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Addressing Environmental Challenges Through Circular Economy Models

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Abstract

This paper presents a critical analysis of sustainable development, with a particular focus on the environmental dimension. The author argues that, despite the significant financial investments made by affluent countries to protect the environment, the actual outcomes of these efforts remain relatively weak. The paper posits that the current linear economic model is fundamentally incompatible with addressing key environmental issues such as waste management, CO₂ emissions, and the depletion of natural resources. This incompatibility arises because the linear model's underlying principles often conflict with the interests of global economic powers. To address these shortcomings, the paper advocates for a transition from the linear economy to a circular economy. The circular economy model is proposed as a solution that can simultaneously ensure sustainability and maintain economic competitiveness. The effectiveness of this model is supported by an analysis using Spearman's rank correlation coefficient, which demonstrates the potential benefits of a circular economy in achieving environmental goals without compromising economic performance. The paper highlights that the shift to a circular economy is not merely an environmental necessity but also a strategic move that can align economic activities with long-term sustainability objectives. By closing resource loops, reducing waste, and minimizing environmental impact, the circular economy offers a viable alternative to the traditional linear model, which has proven inadequate in solving pressing environmental challenges. The paper calls for a fundamental rethinking of the economic models currently in place, emphasizing the need for systemic changes that prioritize sustainability. The analysis suggests that adopting a circular economy could be a crucial step towards achieving meaningful and lasting environmental protection, thus addressing the limitations of current approaches within the global economic framework.

Keywords: Sustainable Development, Circular Economy, Linear Economy, Environmental Protection

JEL Codes: Q56, O44, D63

1. INTRODUCTION

In recent years, the concept of sustainable development has been gaining increasing attention across the globe. This idea has become an integral component of various policies, programs, and development plans at all levels of management, education, and governance. Governments, non-governmental organizations (NGOs), institutions, businesses, and even consumers are investing billions of dollars in the effort to create a more sustainable world. Despite these considerable investments, however, the tangible effects of these efforts, particularly in the environmental sphere, remain relatively weak. The primary objective of this paper is to argue that the potential for transforming the contaminated Earth through sustainable development within the framework of a capitalistic model is inherently limited. While the principles of sustainable development aim to balance economic growth, environmental protection, and social equity, the very structure of capitalism often prioritizes short-term profit and economic expansion over long-term environmental sustainability. This creates inherent tensions between the goals of sustainability and the demands of market-driven economies. The paper will explore how these limitations restrict the effectiveness of sustainable development in achieving meaningful environmental outcomes and will discuss alternative approaches or adaptations needed to address these challenges.

The concept of a circular economy, as a practical implementation of sustainable development, presents a promising approach to reducing the negative externalities associated with global production and consumption. Unlike the traditional linear model of "take, make, dispose," the circular economy aims to close the loop by promoting the reuse, recycling, and regeneration of materials and products. This model not only minimizes waste but also encourages the efficient use of resources, contributing to both economic growth and environmental sustainability. By redesigning systems to keep products and materials in circulation for as long as possible, the circular economy helps cut down on waste, reduce resource extraction, and lower emissions—all while fostering innovation and creating new economic opportunities. This approach enables businesses to remain profitable and competitive while simultaneously addressing critical environmental challenges such as resource depletion and pollution. The circular economy, therefore, offers a practical and effective way to integrate sustainability into the global economy, balancing the need for growth with the imperative to protect the environment. By transitioning towards this model, companies and governments can achieve a more resilient and sustainable future, one where economic development

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is no longer in conflict with environmental stewardship.

