous low-income countries (Barbier, 2010). For instance, in nations such as India and Vietnam, substantial portions of the populace are employed in agriculture (Angelsen et al., 2014; Saint-Macary et al., 2012), while Zambia and the Democratic Republic of Congo generate substantial revenues from mining (Davis et al., 2009; Haggblade et al., 2010). Countries can foster economic growth, reduce poverty, and create employment opportunities by investing in the sustainable management and development of these resources (Lungu, 2008; Nyambe & Kawamya, 2005).

Nevertheless, the exploitation of natural resources can also result in adverse social consequences, including the displacement of communities, human rights violations, and corruption (Ezirigwe, 2017; Mancini & Sala, 2018). In numerous developing countries, the control and exploitation of natural resources by potent elites has resulted in conflict and inequality (Nkuepo, 2012; Smart, 2020). In order to advance social justice and equality, it is important that governments guarantee transparency, accountability, and inclusive decision-making in the administration of natural resources (Maconachie, 2016; Pullen, 2013).

Therefore, natural resources have a multifaceted impact on economic systems, influencing geopolitics, society, and environment of countries worldwide. They are crucial for the creation of jobs, economic growth, and prosperity; however, they also pose obstacles in the areas of environmental protection, social justice, and sustainability. In order to guarantee the long-term welfare of their citizens and the planet, it is critical that nations responsibly and inclusively manage their natural resources. Countries can establish a more resilient and prosperous future for all by investing in sustainable practices, renewable energy, and equitable resource distribution.

Natural Resource Depletion and Economic Consequences

The impact on the cost of production is one of the most immediate consequences of natural resource depletion (Lee, 1998; Ragheb et al., 2022). The prices of natural resources increase as they become scarcer, resulting in increased expenses for businesses that depend on them (Tilton, 2005). For instance, industries that depend on oil for their operations, such as transportation and manufacturing, are directly affected by the increasing cost of oil as a result of the depletion of oil reserves (Banbi, 1996; Sabour, 2003; Śmiech et al., 2020). This, in turn, results in higher prices for consumers, as businesses pass on the heightened costs to preserve their profit margins.

The loss of biodiversity and ecosystem services is an additional economic repercussion of natural resource depletion (Markandya, 2015; Pearce & Moran, 2013). Natural resources

are not only indispensable for economic activities, but they also play a critical role in the preservation of ecological equilibrium and the support of a variety of ecosystems (Balmford et al., 2002; Costanza et al., 1997). The extinction of species and the degradation of ecosystems can result from the overexploitation or depletion of resources, which in turn results in the loss of valuable services such as pollination, water purification, and climate regulation (Díaz et al., 2006; Hufnágel et al., 2018). This, in turn, can have significant economic repercussions, as ecosystem degradation can disrupt food production, increase the risk of natural disasters, and reduce the overall resilience of ecosystems to environmental stressors (Johnson et al., 2023; Palmer & Falco, 2012).

The economy may also be adversely affected by the depletion of natural resources in terms of long-term sustainability and economic growth (Rajapaksa et al., 2017). The exploitation of natural resources, including mining, forestry, and agriculture, is a substantial source of revenue and employment in numerous economies (Shah et al., 2022). Nevertheless, the overexploitation or depletion of these resources can result in a decrease in economic output and the loss of livelihoods for communities that rely on these industries (Dialga, 2017; Seidl, 1995; Veiga et al., 2001). Furthermore, the depletion of natural resources can impede future economic development and innovation by restricting the availability of resources required for industrial expansion and technological advancements (Babatúndé, 2011; Kitula, 2005; Sam et al., 2024).

Social inequalities and conflicts within society can also be exacerbated by the depletion of natural resources (Kronenberg, 2004). As resources become limited, competition for access and control over these resources can intensify, resulting in conflicts between various groups or communities (Giordano et al., 2004; Koubi et al., 2013). This can lead to social unrest, population displacement, and violent conflicts, which can have severe economic repercussions, including the devastation of infrastructure, disruption of economic activities, and loss of investment (Fox & Beall, 2012; Patel & Burkle, 2012 Ware, 2005). In certain instances, resource depletion can also exacerbate political instability and governance challenges, as governments endeavor to address the grievances of marginalized communities and manage competing demands for limited resources (Alao & Olonisakin, 2000; Ross, 2014).

The global economy and international trade can also be significantly affected by the depletion of natural resources (Rudra & Jensen, 2011). The import and export of natural resources are essential for the support of economic activities and the fulfillment of domestic requirements in numerous countries (Bretschger & Valente, 2011; Ruta & Venables, 2012). Nevertheless, the competitiveness of industries that rely on these resources can be impacted, global supply chains can be disrupted, and trade imbalances can be exacerbated when resources become limited, or their prices increase due to depletion (Bell et al., 2013; Gulley et al., 2018; Nassar et al., 2020). This can result in trade disputes, protectionist policies, and market distortion, which can impede economic development and threaten the stability of the global economy.

The indirect economic consequences of natural resource depletion can be attributed to its impact on human health and well-being (Anshasy & Katsaiti, 2015; Xu & Zhao, 2023). Clean water, clean air, and nutritious food are among the numerous natural resources that are indispensable for the survival and well-being of humans (Li et al., 2013; Majeed et al., 2022; Shabbir et al., 2020). Depletion or contamination of these resources can result in adverse health consequences, including malnutrition, air pollution-related ailments, and waterborne diseases (Ernst, 2006; Ratna, 2017; Tirado et al., 2010). These health impacts can have broader economic implications for society as a whole, as they can lead to increased healthcare costs, diminished productivity, and a lower quality of life for individuals and communities.

Environmental Externalities and Economic Impact

Environmental externalities are the unintended and frequently detrimental consequences of economic activities on the environment that are not accounted for in the price of products and services (Hirschberg, 2012). These externalities can have substantial economic repercussions, as they result in costs that are incurred by society as a whole, rather than by the individual or business responsible for the pollution or degradation of the environment (Corrigan & Shah, 2011; Johnson et al., 2023; Sarkar & Wolter, 1998).

Air pollution generated by factories and vehicles is among the most prevalent instances of environmental externalities (Schipper et al., 2001; Stężały et al., 2009). The emission of pollutants, including carbon dioxide, sulfur dioxide, and nitrogen oxides, can have a detrimental impact on human health and contribute to global warming (Manisalidis et al., 2020). The economic consequences of air pollution encompass the impact on the tourism and recreation industries in regions with poor air quality, healthcare expenses for treating respiratory illnesses, and lost productivity due to sickness (Brunekreef & Holgate, 2002; Hirschberg, 2012).

Another significant environmental externality that can have a detrimental economic impact is water pollution (Barwick et al., 2018; Dong et al., 2019; Lanzi et al., 2018). Water quality can be compromised, aquatic ecosystems can be harmed, and human health can be at risk due to contaminants like heavy metals, pesticides, and effluent (Brusseau et al., 2019). The economic costs of water pollution encompass the expenses associated with treating polluted water for potable and agricultural purposes, the depletion of revenue from fisheries and tourism in polluted water bodies, and the cost of cleaning up contaminated sites (De Lange et al., 2012; Easter & Konishi, 2006).

Deforestation and habitat devastation are additional examples of environmental externalities that have economic repercussions (Lakshminarayan et al., 1991). Soil erosion, biodiversity loss, and elevated greenhouse gas emissions may result from the devastation of forests for mining, agriculture, or urban development (Garrod & Willis, 2000; Juniah et al., 2017). Reduced agricultural productivity as a result of soil degradation, the loss of revenue from ecotourism and sustainable timber harvesting, and the loss of ecosystem services such as carbon sequestration and water filtration are among the economic costs of deforestation (May et al., 2013; Runyan & D'Odorico, 2016).

Perhaps the most pressing environmental externality of

our era, climate change has far-reaching economic repercussions (Pearce, 2001). The combustion of fossil fuels for energy production results in the release of carbon dioxide and other greenhouse gases into the atmosphere, which in turn leads to an increase in global temperatures, sea levels, and the occurrence of more frequent extreme weather events (Armaroli & Balzani, 2011; Raimi, 2020). Adapting to changing climate conditions, such as the construction of drought-resistant infrastructure and seawalls, the loss of valuable coastal property due to sea-level rise and storm surges, and the impact on agriculture and food security are all included in the economic costs of climate change (Hsiang et al., 2017).

In addition to the adverse effects of environmental externalities, sustainable practices and policies that mitigate these externalities present opportunities for economic gain (Levitus et al., 2005; Neumann & Strzepek, 2014; Tol, 2009). The investment in renewable energy sources, such as solar and wind power, can result in the creation of employment in the clean energy sector and the reduction of greenhouse gas emissions (Sani, 2019; Sooriyaarachchi et al., 2015). The implementation of pollution control technologies in industries can result in improved air and water quality, which in turn leads to diminished healthcare costs and improved public health outcomes (Mujtaba & Shahzad, 2020; Tran et al., 2024).

In order to mitigate environmental externalities and guarantee that the expenses of pollution are borne by businesses and individuals, government intervention is frequently required (Pautrel, 2012). Pollution levies, cap-and-trade systems, and environmental regulations can help to encourage the adoption of cleaner technologies and practices, while also providing funding for environmental remediation efforts (Marcus et al., 2002; Montalvo Corral & Kemp, 2008). These policies can contribute to the promotion of sustainable development and the preservation of the environment for future generations by internalizing the costs of pollution.