2. GLOBAL ISSUES OF SUSTAINABLE DEVELOPMENT

The concept of sustainable development first emerged in the 1960s as a response to the negative consequences of rapid population growth and increasing consumption, both of which were leading to the uncontrolled exploitation of natural resources. This growing awareness of environmental degradation and the need for a more balanced approach to development culminated in the formal definition of sustainable development in 1987, in the Brundtland Report (also known as *Our Common Future*). The report, published by the United Nations World Commission on Environment and Development (WCED), defined sustainable development as "development that meets the needs of current generations without compromising the ability of future generations to meet their own needs. This definition underscores the importance of ensuring that economic, social, and environmental needs are addressed in a way that allows both present and future generations to thrive. The Brundtland Report emphasized the need for a more integrated approach to development, balancing economic growth with environmental protection and social equity to create a more sustainable future. It remains a cornerstone of global discussions on sustainability and continues to influence policies and strategies aimed at addressing the long-term challenges of resource use, environmental degradation, and social inequality.

However, the definition of sustainable development provided in the Brundtland Report, while widely accepted, is often criticized for being vague and posing numerous methodological challenges. The broad nature of the definition leaves room for interpretation, making it difficult to create universally applicable frameworks or policies. Generally, sustainable development is described in terms of three key dimensions: economic, social, and environmental spheres. These dimensions reflect the need for a balanced approach that ensures economic growth, social well-being, and environmental sustainability. The increasing complexity of the concept is highlighted by the rapid proliferation of definitions. In 2000, there were around 200 definitions of sustainable development (Parkin, Sommer, and Uren, 2003), but by 2010, that number had already surpassed 500 (Lefebvre, 2010). This growth in definitions underscores the dynamic and evolving nature of the concept, as it adapts to new challenges and insights, particularly concerning durability principles—the idea of long-term sustainability and resilience.

These numbers indicate that sustainable development is not a static idea, but one that continues to expand as scholars, policymakers, and practitioners seek to address the complexities of modern global challenges, such as climate change, resource depletion, and social inequality. This evolution reflects ongoing efforts to refine and apply the principles of sustainability in diverse contexts, highlighting the need for adaptable and context-specific solutions. The environmental sphere plays a crucial role in sustainable development because it serves as the material foundation for all human activities. This reality has prompted governments worldwide to allocate increasing amounts of resources to combat environmental degradation and promote sustainability. As early as 1998, environmental protection expenditures in the United States were estimated to exceed 150 billion USD annually, which accounted for approximately 2% of the country's GDP (Morgenstern, Pizer, Shih, 1998). Similarly, in the European Union, environmental protection spending rose from 65.7 billion EUR in 2004 to 87.2 billion EUR in 2013 (Eurostat, 2013). Even China, facing significant environmental challenges due to rapid industrialization, committed to investing more than 817 billion USD in environmental protection between 2011 and 2015 (The Climate Group, 2014). This growing financial commitment reflects a global recognition of the need to prioritize environmental sustainability. Further demonstrating this global shift, during the United Nations Conference on Climate Change held in Paris (COP21), delegates reaffirmed the commitment of developed countries to continue mobilizing USD 100 billion per year for climate action through 2025. After that, a new collective financial goal will be established to ensure sustained global investment in environmental protection and climate mitigation (European Commission, 2016). These large-scale investments illustrate the recognition of the environmental sphere as a vital component of sustainable development and highlight the urgency of addressing environmental challenges to secure a sustainable future for all.

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As early as 2009, during the Copenhagen Summit, researchers presented alarming data indicating that, to limit global warming

to 2°C by 2040, a maximum rate of emissions reduction of 9% per year would be required (Copenhagen Diagnosis, 2009). However, from the perspective of the current global economy, such a drastic reduction is widely viewed as unrealistic. Achieving this rate of reduction would necessitate profound changes in industrial practices, energy consumption, and societal behavior—shifts that, while urgently needed, are difficult to implement at the scale and speed required. The challenge is compounded by the structure of modern economies, which are heavily reliant on fossil fuels and energy-intensive production systems. The integration of renewable energy sources, increased efficiency, and other technological advancements have made strides, but the scale of transformation required to meet the 2°C target remains a significant hurdle. This mismatch between scientific urgency and economic feasibility continues to highlight the complexities involved in global climate mitigation efforts. It underscores the need for innovative policies, international cooperation, and investment in sustainable technologies to achieve meaningful reductions in emissions while maintaining economic stability. The situation is even more alarming when it comes to natural resources, particularly water, which is essential for human survival. Currently, over one billion people live in water-scarce regions, and this number is projected to rise to as many as 3.5 billion by 2025 (World Resources Institute). This looming crisis poses a significant challenge not only to human well-being but also to global development and stability. The situation is particularly dramatic in China, where rapid economic growth has been accompanied by a significant decline in water availability. In 1997, China had 2,253 cubic meters of water per capita, but this has now dropped to 1,812 cubic meters. This steep reduction is a clear indicator of how economic expansion, industrialization, and population growth are placing unsustainable pressure on water resources. Additionally, recent studies highlight that a lack of access to clean water is set to become one of the primary factors hindering China's future development (Sobkowiak, 2011).

Water scarcity, compounded by pollution and mismanagement, threatens to undermine economic progress, food security, and public health in water-stressed regions. As global populations continue to grow and climate change exacerbates these issues, addressing water resource management has become a critical priority for both national governments and international organizations to ensure long-term sustainability and prevent a global water crisis. A striking example that highlights the tension between economic growth and environmental sustainability is the global extraction of material resources, which has continued to escalate despite widespread commitments to sustainable development policies, especially in G8 and OECD countries (OECD, 2009). In 2007, the total volume of material resources extracted or harvested worldwide reached nearly 60 billion metric tonnes (Gt) annually, representing a 65% increase from 1980. Over the last century, material extraction has grown dramatically, rising nearly eight-fold from less than 7 Gt per year in 1900 (Krausmann, 2009). Between 1980 and 2020, global extraction was projected to increase by 200% for metal ores, 81% for fossil energy carriers, 68% for biomass, and 114% for non-metallic minerals (OECD, 2008). Following the financial crisis, as the global economy recovers, this growth in resource extraction is expected to continue, with projections estimating that total global extraction could reach 100 Gt by 2030.

This raises an important question: why, despite the implementation of long-term environmental programs, do developed economies such as the United States and Canada continue to maintain a heavy dependence on fossil fuels? The answer lies partly in the deep integration of fossil fuels into these nations' industrial structures, energy infrastructures, and economic models. While policies promoting renewable energy and resource efficiency have been adopted, the transition away from fossil fuels has proven slow and complex, largely due to economic interests, political factors, and technological dependencies. This paradox demonstrates the ongoing challenges of aligning economic growth with sustainable development goals. Despite efforts to implement environmental policies, the continued rise in global resource extraction, especially of non-renewable materials, highlights the persistent gap between policy ambitions and real-world practices. The question of how to decouple economic prosperity from environmental degradation remains central to the sustainable development discourse.

A similar challenge exists with waste management, as global waste production continues to rise alongside population growth and urbanization. By 2100, it is estimated that the global urban population will generate three times as much waste as it does today (World Bank, 2013). The situation is particularly stark in the United States, where waste generation is at an alarmingly high rate. In 2007, Americans disposed of approximately 570 billion pounds of municipal solid waste. Compared to other nations, the United States has one of the highest per capita waste generation rates. On average, each American discards more than 1,650 pounds of garbage annually, or around 4.6 pounds per person daily. This figure is nearly double the average in 1960, which was about 2.7 pounds per day (Toxics Action Center). This increase reflects broader consumption patterns and underscores the significant challenge that modern societies face in managing waste efficiently, despite advancements in recycling and waste reduction efforts. The growing volume of waste highlights the urgent need for more effective waste management strategies, as the current trajectory is unsustainable. It also emphasizes the necessity for systemic changes in consumption habits, waste reduction initiatives, and the adoption of circular economy principles to manage resources more responsibly and reduce the environmental burden caused by excessive waste.