Sustainable Development and Nature Economics

Sustainable development and nature economics are essential concepts in the contemporary world, as we confront the depletion of natural resources and the escalating environmental challenges (Salih, 2003; Schilling & Chiang, 2010). Sustainable development is the process of addressing the requirements of the present generation without compromising the ability of future generations to meet their own needs (Gupta, 2016; Unruh, 2007). Nature economics, in contrast, emphasizes the significance of safeguarding natural resources to ensure long-term economic prosperity and their economic value (Balmford et al., 2002; Vojnovic, 1995).

The concept of equilibrium is one of the fundamental principles of sustainable development (Barbier, 1987; Epstein et al., 2017; Munda, 1997). This entails the establishment of a harmonious equilibrium between environmental preservation, social advancement, and economic expansion (Bindzár et al., 2018). Nature economics is instrumental in attaining this equilibrium by emphasizing the significance of natural resources in fostering economic growth and social well-being (Aronson et al., 2006; Barbier, 2003; Pan, 2018). Policymakers and businesses can make more informed decisions about resource management and conservation by acknowledging the economic value of nature (Hart, 1995).

Externalities, which are the unintended consequences of economic activities on the environment, are also emphasized in nature economics (Balmford et al., 2002; Braat, 2013; Lippke & Bishop, 1999). The purity of air and water, as well as human health, can be adversely affected by the pollution generated by industrial production(Jones-Walters & Mulder, 2009). Nature economics contributes to ensuring that the genuine cost of resource exploitation is considered by integrating the costs of these externalities into economic decision-making (Lanzi et al., 2018).

The concept of ecosystem services is another critical component of nature economics (Costanza et al., 1997). The advantages that humans derive from nature, including clean air, water, and sustenance, are referred to as ecosystem services (Lazo, 2002). Policymakers can make more informed decisions about how to manage and protect natural ecosystems by acknowledging the economic value of these services (Day & Hall, 2016). The preservation of wetlands can generate economic benefits through tourism and recreation, as well as provide habitat for wildlife and prevent inundation (Mitsch et al., 2015).

The significance of biodiversity is also underscored in the fields of sustainable development and nature economics (Kakuru et al., 2013; Woodward & Wui, 2001). The term "biodiversity" denotes the diversity of living organisms within an ecosystem, and it is essential for the preservation of ecological balance and the enhancement of ecosystem services (Al-Farabi, 2013). The long-term health and resilience of ecosystems, as well as the economic benefits they provide, can be guaranteed by conserving biodiversity (Bhat et al., 2020; Thomas, 1995).

The short-term focus of numerous economic decision-makers is one of the obstacles to the implementation of sustainable development and nature economics (Palmer & Falco, 2012; Pearce & Moran, 2013; Perrings, 2010). Businesses and policymakers frequently prioritize short-term profits over long-term sustainability, which results in the overexploitation of natural resources and the degradation of the environment (Bocken & Short, 2021). In order to confront this obstacle, nature economics advocates for the incorporation of environmental and social factors into economic decision-making, ensuring that the economic outcomes accurately reflect the true value of nature (Chausson et al., 2024; Damineva et al., 2019; The Economics of Biodiversity: The Dasgupta Review, 2024).

It is imperative to involve a diverse array of stakeholders, such as government agencies, businesses, NGOs, and local communities, in order to accomplish sustainable development and nature economics (Bateman et al., 2013; Johnson et al., 2023). We can establish a more environmentally benign and resilient economy by collaborating to develop and implement policies that prioritize resource conservation and sustainable development (Han et al., 2024; Tseng et al., 2019). A sustainable future for all is contingent upon the collaboration of various sectors and stakeholders in order to effect enduring change.

In the final analysis, sustainable development and nature economics are interconnected concepts that are indispensable for confronting the environmental obstacles that our planet is cur-

rently encountering (Arora et al., 2018; Bindzár et al., 2018; Nieto, 1997). By acknowledging the economic value of nature and integrating it into decision-making processes, we can guarantee that natural resources are managed and conserved in a manner that is beneficial to both present and future generations. By adopting sustainable development and nature economics, we can establish a society that is more environmentally benign, resilient, and equitable for all.

The Future of Nature Economics

The necessity of integrating the value of ecosystem services into conventional economic models is a critical component of the future of nature economics (Costanza, 2014; Johnson et al., 2023). Clean air and water, pollination, and nutrient cycling are essential ecosystem services that contribute to economic prosperity and human well-being. Policymakers can gain a more comprehensive understanding of the complete costs and benefits of different environmental actions by quantifying and integrating these services into economic decision-making (Balmford et al., 2002; Drupp et al., 2024).

The necessity of transitioning to more sustainable and regenerative practices in agriculture, energy production, and resource extraction is another critical factor in the future of nature economics (Daily & Matson, 2008; Dasgupta & Levin, 2023; Díaz et al., 2019). Environmental degradation and the loss of essential natural resources are frequently the result of traditional economic models that prioritize short-term gains over long-term sustainability (Farley & Voinov, 2016; Lampert, 2019). We can guarantee the health and vitality of our ecosystems for future generations by implementing a nature-based approach to economic development.

The development of ecological and circular economies is a promising avenue for the future of nature economics (Chami et al., 2022; Johnson et al., 2023; Stefanakis et al., 2021). Green economies prioritize the reduction of carbon emissions, the reduction of waste, and the promotion of renewable energy sources (Stefanakis et al., 2021; Sverdan, 2021). On the other hand, circular economies endeavor to reduce resource consumption and waste by recycling and repurposing materials in a closed-loop system (Heshmati, 2017; Wang et al., 2022; Patwa et al., 2020). By incorporating these principles into economic policy, we can establish a more resilient and sustainable economy that benefits both individuals and the environment.

The future of nature economics also has the potential to catalyze technological advancements and innovations that promote environmental conservation and restoration (Balmford et al., 2002; Chami et al., 2022; Heal, 2020). We can safeguard the natural world while generating new economic growth opportunities by investing in sustainable infrastructure and green technology (Chenoweth et al., 2018). In the years ahead, we can anticipate a rise in the level of collaboration among scientists, policymakers, and business leaders in order to create and execute innovative solutions to environmental challenges.

The necessity of addressing the inequities and injustices that frequently accompany environmental degradation is one of the main challenges that the future of nature economics will encounter (Allen & Malin, 2008; Aragón-Correa et al., 2007; York & Venkataraman, 2010). Communities that are already marginalized and disadvantaged are those that are most susceptible to the effects of climate change and environmental pollution (Singer, 2018; Thomas & Twyman, 2005). Prioritizing social justice and guaranteeing that all individuals have access to a pure and healthy environment are indispensable as we strive for a more sustainable and equitable future.

It will be imperative to establish partnerships and collaborations across sectors and disciplines in order to fully realize the potential of nature economics (Díaz et al., 2019; Hahn, 1993). We can promote a more sustainable future and generate positive change by utilizing the resources and expertise of a diverse range of stakeholders through collaboration (Blignaut & Aronson, 2019; Mayor et al., 2021). This will necessitate a dedication to establishing consensus around shared values and objectives, as well as effective leadership.

The future of nature economics will also be contingent upon the capacity to educate and engage the public regarding the significance of sustainable living and environmental conservation (Balmford et al., 2002; Chapin et al., 2022; Durán et al., 2023). By increasing awareness and fostering environmental literacy, we can enable individuals to make informed decisions that are advantageous to both them and the environment. By means of education and outreach initiatives, we can motivate a new generation of leaders who are dedicated to the establishment of a more sustainable and equitable world.

The future of nature economics will be determined by our willingness to prioritize the well-being of the planet and its inhabitants over short-term economic gains. A more resilient, equitable, and sustainable future for all can be achieved by adopting a holistic and interconnected approach to economic development (Hickel et al., 2021; Johnson et al., 2023; Morrissey & Heidkamp, 2022). It is evident that nature economics will be instrumental in determining the future of our planet and guaranteeing a prosperous and healthy future for future generations as we look to the future.

Conclusion

Nature economics offers a holistic approach to economic decision-making that prioritizes the long-term health of our planet and its resources. By considering the true value of nature in economic calculations and policy frameworks, we can pave the way for a more sustainable and balanced future. As we navigate the complexities of a rapidly changing world, integrating nature economics principles will be essential in shaping a prosperous and resilient society for generations to come.■

References

Adhikari, B., & Nadella, K. (2011). Ecological economics of soil erosion: a review of the current state of knowledge. Annals of the New York Academy of Sciences, 1219(1), 134–152. DOI: https://doi.org/10.1111/j.1749-6632.2010.05910.x

Aikins, E. K. (2014). The relationship between sustainable development and resource use from a geographic perspective. Natural Resources Forum, 38(4), 261–269. DOI: https://doi.org/10.1111/1477-8947.12059

Aillery, M., Hrubovcak, J., Kramer-LeBlanc, C., Shoemaker, R., & Tegene, A. (1996). Agriculture in an Ecosystems Framework. Agricultural and Resource Economics Review, 25(2), 101–117. DOI: https://doi.org/10.1017/s1068280500007759

Alao, A., & Olonisakin, F. (2000). Economic fragility and political fluidity: Explaining natural resources and conflicts. International Peacekeeping, 7(4), 23–36. DOI: https://doi.org/10.1080/13533310008413861

Al-Farabi, J. W. (2013). Biodiversity conservation needs and method to conserve the biological diversity. Journal of Biodiversity & Endangered Species, 1(3), 1000113. DOI: https://doi.org/10.4172/2332-2543.1000113

Allen, J. C., & Malin, S. (2008). Green Entrepreneurship: A Method for Managing Natural Resources? Society & Natural Resources, 21(9), 828–844. DOI: https://doi.org/10.1080/08941920701612917

Angelsen, A., Jagger, P., Babigumira, R., Belcher, B., Hogarth, N. J., Bauch, S., Börner, J., Smith-Hall, C., & Wunder, S. (2014). Environmental Income and Rural Livelihoods: A Global-Comparative Analysis. World Development, 64, S12–S28. DOI: https://doi.org/10.1016/j.worlddev.2014.03.006

Anshasy, A. a. E., & Katsaiti, M. (2015). Are natural resources bad for health? Health & Place, 32, 29–42. DOI: https://doi.org/10.1016/j.healthplace.2014.12.011

Aragón-Correa, J. A., Hurtado-Torres, N., Sharma, S., & García-Morales, V. J. (2007). Environmental strategy and performance in small firms: A resource-based perspective. Journal of Environmental Management, 86(1), 88–103. DOI: https://doi.org/10.1016/j.jenvman.2006.11.022

Armaroli, N., & Balzani, V. (2011). The Legacy of Fossil Fuels. Chemistry - an Asian Journal, 6(3), 768–784. DOI: https://doi.org/10.1002/asia.201000797

Aronson, J., Clewell, A. F., Blignaut, J. N., & Milton, S. J. (2006). Ecological restoration: A new frontier for nature conservation and economics. Journal for Nature Conservation, 14(3–4), 135–139. DOI: https://doi.org/10.1016/j.jnc.2006.05.005

Aronson, J., Milton, S., & Blignaut, J. (2006). Conceiving the Science, Business, and Practice of Restoring Natural Capital. Ecological Restoration, North America, 24(1), 22–24. DOI: https://doi.org/10.3368/er.24.1.22

Arora, N. K., Fatima, T., Mishra, I., Verma, M., Mishra, J., & Mishra, V. (2018). Environmental sustainability: challenges and viable solutions. Environmental Sustainability, 1(4), 309–340. DOI: https://doi.org/10.1007/s42398-018-00038-w

Atkinson, G., Bateman, I., & Mourato, S. (2012). Recent advances in the valuation of ecosystem services and biodiversity. Oxford Review of Economic Policy, 28(1), 22–47. DOI: https://doi.org/10.1093/oxrep/grs007

Babatunde, A. O. (2011). Oil Exploitation, Local Economy and Conflict in the Oil-Bearing Areas of Nigeria's Niger Delta. All Days. DOI: https://doi.org/10.2118/150789-ms

Balmford, A., Bruner, A., Cooper, P., Costanza, R., Farber, S., Green, R. E., Jenkins, M., Jefferiss, P., Jessamy, V., Madden, J., Munro, K., Myers, N., Naeem, S., Paavola, J., Rayment, M., Rosendo, S., Roughgarden, J., Trumper, K., & Turner, R. K. (2002). Economic Reasons for Conserving Wild Nature. Science, 297(5583), 950–953. DOI: https://doi.org/10.1126/science.1073947

Banbi, H. E. (1996). Impact of uncertain oil prices on investment and integration efforts in the oil and gas industry. Journal of Petroleum Technology, 48(2). DOI: https://doi.org/10.2118/31171-ms

Barbier, E. B. (1987). The Concept of Sustainable Economic Development. Environmental Conservation, 14(2), 101–110. DOI: https://doi.org/10.1017/s0376892900011449

Barbier, E. B. (2003). The role of natural resources in economic development. Australian Economic Papers, 42(2), 253–272. DOI: https://doi.org/10.1111/1467-8454.00198

Barbier, E. B. (2005). Natural resource-based economic development in history. In Cambridge University Press eBooks (pp. 51–107). DOI: https://doi.org/10.1017/cbo9780511754036.003

Barbier, E. B. (2010). Poverty, development, and environment. Environment and Development Economics, 15(6), 635–660. DOI: https://doi.org/10.1017/s1355770x1000032x

Barbier, E. B. (2013). Economics of the Regulating Services. In Elsevier eBooks (pp. 45–54). DOI: https://doi.org/10.1016/b978-0-12-384719-5.00183-0

Barbier, E. B. (2018). The concept of natural capital. Oxford Review of Economic Policy, 35(1), 14–36. DOI: https://doi.org/10.1093/oxrep/gry028

Barbier, E. B. (2019). Natural Resources and Developing Countries: An Overview. In Cambridge University Press eBooks (pp. 11–48). DOI: https://doi.org/10.1017/9781316875681.002

Barr, G. D. I., & Sharp, L. J. (2006). The Economics of Democracy in Resource-Producing Countries. Studies in Economics and Econometrics, 30(1), 41–58. DOI: https://doi.org/10.1080/10800379.2006.12106399

Barrett, B. F. D. (1999). Environmentalism in periods of rapid societal transformation: the legacy of the industrial revolution in the United Kingdom and the Meiji Restoration in Japan. Sustainable Development, 7, 178–190. Available at: https://onlinelibrary.wiley.com/doi/10.1002/(SICI)1099-1719(199911)7:4%3C178::AID-SD113%3E3.0.CO;2-L

Barwick, P. J., Li, S., Rao, D., & Zahur, N. B. (2018). The Healthcare Cost of Air Pollution: Evidence from the World's Largest Payment Network. DOI: https://doi.org/10.3386/w24688

Bastien-Olvera, B. A., Conte, M. N., Dong, X., Briceno, T., Batker, D., Emmerling, J., Tavoni, M., Granella, F., & Moore, F. C. (2023). Unequal climate impacts on

global values of natural capital. Nature, 625(7996), 722–727. DOI: https://doi.org/10.1038/s41586-023-06769-z

Bateman, I. J., Harwood, A. R., Abson, D. J., Andrews, B., Crowe, A., Dugdale, S., Fezzi, C., Foden, J., Hadley, D., Haines-Young, R., Hulme, M., Kontoleon, A., Munday, P., Pascual, U., Paterson, J., Perino, G., Sen, A., Siriwardena, G., & Termansen, M. (2013). Economic Analysis for the UK National Ecosystem Assessment: Synthesis and Scenario Valuation of Changes in Ecosystem Services. Environmental and Resource Economics, 57(2), 273c297. DOI: https://doi.org/10.1007/s10640-013-9662-y

Bell, J. E., Mollenkopf, D. A., & Stolze, H. J. (2013). Natural resource scarcity and the closed–loop supply chain: a resource–advantage view. International Journal of Physical Distribution & Logistics Management, 43(5/6), 351–379. DOI: https://doi.org/10.1108/ijpdlm-03-2012-0092

Berry, A. (2008). Growth, employment and distribution impacts of minerals dependency: Four case studies. South African Journal of Economics, 76(s2). DOI: https://doi.org/10.1111/j.1813-6982.2008.00186.x

Bhat, J. A., Kumar, M., Negi, A., Todaria, N., Malik, Z. A., Pala, N. A., Kumar, A., & Shukla, G. (2020). Species diversity of woody vegetation along altitudinal gradient of the Western Himalayas. Global Ecology and Conservation, 24, e01302. DOI: https://doi.org/10.1016/j.gecco.2020.e01302

Billon, P. L. (2001). The political ecology of war: natural resources and armed conflicts. Political Geography, 20(5), 561–584. DOI: https://doi.org/10.1016/s0962-6298(01)00015-4

Bindzár, P., Sang, S., Gasanov, E., & Aliyarov, R. (2018). Sustainable Development as a Global Trend and an Economic Priority for the Nation. E3S Web of Conferences, 41, 04033. DOI: https://doi.org/10.1051/e3sconf/20184104033

Blignaut, J., & Aronson, J. (2019). Developing a restoration narrative: A pathway towards system-wide healing and a restorative culture. Ecological Economics, 168, 106483. DOI: https://doi.org/10.1016/j.ecolecon.2019.106483

Bocken, N. M., & Short, S. W. (2021). Unsustainable business models – Recognising and resolving institutionalised social and environmental harm. Journal of Cleaner Production, 312, 127828. DOI: https://doi.org/10.1016/j.jclepro.2021.127828

Bockstael, N. E., Freeman, A. M., Kopp, R. J., Portney, P. R., & Smith, V. K. (2000). On Measuring Economic Values for Nature. Environmental Science & Technology, 34(8), 1384–1389. DOI: https://doi.org/10.1021/es990673l

Braat, L. C. (2013). The Value of the Ecosystem Services Concept in Economic and Biodiversity Policy. In Elsevier eBooks (pp. 97–103). DOI: https://doi.org/10.1016/b978-0-12-419964-4.00010-x

Bretschger, L., & Valente, S. (2011). International economics and natural resources: from theory to policy. International Economics and Economic Policy, 8(2), 115–120. DOI: https://doi.org/10.1007/s10368-011-0195-y

Brunekreef, B., & Holgate, S. T. (2002). Air pollution and health. The Lancet, 360(9341), 1233–1242. DOI: https://doi.org/10.1016/s0140-6736(02)11274-8

Brusseau, M., Ramirez-Andreotta, M., Pepper, I., & Maximillian, J. (2019). Environmental Impacts on Human Health and Well-Being. In Elsevier eBooks (pp. 477–499). DOI: https://doi.org/10.1016/b978-0-12-814719-1.00026-4