Interestingly, as far back as 1986, it was predicted that U.S. enterprises could significantly reduce the quantity of waste generated by up to 50% over a five-year period, which would have also led to substantial cuts in manufacturing costs (Taylor, 1986: 48). However, this potential has largely remained unrealized due to a lack of regulations and, perhaps more importantly, a lack of good will from businesses. The root of the problem lies in the prevailing neo-liberal capitalist system, which is driven by the maximization of profits and operates according to a linear model of resource consumption—take, use, and dispose. This system is inherently unsustainable. As Barry Commoner argued in 1972, "we have broken out of the circle of life, converting its endless cycles into man-made, linear events" (Commoner, 1972: 12). In this linear approach, there is no inherent mechanism

for reusing, reducing, or recycling resources, leading to an accumulation of waste and depletion of natural resources. In response to the environmental degradation caused by this unsustainable model, some researchers have proposed the term "Anthropocene" to describe the current epoch, in which human activities have driven profound environmental changes and a geological revolution of human origin (Bonneuil & Fressoz, 2016). This term reflects the reality that human actions have pushed the Earth into a state it has not experienced for millions of years, characterized by environmental crises and the destabilization of natural systems. Considering these developments, it is increasingly evident that the current economic paradigms are untenable in the long run. The solution lies in transitioning to a circular economy model, which promotes the reuse, recycling, and regeneration of materials, thereby closing the loop of production and consumption. Unlike the linear model, the circular economy seeks to minimize waste, extend the life cycle of products, and use resources more efficiently, making it a more sustainable and resilient approach for both the environment and the economy. This shift represents a necessary evolution in how we approach resource management and economic growth, aiming to balance the needs of current and future generations.

3. DISCUSSION

The concept of the circular economy has existed for centuries, particularly in regions where access to financial, material, or natural resources was limited. The idea, built on the principles of Reduce, Reuse, and Recycle, envisions an economy capable of reusing waste by reintegrating it into the production and consumption cycle as raw materials or components. The fundamental assumption of this model is that every stakeholder, whether consumer or producer, must find their participation in the system profitable. When economic benefits are clearly evident, businesses and individuals are more likely to change their behavior, adopting sustainable practices and evolving into what Geng and Doberstein refer to as a more environmentally conscious "homo sustiens". The circular economy operates on multiple levels within society. At the micro level, it involves creating eco-projects, developing eco-friendly products, minimizing waste, and implementing comprehensive environmental management systems. At the macro level, it facilitates the creation of eco-industrial parks where industries collaborate to optimize resource use and minimize waste. On a broader scale, at the mezzo level, it encourages the development of eco-cities, eco-communities, and eco-regions, integrating sustainable practices into daily life. Establishing such a network requires active government involvement to ensure that policies, incentives, and regulations support these circular economy practices at all levels.

From this perspective, the circular economy can be understood as an industrial system designed to be restorative and regenerative. Instead of following a linear "end-of-life" process, it seeks to restore and reuse resources. The focus is on promoting renewable energy, eliminating toxic chemicals that prevent the reuse of materials, and designing products and systems to minimize waste. By doing so, the circular economy decouples economic growth from the consumption of finite resources, moving toward what is often referred to as circular innovation. The main advantage of the circular economy lies in its potential to simultaneously promote sustainability and economic competitiveness. For instance, it could foster economic growth, create new jobs, and significantly reduce carbon emissions. According to McKinsey, Europe could leverage the impending technological revolution to create a net benefit that far exceeds what would be achieved through a traditional linear development path. These possibilities have made the concept of a circular economy increasingly appealing across the globe, despite the long-term nature of the transformation and the significant reforms and investments required.

In 2015, the European Commission introduced measures to accelerate Europe's transition toward a circular economy. These included substantial funding, initiatives to reduce food waste, the development of quality standards for secondary raw materials, and measures to enhance the reparability, durability, and recyclability of products. While the extent of circular economy implementation varies across countries, it is clear that many have recognized the potential benefits of embracing these principles. Countries such as Denmark, the Netherlands, Norway, Germany, and Japan are at the forefront of implementing circular economy practices, each adapting the model to its own economic, political, and social context. Interestingly, a strong correlation exists between the countries that have adopted circular economy principles and those that rank highly on the IMD World Competitiveness Scoreboard. This suggests that nations prioritizing sustainability through the circular economy also tend to be more competitive, demonstrating the mutual benefits of adopting this forward-thinking model.