Bunker, S. G. (2005). The Poverty of Resource Extraction. In Research in rural sociology and development (pp. 211–226). DOI: https://doi.org/10.1016/s1057-1922(05)11008-7

Burnete, S., & Pilasluck, C. (2015). Trade And Environment: A Historical Perspective. Studies in Business and Economics, 10(2), 17–31. DOI: https://doi.org/10.1515/sbe-2015-0017

Cai, J., & Leung, P. (2007). A review of comparative advantage assessment approaches in relation to aquaculture development. In Species and System Selection for Sustainable Aquaculture (pp. 43–56). Wiley. DOI: https://doi.org/10.1002/9780470277867.ch4

Chami, R., Cosimano, T., Fullenkamp, C., & Nieburg, D. (2022). Toward a Nature-Based Economy. Frontiers in Climate, 4. DOI: https://doi.org/10.3389/fclim.2022.855803

Chapin, F. S., Weber, E. U., Bennett, E. M., Biggs, R., Van Den Bergh, J., Adger, W. N., Crépin, A., Polasky, S., Folke, C., Scheffer, M., Segerson, K., Anderies, J. M., Barrett, S., Cardenas, J., Carpenter, S. R., Fischer, J., Kautsky, N., Levin, S. A., Shogren, J. F., . . . De Zeeuw, A. (2022). Earth stewardship: Shaping a sustainable future through interacting policy and norm shifts. AMBIO, 51(9), 1907–1920. DOI: https://doi.org/10.1007/s13280-022-01721-3

Chausson, A., Seddon, N., Smith, A., Reger, R. Z., O'Callaghan, B., Zapata, F., & Mori-Clement, Y. (2024). Harnessing Nature-based Solutions for Economic Recovery: A Systematic review. PLoS Climate, In press. DOI: https://doi.org/10.31223/x5p701

Chenoweth, J., Anderson, A. R., Kumar, P., Hunt, W., Chimbwandira, S. J., & Moore, T. L. (2018). The interrelationship of green infrastructure and natural capital. Land Use Policy, 75, 137–144. DOI: https://doi.org/10.1016/j.landusepol.2018.03.021

Ciccantell, P. S., & Smith, D. A. (2007). Nature, Raw Materials, and Political Economy: An Introduction. In Research in rural sociology and development (pp. 1–20). DOI: https://doi.org/10.1016/s1057-1922(05)10001-8

Common, M., & Stagl, S. (2005). The economy in the environment – a conceptual framework. In Cambridge University Press eBooks (pp. 86–122). DOI: https://doi.org/10.1017/cbo9780511805547.007

Cooper, R. (1975). Natural resources and national security. Resources Policy, 1(4), 192–203. DOI: https://doi.org/10.1016/0301-4207(75)90099-9

Coria, J., & Sterner, T. (2010). Natural Resource Management: Challenges and Policy Options. Annual Review of Resource Economics, 3(1), 203–230. DOI: https://doi.org/10.1146/annurev-resource-083110-120131

Corrigan, K., & Shah, A. J. (2011). Quantifying Equilibria Shifts due to Externalities. ASME 2011 5th International Conference on Energy Sustainability, Parts a, B, and C. DOI: https://doi.org/10.1115/es2011-54828

Costanza, R. (2014). Foreword: The importance of valu-

ing ecosystem services. In Edward Elgar Publishing eBooks. DOI: https://doi.org/10.4337/9781781955161.00008
Costanza, R., D'Arge, R., De Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R. V., Paruelo, J., Raskin, R. G., Sutton, P., & Van Den Belt, M. (1997). The value of the world's ecosystem services and natural capital. Nature, 387(6630), 253–260. DOI: https://doi.org/10.1038/387253a0
Daily, G. C., & Matson, P. A. (2008). Ecosystem services: From theory to implementation. Proceedings of the National Academy of Sciences, 105(28), 9455–9456. DOI: https://doi.org/10.1073/pnas.0804960105
Damineva, R., Shulaev, N., Pryanichnikova, V., Kadyrov, R., & Bykovsky, N. (2019). Economic assessment of the effects of pollution of land resources. SHS Web of Conferences, 69, 00145. DOI: https://doi.org/10.1051/shsconf/20196900145
Dark age: the political odyssey of Emperor Bokassa. (1997). Choice Reviews Online, 35(2), 35–1049. DOI: https://doi.org/10.5860/choice.35-1049
Das, P. (2007). Environmental Degradation: Unearthing the Past for Future Longevity. Strategic Analysis, 31(2), 401–413. DOI: https://doi.org/10.1080/09700160701391258
Dasgupta, P., & Levin, S. (2023). Economic factors underlying biodiversity loss. Philosophical Transactions of the Royal Society B Biological Sciences, 378(1881), 20220197. DOI: https://doi.org/10.1098/rstb.2022.0197
Davis, B., Winters, P., Carletto, G., Covarrubias, K., Quiñones, E. J., Zezza, A., Stamoulis, K., Azzarri, C., & DiGiuseppe, S. (2009). A Cross-Country Comparison of Rural Income Generating Activities. World Development, 38(1), 48–63. DOI: https://doi.org/10.1016/j.worlddev.2009.01.003
Day, J. W., & Hall, C. (2016). The Wealth of Nature Is the Wealth of Nations: Ecosystem Services and Their Value to Society. In Springer eBooks (pp. 115–135). DOI: https://doi.org/10.1007/978-1-4939-3243-6_5
De Lange, W., Mahumani, B., Steyn, M., & Oelofse, S. (2012). Monetary valuation of salinity impacts and microbial pollution in the Olifants Water Management Area, South Africa. Water SA, 38(2). DOI: https://doi.org/10.4314/wsa.v38i2.9
Dialga, I. (2017). A Sustainability Index of Mining Countries. Journal of Cleaner Production, 179, 278–291. DOI: https://doi.org/10.1016/j.jclepro.2017.12.185
Díaz, S., Fargione, J., Chapin, F. S., & Tilman, D. (2006). Biodiversity Loss Threatens Human Well-Being. PLoS Biology, 4(8), e277. DOI: https://doi.org/10.1371/journal.pbio.0040277
Díaz, S., Settele, J., Brondízio, E. S., Ngo, H. T., Agard, J., Arneth, A., Balvanera, P., Brauman, K. A., Butchart, S. H. M., Chan, K. M. A., Garibaldi, L. A., Ichii, K., Liu, J., Subramanian, S. M., Midgley, G. F., Miloslavich, P., Molnár, Z., Obura, D., Pfaff, A., . . . Zayas, C. N. (2019). Pervasive human-driven decline of life on Earth points to the need for transformative change. Science, 366(6471). DOI: https://doi.org/10.1126/science.aax3100
Dinçer, I. (2000). Renewable energy and sustainable development: a crucial review. Renewable and Sustainable Energy Reviews, 4(2), 157–175. DOI: https://doi.org/10.1016/s1364-0321(99)00011-8
Dong, D., Xu, X., Yu, H., & Zhao, Y. (2019). The Impact of Air Pollution on Domestic Tourism in China: A Spatial Econometric Analysis. Sustainability, 11(15), 4148. DOI: https://doi.org/10.3390/su11154148
Drupp, M. A., Hänsel, M. C., Fenichel, E. P., Freeman, M., Gollier, C., Groom, B., Heal, G. M., Howard, P. H., Millner, A., Moore, F. C., Nesje, F., Quaas, M. F., Smulders, S., Sterner, T., Traeger, C., & Venmans, F. (2024). Accounting for the increasing benefits from scarce ecosystems. Science, 383(6687), 1062–1064. DOI: https://doi.org/10.1126/science.adk2086
Durán, A. P., Kuiper, J. J., Aguiar, A. P. D., Cheung, W. W. L., Diaw, M. C., Halouani, G., Hashimoto, S., Gasalla, M. A., Peterson, G. D., Schoolenberg, M. A., Abbasov, R., Acosta, L. A., Armenteras, D., Davila, F., Denboba, M. A., Harrison, P. A., Harhash, K. A., Karlsson-Vinkhuyzen, S., Kim, H., . . . Pereira, L. M. (2023). Bringing the Nature Futures Framework to life: creating a set of illustrative narratives of nature futures. Sustainability Science. DOI: https://doi.org/10.1007/s11625-023-01316-1
Easter, K. W., & Konishi, Y. (2006). What Are the Economic Health Costs of Non-action in Controlling Toxic Water Pollution? International Journal of Water Resources Development, 22(4), 529–541. DOI: https://doi.org/10.1080/07900620600799978
Ellabban, O., Abu-Rub, H., & Blaabjerg, F. (2014). Renewable energy resources: Current status, future prospects and their enabling technology. Renewable and Sustainable Energy Reviews, 39, 748–764. DOI: https://doi.org/10.1016/j.rser.2014.07.113
Epstein, M. J., Buhovac, A. R., Elkington, J., & Leonard, H. B. &qout;. (2017). Making Sustainability Work. In Routledge eBooks. DOI: https://doi.org/10.4324/9781351276443
Ernst, W. G. (2006). Earth Materials and Human Health. International Geology Review, 48(3), 191–208. DOI: https://doi.org/10.2747/0020-6814.48.3.191
Ertimi, B., Sarmidi, T., Khalid, N., & Ali, M. H. (2021). The Policy Framework of Natural Resource Management in Oil-Dependence Countries. Economies, 9(1), 25. DOI: https://doi.org/10.3390/economies9010025
Ezirigwe, J. (2017). Human rights and property rights in natural resources development. Journal of Energy & Natural Resources Law, 35(2), 201–213. DOI: https://doi.org/10.1080/02646811.2017.1298697
Farley, J. (2012). Ecosystem services: The economics debate. Ecosystem Services, 1(1), 40–49. DOI: https://doi.org/10.1016/j.ecoser.2012.07.002
Farley, J., & Voinov, A. (2016). Economics, socio-ecological resilience and ecosystem services. Journal of Environmental Management, 183, 389–398. DOI: https://doi.org/10.1016/j.jenvman.2016.07.065
Fox, S., & Beall, J. (2012). Mitigating Conflict and Violence in African Cities. Environment and Planning C Government and Policy, 30(6), 968–981. DOI: https://doi.org/10.1068/c11333j
Frankel, J. (2010). The Natural Resource Curse: A Survey. In NBER WORKING PAPER SERIES (No. 15836). DOI: https://doi.org/10.3386/w15836
Fremdling, R. (1996). Industrial Revolution and Scientific and Technological Progress. Available at: https://econpapers.repec.org/RePEc:gro:rugggd:199630
Garrod, G. D., & Willis, K. G. (2000). Economic ap-