Even China has begun to follow the path of the circular economy, and this shift is not coincidental. For several decades, China's economy has been growing at an unprecedented rate, but this rapid development has come at a significant cost to the environment. The consequences are most visible in the country's smog-ridden cities, where access to clean air and drinking water has become a luxury. The environmental degradation is severe, with two-thirds of the economic growth during the 1990s occurring at the expense of the environment (Lévy, 2009). Faced with the growing urgency of environmental issues, China has been forced to act quickly. The country introduced the China Circular Economy Promotion Law in 2009, which integrates economic growth with ecological preservation. This law, rooted in the principles of the circular economy, applies at both the local and central levels, with a budget of 36 billion yuan allocated specifically for circular economy projects. These initiatives span across various sectors, including circular agriculture, circular industry, and the development of eco-cities and eco-parks (Lévy & Auez, 2014). China's embrace of the circular economy reflects a growing recognition of the need to balance rapid economic development with environmental sustainability. By adopting circular economy practices, China aims to mitigate the environmental damage caused by decades of unchecked industrial growth while continuing to drive its economy forward. This

represents a crucial step toward addressing the country's environmental crisis and creating a more sustainable future.

4. CONCLUSIONS

The concept of sustainable development, while built on sound principles of balancing economic, social, and environmental priorities, is not without its limitations when faced with the magnitude of global challenges such as natural resource depletion and environmental degradation. Although sustainable development promotes the idea of growth that meets the needs of the present without compromising the ability of future generations to meet theirs, this concept does not inherently address the fundamental flaws of the current linear economic model. In this linear system, resources are extracted, used for production, consumed, and then discarded as waste—a cycle that is inherently unsustainable. The paradox of sustainable development lies in its compatibility with a system that prioritizes short-term economic growth over long-term resource regeneration. The model's failure to fully integrate the reuse and recycling of resources, particularly in industries that thrive on mass production and consumption, results in continuous waste generation and environmental damage. While sustainable development policies may attempt to curb some of these effects, they are often not radical enough to reverse the harm done by this linear process. One of the most pressing issues is that many of the world's natural resources—whether forests, water supplies, minerals, or fossil fuels—are being consumed at rates far beyond their ability to regenerate. This overuse has already pushed several critical ecosystems and resources to the brink, where recovery is either impossible or would require centuries.

Climate change, biodiversity loss, and soil depletion are just a few of the visible consequences of this unchecked exploitation. The linear paradigm not only exacerbates these problems but also offers no viable solution for ensuring the long-term sustainability of the planet. This disconnect between the goal of sustainability and the economic systems in place makes it clear that the traditional sustainable development approach is, at best, incomplete and, at worst, ineffective in halting environmental decline. Moreover, while sustainable development frameworks often advocate for more efficient resource use and encourage green technologies, these solutions are often incremental rather than transformative. They address the symptoms—such as energy inefficiency, pollution, or waste—without challenging the underlying economic model that creates these issues. For instance, renewable energy can reduce carbon emissions, but without addressing consumption patterns and resource use, it doesn't tackle the broader issue of overexploitation of materials or habitat destruction. At its core, the linear economic system operates on the assumption of endless resource availability, which is fundamentally at odds with the concept of sustainability. The idea that we can continue extracting, consuming, and discarding resources without reaching a breaking point is not only unrealistic but also dangerous.