proaches to valuing the environmental costs and benefits of mineral and aggregate extraction. Raw Materials Report/Minerals & Energy./Minerals & Energy, 15(4), 12–20. DOI: https://doi.org/10.1080/14041040009362569
Giordano, M. F., Giordano, M. A., & Wolf, A. T. (2004). International Resource Conflict and Mitigation. Journal of Peace Research, 42(1), 47–65. DOI: https://doi.org/10.1177/0022343305049666
Gulley, A. L., Nassar, N. T., & Xun, S. (2018). China, the United States, and competition for resources that enable emerging technologies. Proceedings of the National Academy of Sciences, 115(16), 4111–4115. DOI: https://doi.org/10.1073/pnas.1717152115
Guo, J. (2011). A Study on the Strategies of Eco-civilization Construction. Journal of Social and Development Sciences, 2(3), 147–152. DOI: https://doi.org/10.22610/jsds.v2i3.664
Guo, R. (2017). Globalization, Natural Resources and Borders. In Elsevier eBooks (pp. 23–49). DOI: https://doi.org/10.1016/b978-0-444-64002-4.00002-7
Gupta, G. S. (2016). The Paradox of Sustainable Development: A Critical Overview of the Term and the Institutionalization Process. Periodica Polytechnica Social and Management Sciences, 25(1), 1–7. DOI: https://doi.org/10.3311/ppso.8919
Gupta, S. S. (2020). Maintaining Natural Capital Stocks: An Insight into Traditional and Modern Approaches. Current World Environment, 335–345. DOI: https://doi.org/10.12944/cwe.15.2.21
Gylfason, T., & Zoëga, G. (2006). Natural Resources and Economic Growth: The Role of Investment. World Economy, 29(8), 1091–1115. DOI: https://doi.org/10.1111/j.1467-9701.2006.00807.x
Haggblade, S., Hazell, P., & Reardon, T. (2010). The Rural Non-farm Economy: Prospects for Growth and Poverty Reduction. World Development, 38(10), 1429–1441. DOI: https://doi.org/10.1016/j.worlddev.2009.06.008
Hahn, R. W. (1993). Getting more environmental protection for less money: A practitioner's guide. Oxford Review of Economic Policy, 9(4), 112–123. DOI: https://doi.org/10.1093/oxrep/9.4.112
Han, S., Li, C., Li, M., Lenzen, M., Chen, X., Zhang, Y., Li, M., Yin, T., Li, Y., Li, J., Liu, J., & Li, Y. (2024). Prospects for global sustainable development through integrating the environmental impacts of economic activities. Nature Communications, 15(1). DOI: https://doi.org/10.1038/s41467-024-52854-w
Hanley, N. (2015). Environmental economics: Pricing the planet. Nature, 520(7548), 434–435. DOI: https://doi.org/10.1038/520434a
Hart, S. L. (1995). A Natural-Resource-Based View of the Firm. Academy of Management Review, 20(4), 986–1014. DOI: https://doi.org/10.5465/amr.1995.9512280033
Heal, G. M. (2020). The Economic Case for Protecting Biodiversity. SSRN Electronic Journal. DOI: https://doi.org/10.2139/ssrn.3714455
Heshmati, A. (2017). A review of the circular economy and its implementation. International Journal of Green Economics, 11(3/4), 251. DOI: https://doi.org/10.1504/ijge.2017.089856
Hickel, J., Brockway, P., Kallis, G., Keyßer, L., Lenzen, M., Slameršak, A., Steinberger, J., & Ürge-Vorsatz, D. (2021). Urgent need for post-growth climate mitigation scenarios. Nature Energy, 6(8), 766–768. DOI: https://doi.org/10.1038/s41560-021-00884-9
Hirschberg, S. (2012). Externalities in the Global Energy System. In Environment & policy (pp. 121–138). DOI: https://doi.org/10.1007/978-94-007-4162-1_10
Hou, X., Liu, J., & Zhang, D. (2018). Regional sustainable development: The relationship between natural capital utilization and economic development. Sustainable Development, 27(1), 183–195. DOI: https://doi.org/10.1002/sd.1915
Hsiang, S., Kopp, R., Jina, A., Rising, J., Delgado, M., Mohan, S., Rasmussen, D. J., Muir-Wood, R., Wilson, P., Oppenheimer, M., Larsen, K., & Houser, T. (2017). Estimating economic damage from climate change in the United States. Science, 356(6345), 1362–1369. DOI: https://doi.org/10.1126/science.aal4369
Huang, X., & Lei, C. (2022). Covid-19 impact on financial growth and guidelines for green recovery in BRICS: fresh insights from econometric analysis. Economic Change and Restructuring, 56(2), 1243–1261. DOI: https://doi.org/10.1007/s10644-022-09460-x
Hufnagel, L., Mics, F., & Homoródi, R. (2018). Introductory Chapter: Evaluation Methods of Ecosystem Services and Their Scientific and Societal Importance in Service of Solving the Global Problems of the Humankind. In InTech eBooks. DOI: https://doi.org/10.5772/intechopen.80227
Hughes, J. D. (1977). Forest Indians: The Holy Occupation. Environmental Review, 1(2), 2–13. DOI: https://doi.org/10.2307/3984362
Imppola, J. J. (2020). Global economy and its sustainability in the globalized world. SHS Web of Conferences, 74, 04008. DOI: https://doi.org/10.1051/shsconf/20207404008
Johnson, J. A., Baldos, U. L., Corong, E., Hertel, T., Polasky, S., Cervigni, R., Roxburgh, T., Ruta, G., Salemi, C., & Thakrar, S. (2023). Investing in nature can improve equity and economic returns. Proceedings of the National Academy of Sciences, 120(27). DOI: https://doi.org/10.1073/pnas.2220401120
Jones-Walters, L., & Mulder, I. (2009). Valuing nature: The economics of biodiversity. Journal for Nature Conservation, 17(4), 245–247. DOI: https://doi.org/10.1016/j.jnc.2009.06.001
Juniah, R., Dalimi, R., Suparmoko, M., Moersidik, S. S., & Waristian, H. (2017). Environmental value losses as impacts of natural resources utilization of in coal open mining. MATEC Web of Conferences, 101, 04013. DOI: https://doi.org/10.1051/matecconf/201710104013
Kakuru, W., Turyahabwe, N., & Mugisha, J. (2013). Total Economic Value of Wetlands Products and Services in Uganda. The Scientific World Journal, 2013(1). DOI: https://doi.org/10.1155/2013/192656
Kitula, A. (2005). The environmental and socio-economic impacts of mining on local livelihoods in Tanzania: A case study of Geita District. Journal of Cleaner Production, 14(3–4), 405–414. DOI: https://doi.org/10.1016/j.jclepro.2004.01.012
Knowler, D. J. (2004). The economics of soil productivity: local, national and global perspectives. Land Degradation and Development, 15(6), 543–561. DOI: https://doi.org/10.1002/ldr.635
Koubi, V., Spilker, G., Böhmelt, T., & Bernauer, T. (2013). Do natural resources matter for interstate and intra-

state armed conflict? Journal of Peace Research, 51(2), 227–243. DOI: https://doi.org/10.1177/0022343313493455
Kronenberg, T. (2004). The curse of natural resources in the transition economies*. Economics of Transition, 12(3), 399–426. DOI: https://doi.org/10.1111/j.0967-0750.2004.00187.x
Lakshminarayan, P., Atwood, J. D., Johnson, S. R., & Sposito, V. A. (1991). Compromise solution for economic-environmental decisions in agriculture. Journal of Environmental Management, 33(1), 51–64. DOI: https://doi.org/10.1016/s0301-4797(05)80047-7
Lampert, A. (2019). Over-exploitation of natural resources is followed by inevitable declines in economic growth and discount rate. Nature Communications, 10(1), 1419. DOI: https://doi.org/10.1038/s41467-019-09246-2
Lanzi, E., Dellink, R., & Chateau, J. (2018). The sectoral and regional economic consequences of outdoor air pollution to 2060. Energy Economics, 71, 89–113. DOI: https://doi.org/10.1016/j.eneco.2018.01.014
Lazo, J. K. (2002). Economic valuation of ecosystem services: Discussion and application. Drug and Chemical Toxicology, 25(4), 349–374. DOI: https://doi.org/10.1081/dct-120014788
Lee, C. (1998). Formulation of resource depletion index. Resources Conservation and Recycling, 24(3–4), 285–298. DOI: https://doi.org/10.1016/s0921-3449(98)00046-9
Lestari, S., Winarno, B., & Premono, B. T. (2020). Incrasing stakeholder engagement for sustainable natural resource management in Southern Sumatra, Indonesia. E3S Web of Conferences, 153, 03010. DOI: https://doi.org/10.1051/e3sconf/202015303010
Levitus, S., Antonov, J., & Boyer, T. (2005). Warming of the world ocean, 1955–2003. Geophysical Research Letters, 32(2), L02604. DOI: https://doi.org/10.1029/2004gl021592
Li, P., Fan, C., Chen, D., & Peng, C. (2013). Sustainability analysis of SEEA indicators for non-renewable resources. Chinese Journal of Population Resources and Environment, 11(2), 97–108. DOI: https://doi.org/10.1080/10042857.2013.777201
Lippke, B. R., & Bishop, J. T. (1999). The economic perspective. In Cambridge University Press eBooks (pp. 597–638). DOI: https://doi.org/10.1017/cbo9780511613029.020
Liu, H. (2022). Measuring the macroeconomic determinants of agricultural price volatility: Implications for natural resource commodity prices for green recovery. Frontiers in Public Health, 10, 1035432. DOI: https://doi.org/10.3389/fpubh.2022.1035432
Lovins, L. (2001). Natural Capitalism: Path to Sustainability? Corporate Environmental Strategy, 8(2), 99–108. DOI: https://doi.org/10.1016/s1066-7938(01)00075-6
Lungu, J. (2008). Socio-economic change and natural resource exploitation: a case study of the Zambian copper mining industry. Development Southern Africa, 25(5), 543–560. DOI: https://doi.org/10.1080/03768350802447719
Maconachie, R. (2016). The extractive industries, mineral sector reform and post-conflict reconstruction in developing countries. The Extractive Industries and Society, 3(2), 313–315. DOI: https://doi.org/10.1016/j.exis.2016.03.004
Majeed, A., Ye, C., Chenyun, Y., Wei, X., & Muniba, N. (2022). Roles of natural resources, globalization, and technological innovations in mitigation of environmental degradation in BRI economies. PLoS ONE, 17(6), e0265755. DOI: https://doi.org/10.1371/journal.pone.0265755
Mancini, L., & Sala, S. (2018). Social impact assessment in the mining sector: Review and comparison of indicators frameworks. Resources Policy, 57, 98–111. DOI: https://doi.org/10.1016/j.resourpol.2018.02.002
Manisalidis, I., Stavropoulou, E., Stavropoulos, A., & Bezirtzoglou, E. (2020). Environmental and Health Impacts of Air Pollution: A Review. Frontiers in Public Health, 8. DOI: https://doi.org/10.3389/fpubh.2020.00014
Marasová, D., Ligatto, M., Cassati, D., & Zolotukhin, V. (2018). On the Methodological Unity of Post-Industrial and Sustainable Development as the Environment Preservation Imperative. E3S Web of Conferences, 41, 04021. DOI: https://doi.org/10.1051/e3sconf/20184104021
Marcus, A. A., Geffen, D. A., & Sexton, K. (2002). Business–Government Cooperation in Environmental Decision-Making. Corporate Environmental Strategy, 9(4), 345–355. DOI: https://doi.org/10.1016/s1066-7938(02)00110-0
Markandya, A. (2015). The Economic Feedbacks of Loss of Biodiversity and Ecosystems Services. OECD Environment Working Papers. DOI: https://doi.org/10.1787/5jrqgv610fg6-en
May, P. H., Soares-Filho, B. S., & Strand, J. (2013). How Much is the Amazon Worth? The State of Knowledge concerning the Value of Preserving Amazon Rainforests. In World Bank policy research working paper. DOI: https://doi.org/10.1596/1813-9450-6668
Mayor, B., Toxopeus, H., McQuaid, S., Croci, E., Lucchitta, B., Reddy, S. E., Egusquiza, A., Altamirano, M. A., Trumbic, T., Tuerk, A., García, G., Feliu, E., Malandrino, C., Schante, J., Jensen, A., & Gunn, E. L. (2021). State of the Art and Latest Advances in Exploring Business Models for Nature-Based Solutions. Sustainability, 13(13), 7413. DOI: https://doi.org/10.3390/su13137413
McIntosh, A., & Pontius, J. (2016). Human Impacts on the Global Landscape. In Elsevier eBooks (pp. 361–470). DOI: https://doi.org/10.1016/b978-0-12-801712-8.00004-4
Mitsch, W. J., Bernal, B., & Hernandez, M. E. (2015). Ecosystem services of wetlands. International Journal of Biodiversity Science Ecosystems Services & Management, 11(1), 1–4. DOI: https://doi.org/10.1080/21513732.2015.1006250
Mohamed, A., DeClerck, F., Verburg, P. H., Obura, D., Abrams, J. F., Zafra-Calvo, N., Rocha, J., Estrada-Carmona, N., Fremier, A., Jones, S. K., Meier, I. C., & Stewart-Koster, B. (2024). Securing Nature's Contributions to People requires at least 20%–25% (semi-)natural habitat in human-modified landscapes. One Earth, 7(1), 59–71. DOI: https://doi.org/10.1016/j.oneear.2023.12.008
Montalvo Corral, C., & Kemp, R. (2008). Cleaner technology diffusion: Case studies, modeling and policy. Editorial. Journal of Cleaner Production, 16(Suppl.

1), S1–S6. Available at: https://repository.tno.nl/islandora/object/uuid%3A9b333dd6-f173-4d4b-95ef-b09954ea8583
Morgan, J. D. (1976). The world supply/demand outlook for minerals. AIP Conference Proceedings. DOI: https://doi.org/10.1063/1.30801
Morrissey, J., & Heidkamp, P. (2022). Sustainability after COVID-19: pillars for a just transition. Environmental Sustainability, 5(2), 261–269. DOI: https://doi.org/10.1007/s42398-022-00231-y
Mujtaba, G., & Shahzad, S. J. H. (2020). Air pollutants, economic growth and public health: implications for sustainable development in OECD countries. Environmental Science and Pollution Research, 28(10), 12686–12698. DOI: https://doi.org/10.1007/s11356-020-11212-1
Munda, G. (1997). Environmental Economics, Ecological Economics, and the Concept of Sustainable Development. Environmental Values, 6(2), 213–233. DOI: https://doi.org/10.3197/096327197776679158
Nahman, A., Wise, R., & De Lange, W. (2010). Environmental and resource economics in South Africa: Status quo and lessons for developing countries. South African Journal of Science, 105(9/10). DOI: https://doi.org/10.4102/sajs.v105i9/10.108
Nassar, N. T., Brainard, J., Gulley, A., Manley, R., Matos, G., Lederer, G., Bird, L. R., Pineault, D., Alonso, E., Gambogi, J., & Fortier, S. M. (2020). Evaluating the mineral commodity supply risk of the U.S. manufacturing sector. Science Advances, 6(8). DOI: https://doi.org/10.1126/sciadv.aay8647
Neale, W. C. (1973). Primitive Affluence: Stone Age Economics . Marshall Sahlins. Aldine-Atherton, Chicago, 1972. xiv, 348 pp., illus. $8.95. Science, 179(4071), 372–373. DOI: https://doi.org/10.1126/science.179.4071.372
Neugarten, R. A., Chaplin-Kramer, R., Sharp, R. P., Schuster, R., Strimas-Mackey, M., Roehrdanz, P. R., Mulligan, M., Van Soesbergen, A., Hole, D., Kennedy, C. M., Oakleaf, J. R., Johnson, J. A., Kiesecker, J., Polasky, S., Hanson, J. O., & Rodewald, A. D. (2024). Mapping the planet's critical areas for biodiversity and nature's contributions to people. Nature Communications, 15(1). DOI: https://doi.org/10.1038/s41467-023-43832-9
Neumann, J. E., & Strzepek, K. (2014). State of the literature on the economic impacts of climate change in the United States. Journal of Benefit-Cost Analysis, 5(03), 411–443. DOI: https://doi.org/10.1515/jbca-2014-9003
Nieto, C. C. (1997). Toward a Holistic Approach to the Ideal of Sustainability. Society for Philosophy and Technology Quarterly Electronic Journal, 2(2), 79–83. DOI: https://doi.org/10.5840/techne19972227
Niroumand, H., Zain, M., Jamil, M., & Niroumand, S. (2013). Earth Architecture from Ancient until Today. Procedia - Social and Behavioral Sciences, 89, 222–225. DOI: https://doi.org/10.1016/j.sbspro.2013.08.838
Nkuepo, H. J. (2012). Natural Resources, Intergenerational Injustice, Environmental Degradation, Water Pollution and the Right to Healthcare. SSRN Electronic Journal. DOI: https://doi.org/10.2139/ssrn.2012920
Nurturing natural capital. (2019). Food Science and Technology, 33(1), 38–42. DOI: https://doi.org/10.1002/fsat.3301_11.x
Nyambe, I. A., & Kawamya, V. M. (2005). Approaches to sustainable minerals development in Zambia. Geological Society London Special Publications, 250(1), 73–86. DOI: https://doi.org/10.1144/gsl.sp.2005.250.01.08
Offiong, E. E. (2016). Environmental Degradation and Conservation in the Cross River Area: A historical appraisal of colonial and post colonial interventions. PEOPLE International Journal of Social Sciences, 2(1), 607–621. DOI: https://doi.org/10.20319/pijss.2016.s21.607621
Olanrewaju, F. O., Joshua, S., & Olanrewaju, A. (2020). Natural Resources, Conflict and Security Challenges in Africa. India Quarterly a Journal of International Affairs, 76(4), 552–568. DOI: https://doi.org/10.1177/0974928420961742
Palmer, C., & Di Falco, S. (2012). Biodiversity, poverty, and development. Oxford Review of Economic Policy, 28(1), 48–68. DOI: https://doi.org/10.1093/oxrep/grs008
Pan, J. (2018). Analysis of the Value System Concerning Nature's Role in Distribution. Chinese Journal of Urban and Environmental Studies, 06(01), 1850001. DOI: https://doi.org/10.1142/s234574811850001x
Panwar, N., Reddy, V. S., Ranjan, K. R., Seepana, M. M., & Totlani, P. (2013). Sustainable development with renewable energy resources: a review. World Review of Science Technology and Sustainable Development, 10(4), 163. DOI: https://doi.org/10.1504/wrstsd.2013.057679
Patel, R. B., & Burkle, F. M. (2012). Rapid Urbanization and the Growing Threat of Violence and Conflict: A 21st Century Crisis. Prehospital and Disaster Medicine, 27(2), 194–197. DOI: https://doi.org/10.1017/s1049023x12000568
Patwa, N., Sivarajah, U., Seetharaman, A., Sarkar, S., Maiti, K., & Hingorani, K. (2020). Towards a circular economy: An emerging economies context. Journal of Business Research, 122, 725–735. DOI: https://doi.org/10.1016/j.jbusres.2020.05.015
Pautrel, X. (2012). Pollution, Private Investment in Healthcare, and Environmental Policy*. Scandinavian Journal of Economics, 114(2), 334–357. DOI: https://doi.org/10.1111/j.1467-9442.2012.01696.x
Pearce, D., & Moran, D. (2013). The Economic Value of Biodiversity. In Routledge eBooks. DOI: https://doi.org/10.4324/9781315070476
Pearce, D. W. (2001). The Economic Value of Forest Ecosystems. Ecosystem Health, 7(4), 284–296. DOI: https://doi.org/10.1046/j.1526-0992.2001.01037.x
Pérez, C. (2015). 11. Capitalism, Technology and a Green Global Golden Age: The Role of History in Helping to Shape the Future. The Political Quarterly, 86(S1), 191–217. DOI: https://doi.org/10.1111/1467-923x.12240
Perrings, C. (2010). The economics of biodiversity: the evolving agenda. Environment and Development Economics, 15(6), 721–746. DOI: https://doi.org/10.1017/s1355770x10000343
Ponting, C. (1990). Historical Perspectives on Sustainable Development. Environment Science and Policy for Sustainable Development, 32(9), 4–39. DOI: https://doi.org/10.1080/00139157.1990.9929051
Posłuszna, E. (2015). Environmental Movement: The Origins, Development, and Radicalization. In Else-

vier eBooks (pp. 115–130). DOI: https://doi.org/10.1016/b978-0-12-801478-3.00007-2
Poudel, K. P. (2014). Resource Management: A Geographical Perspective. The Third Pole Journal of Geography Education, 21–28. DOI: https://doi.org/10.3126/ttp.v11i0.11526
Pullen, J. (2013). An Essay on Distributive Justice and the Equal Ownership of Natural Resources. American Journal of Economics and Sociology, 72(5), 1044–1074. DOI: https://doi.org/10.1111/ajes.12035
Ragheb, G., El-Wahab, M. A., & Ragheb, R. A. (2022). Sustainable Indicators Framework for Strategic Urban Development: A Case Study of Abu Teeg City in Assiut, Egypt. International Journal of Sustainable Development and Planning, 17(1), 91–107. DOI: https://doi.org/10.18280/ijsdp.170109
Raimi, D. (2020). The greenhouse gas effects of increased US oil and gas production. Energy Transitions, 4(1), 45–56. DOI: https://doi.org/10.1007/s41825-020-00022-1
Rajapaksa, D., Islam, M., & Managi, S. (2017). Natural Capital Depletion: the Impact of Natural Disasters on Inclusive Growth. Economics of Disasters and Climate Change, 1(3), 233–244. DOI: https://doi.org/10.1007/s41885-017-0009-y
Ratna, R. V. (2017). Economic Analysis of Health Impacts in Developing Countries. In Elsevier eBooks (pp. 221–230). DOI: https://doi.org/10.1016/b978-0-12-409548-9.10939-x
Reinman, S. L. (2015). Open Knowledge Repository. Reference Reviews, 29(5), 21–22. DOI: https://doi.org/10.1108/rr-05-2015-0113
Ross, M. L. (2014). What Have We Learned about the Resource Curse? Annual Review of Political Science, 18(1), 239–259. DOI: https://doi.org/10.1146/annurev-polisci-052213-040359
Rudra, N., & Jensen, N. M. (2011). Globalization and the Politics of Natural Resources. Comparative Political Studies, 44(6), 639–661. DOI: https://doi.org/10.1177/0010414011401207
Runyan, C., & D'Odorico, P. (2016). Economic Impacts and Drivers of Deforestation. In Cambridge University Press eBooks (pp. 145–172). DOI: https://doi.org/10.1017/cbo9781316471548.006
Ruta, M., & Venables, A. J. (2012). International Trade in Natural Resources: Practice and Policy. Annual Review of Resource Economics, 4(1), 331–352. DOI: https://doi.org/10.1146/annurev-resource-110811-114526
Sabour, S. A. (2003). Quantifying the external cost of oil consumption within the context of sustainable development. Energy Policy, 33(6), 809–813. DOI: https://doi.org/10.1016/j.enpol.2003.10.006
Sagoff, M. (2009). The Economic Value of Ecosystem Services. BioScience, 59(6), 461. DOI: https://doi.org/10.1525/bio.2009.59.6.18
Saint-Macary, C., Keil, A., Nielsen, T., Birkenberg, A., Van, L. T. A., Van, D. T. T., Ufer, S., Dung, P. T. M., Heidhues, F., & Zeller, M. (2012). Linkages Between Agriculture, Poverty and Natural Resource Use in Mountainous Regions of Southeast Asia. In Springer environmental science and engineering (pp. 175–212). DOI: https://doi.org/10.1007/978-3-642-33377-4_5
Saleh, H., Surya, B., Ahmad, D. N. A., & Manda, D. (2020). The Role of Natural and Human Resources on Economic Growth and Regional Development: With Discussion of Open Innovation Dynamics. Journal of Open Innovation Technology Market and Complexity, 6(4), 103. DOI: https://doi.org/10.3390/joitmc6040103
Salih, T. M. (2003). Sustainable economic development and the environment. International Journal of Social Economics, 30(1/2), 153–162. DOI: https://doi.org/10.1108/03068290310453655
Sam, K., Pegg, S., & Oladejo, A. O. (2024). Mining from the pipeline: Artisanal oil refining as a consequence of failed CSR policies in the Niger Delta. Journal of Environmental Management, 352, 120038. DOI: https://doi.org/10.1016/j.jenvman.2024.120038
Sani, N. G. D. (2019). Renewable Energy: Environmental Impacts and Economic Benefits for Sustainable Development. International Journal of Engineering Research And, V8(08). DOI: https://doi.org/10.17577/ijertv8is080224
Sarkar, A., & Wolter, N. (1998). Environmental Externalities From Energy Sources: A Review in the Context of Global Climate Change. Strategic Planning for Energy and the Environment, 18(2), 55–63. DOI: https://doi.org/10.1080/10485236.1998.10530556
Schilling, M., & Chiang, L. (2010). The effect of natural resources on a sustainable development policy: The approach of non-sustainable externalities. Energy Policy, 39(2), 990–998. DOI: https://doi.org/10.1016/j.enpol.2010.11.030
Schipper, Y., Rietveld, P., & Nijkamp, P. (2001). Environmental externalities in air transport markets. Journal of Air Transport Management, 7(3), 169–179. DOI: https://doi.org/10.1016/s0969-6997(01)00002-3
Schulz, K., & Briskey, J. (2003). The Global Mineral Resource Assessment Project. Fact Sheet. DOI: https://doi.org/10.3133/fs05303
Seidl, P. R. (1995). Amazon Biodiversity: A Renewable Natural Resource? In ACS symposium series (pp. 2–7). DOI: https://doi.org/10.1021/bk-1995-0588.ch001
Shabbir, A., Kousar, S., & Kousar, F. (2020). The role of natural resources in economic growth: new evidence from Pakistan. Journal of Economics Finance and Administrative Science, 25(50), 221–238. DOI: https://doi.org/10.1108/jefas-03-2019-0044
Shah, Z., Zaman, K., Khan, H. U. R., & Rashid, A. (2022). The Economic Value of Natural Resources and Its Implications for Pakistan's Economic Growth. Commodities, 1(2), 65–97. DOI: https://doi.org/10.3390/commodities1020006
Shine, K. I. (1996). The wealth of nations: Knowledge as a national resource. American Journal of Obstetrics and Gynecology, 174(4), 1089–1093. DOI: https://doi.org/10.1016/s0002-9378(96)70649-x
Sibi, G. (2018). Bioenergy Production from Wastes by Microalgae as Sustainable Approach for Waste Management and to Reduce Resources Depletion. International Journal of Environmental Sciences & Natural Resources, 13(3). DOI: https://doi.org/10.19080/ijesnr.2018.13.555864
Singer, M. (2018). Climate Change and Social Inequality. In Routledge eBooks. DOI: https://doi.org/10.4324/9781315103358
Sisaye, S. (2012). An ecological analysis of four competing approaches to sustainability development.

World Journal of Entrepreneurship Management and Sustainable Development, 8(1), 18–35. DOI: https://doi.org/10.1108/20425961211221606
Smart, S. (2020). The political economy of Latin American conflicts over mining extractivism. The Extractive Industries and Society, 7(2), 767–779. DOI: https://doi.org/10.1016/j.exis.2020.02.004
Śmiech, S., Papież, M., Rubaszek, M., & Snarska, M. (2020). The role of oil price uncertainty shocks on oil-exporting countries. Energy Economics, 93, 105028. DOI: https://doi.org/10.1016/j.eneco.2020.105028
Smyntyna, O. V. (2003). The Environmental Approach to Prehistoric Studies: Concepts and Theories. History and Theory, 42(4), 44–59. DOI: https://doi.org/10.1046/j.1468-2303.2003.00256.x
Somma, M. (2009). Chapter 2 Traditional living practices: Return to the villages. In Advances in ecopolitics (pp. 29–53). DOI: https://doi.org/10.1108/s2041-806x(2009)0000004005
Sooriyaarachchi, T. M., Tsai, I., Khatib, S. E., Farid, A. M., & Mezher, T. (2015). Job creation potentials and skill requirements in, PV, CSP, wind, water-to-energy and energy efficiency value chains. Renewable and Sustainable Energy Reviews, 52, 653–668. DOI: https://doi.org/10.1016/j.rser.2015.07.143
Spash, C. L. (1995). The political economy of nature∗. Review of Political Economy, 7(3), 279–293. DOI: https://doi.org/10.1080/09538259500000042
Stefanakis, A. I., Calheiros, C. S., & Nikolaou, I. (2021). Nature-Based Solutions as a Tool in the New Circular Economic Model for Climate Change Adaptation. Circular Economy and Sustainability, 1(1), 303–318. DOI: https://doi.org/10.1007/s43615-021-00022-3
Stężały, A., Wyrwa, A., Pluta, M., Zysk, J., & Sliz, B. (2009). Externalities of Energy Production: The Hot Issue. World Futures, 65(5–6), 406–416. DOI: https://doi.org/10.1080/02604020903021727
Stigson, B. (1999). Sustainable development for industry and society. Building Research & Information, 27(6), 424–430. DOI: https://doi.org/10.1080/096132199369282
Sverdan, M. (2021). The blue economy: A new trend in social development. Green Blue and Digital Economy Journal, 2(3), 49–56. DOI: https://doi.org/10.30525/2661-5169/2021-3-8
Telles, T. S., Dechen, S. C. F., De Souza, L. G. A., & De Fátima Guimarães, M. (2013a). Valuation and assessment of soil erosion costs. Scientia Agricola, 70(3), 209–216. DOI: https://doi.org/10.1590/s0103-90162013000300010
The economics of biodiverity: The Dasgupta Review | Royal Society. (2024). Available at: https://royalsociety.org/news-resources/projects/biodiversity/economics-biodiversity/
Theodore, O. (2017). Management of transboundary natural resources. Journal of Law and Conflict Resolution, 9(4), 42–52. DOI: https://doi.org/10.5897/jlcr2016.0266
Thomas, D. S., & Twyman, C. (2005). Equity and justice in climate change adaptation amongst natural-resource-dependent societies. Global Environmental Change, 15(2), 115–124. DOI: https://doi.org/10.1016/j.gloenvcha.2004.10.001
Thomas, J. W. (1995). The Forest Service ethics and course to the future. Landscape and Urban Planning, 32(3), 157–159. DOI: https://doi.org/10.1016/0169-2046(94)00196-a
Tilton, J. E. (2005). Depletion and the Long-Run Availability of Mineral Commodities [Wealth Creation in the Minerals Industry: Integrating Science, Business, and Education]. In The Society of Economic Geologists (pp. 61–70). DOI: https://doi.org/10.5382/sp.12.03
Tinch, R., Beaumont, N., Sunderland, T., Ozdemiroglu, E., Barton, D., Bowe, C., Börger, T., Burgess, P., Cooper, C. N., Faccioli, M., Failler, P., Gkolemi, I., Kumar, R., Longo, A., McVittie, A., Morris, J., Park, J., Ravenscroft, N., Schaafsma, M., . . . Ziv, G. (2019). Economic valuation of ecosystem goods and services: a review for decision makers. Journal of Environmental Economics and Policy, 8(4), 359–378. DOI: https://doi.org/10.1080/21606544.2019.1623083
Tirado, M., Cohen, M., Aberman, N., Meerman, J., & Thompson, B. (2010). Addressing the challenges of climate change and biofuel production for food and nutrition security. Food Research International, 43(7), 1729–1744. DOI: https://doi.org/10.1016/j.foodres.2010.03.010
Tol, R. S. J. (2009). The Economic Effects of Climate Change. The Journal of Economic Perspectives, 23(2), 29–51. DOI: https://doi.org/10.1257/jep.23.2.29
Tran, H., Polka, E., Buonocore, J. J., Roy, A., Trask, B., Hull, H., & Arunachalam, S. (2024). Air Quality and Health Impacts of Onshore Oil and Gas Flaring and Venting Activities Estimated Using Refined Satellite‐Based Emissions. GeoHealth, 8(3). DOI: https://doi.org/10.1029/2023gh000938
Tseng, M. L., Chiu, A. S., Ashton, W., & Moreau, V. (2019). Sustainable management of natural resources toward sustainable development goals. Resources Conservation and Recycling, 145, 419–421. DOI: https://doi.org/10.1016/j.resconrec.2019.03.012
Turner, R., Adger, W., & Brouwer, R. (1998). Ecosystem services value, research needs, and policy relevance: a commentary. Ecological Economics, 25(1), 61–65. DOI: https://doi.org/10.1016/s0921-8009(98)00018-4
Unruh, G. (2007). Sustainable development vs. sustainable redevelopment. Thunderbird International Business Review, 50(1), 17–23. DOI: https://doi.org/10.1002/tie.20173
Usman, M., & Balsalobre-Lorente, D. (2022). Environmental concern in the era of industrialization: Can financial development, renewable energy and natural resources alleviate some load? Energy Policy, 162, 112780. DOI: https://doi.org/10.1016/j.enpol.2022.112780
Veiga, M. M., Scoble, M., & McAllister, M. L. (2001). Mining with communities. Natural Resources Forum, 25(3), 191–202. DOI: https://doi.org/10.1111/j.1477-8947.2001.tb00761.x
Vermeij, G. J., & Leigh, E. G. (2011). Natural and human economies compared. Ecosphere, 2(4), art39. DOI: https://doi.org/10.1890/es11-00004.1
Vojnovic, I. (1995). Intergenerational and Intragenerational Equity Requirements for Sustainability. Environmental Conservation, 22(3), 223–228. DOI:

https://doi.org/10.1017/s0376892900010626
Wang, F., Jin, M., Li, J., Zhang, Y., & Chen, J. (2022). Profound Impact of Economic Openness and Digital Economy towards a Sustainable Development: A New Look at RCEP Economies. Sustainability, 14(21), 13922. DOI: https://doi.org/10.3390/su142113922
Wang, K., Belt, M. C. D., Heath, G., Walzberg, J., Curtis, T., Berrie, J., Schröder, P., Lazer, L., & Altamirano, J. (2022). Circular economy as a climate strategy: current knowledge and calls-to-action. DOI: https://doi.org/10.2172/1897625
Wang, S. J. (2014). A Few Basis Points of the Ecological Economy. Advanced Materials Research, 1073–1076, 2871–2874. DOI: https://doi.org/10.4028/www.scientific.net/amr.1073-1076.2871
Ware, H. (2005). Demography, Migration and Conflict in the Pacific. Journal of Peace Research, 42(4), 435–454. DOI: https://doi.org/10.1177/0022343305054090
Weick, V. (2016). Green Economy and sustainable development. In Edward Elgar Publishing eBooks. DOI: https://doi.org/10.4337/9781783473816.00016
Williams, M. (1998). “The End of Modern History”? Geographical Review, 88(2), 275. DOI: https://doi.org/10.2307/215805
Woodward, R. T., & Wui, Y. (2001). The economic value of wetland services: a meta-analysis. Ecological Economics, 37(2), 257–270. DOI: https://doi.org/10.1016/s0921-8009(00)00276-7
Xu, Y., & Zhao, F. (2023). Impact of energy depletion, human development, and income distribution on natural resource sustainability. Resources Policy, 83, 103531. DOI: https://doi.org/10.1016/j.resourpol.2023.103531
Yilin, Z. (2013). The Man-Nature Relationship in Chinese History: A Study from Multiple Perspectives. Social Sciences in China, 34(4), 193–201. DOI: https://doi.org/10.1080/02529203.2013.849099
York, J. G., & Venkataraman, S. (2010). The entrepreneur–environment nexus: Uncertainty, innovation, and allocation. Journal of Business Venturing, 25(5), 449–463. DOI: https://doi.org/10.1016/j.jbusvent.2009.07.007

Received: September 18, 2024 | Revised: October 28, 2024 | Accepted: November 09, 2024