Natural resources are not infinite, and many are being depleted faster than they can be replaced. This not only threatens the environment but also jeopardizes the very economic systems that rely on these resources to function. The economic growth achieved at the expense of natural capital is ultimately unsustainable, as it depletes the very foundations on which societies and economies depend. What this reveals is the necessity for a deeper shift—a transition from a linear economy to a circular economy. Unlike the linear model, the circular economy is built on the principles of resource regeneration, reuse, and recycling, aiming to close the loop of production and consumption. In a circular economy, materials are designed to be reused, repaired, and recycled, minimizing waste and ensuring that the life cycle of products is extended. This model aligns much more closely with the true essence of sustainable development because it acknowledges the finite nature of resources and seeks to keep them in circulation rather than discarding them after a single use. Furthermore, the circular economy does not only focus on environmental benefits. It also holds significant economic potential by reducing material costs, fostering innovation in product design, and creating new industries around the repair and recycling of goods. By decoupling economic growth from resource consumption, the circular economy offers a way to achieve prosperity without exhausting the planet's natural assets. This is critical because, as current models show, attempts to achieve sustainable development within a linear economy are destined to fall short of their goals. The circular economy also promotes a shift in mindset—from viewing waste as a byproduct to seeing it as a resource. For example, in industries such as construction or agriculture, what is typically considered waste can be reintroduced into the production cycle as raw materials for new products. Similarly, in consumer goods, product life cycle design could ensure that products are either biodegradable or easily disassembled for recycling. Such approaches go far beyond the incremental improvements often associated with traditional sustainable development policies and represent a much-needed systemic shift in how we think about resource use.

In conclusion, while sustainable development offers a framework for balancing economic growth with environmental stewardship, its effectiveness is limited within the confines of a linear economic system. The key to truly addressing the global environmental crisis lies in transitioning to a circular economy, where resources are continuously reused and regenerated, and waste is minimized. This transformation requires more than just policy adjustments or technological fixes—it demands a paradigm shift in how economies are structured and how society values resources. Without this fundamental change, sustainable development may remain a well-intentioned concept that is ultimately insufficient to address the ecological and resource challenges of our time. The analysis revealed a troubling paradox: despite increasing investments in environmental protection, these actions have not yielded the anticipated results. Major economic powers, such as the United States, Canada, and China, continue to be some of the world's largest polluters. This contradiction highlights a fundamental issue in the global approach to environmental sustainability. While substantial resources are allocated to address environmental concerns, the focus of these efforts is often undermined by the prevailing economic model, which prioritizes short-term profit and economic

growth over long-term environmental protection.

In these economies, the drive for immediate economic gain often leads to policies and practices that deplete natural resources and increase pollution. Industries that are key drivers of economic growth, such as manufacturing, energy production, and agriculture, are typically high emitters of greenhouse gases and other pollutants. This economic model, which emphasizes growth at all costs, inherently conflicts with the goals of environmental protection. The persistent prioritization of economic expansion over sustainability results in a cycle where environmental degradation continues, despite efforts to mitigate it through regulation or investment. This dynamic creates a situation in which economic powers, while capable of leading the world in environmental innovation, remain among the largest contributors to global pollution. The failure to balance economic growth with genuine environmental protection highlights the need for more comprehensive and integrated solutions that move beyond temporary fixes or superficial investments. Until the underlying economic incentives that favor short-term gains over sustainable practices are addressed, the global challenge of pollution and resource depletion will likely persist, with environmental investments failing to deliver the long-term results that are critically needed.

The reality is that we cannot simply impose an immediate stop to economic growth or environmental degradation and hope to address the consequences at a later stage. The interconnectedness of global economies means that any sudden disruption could have severe economic and social repercussions, especially in terms of livelihoods, poverty alleviation, and overall development. However, this does not mean that we are without solutions. This is where the concept of the circular economy offers a real opportunity to reconcile competitiveness with environmental protection. The circular economy presents an alternative to the traditional linear model, which has historically driven economic growth at the cost of environmental sustainability. By promoting the reuse, recycling, and regeneration of resources, the circular economy aims to decouple economic growth from the depletion of finite resources. This model allows for continued industrial and economic development while significantly reducing the environmental footprint. In a circular economy, businesses can maintain their competitiveness by adopting innovative production methods that minimize waste, improve resource efficiency, and extend the lifecycle of products. This shift not only enhances environmental sustainability but also creates new opportunities for economic growth. Companies that embrace circular practices are often able to lower production costs, reduce dependency on raw materials, and open new revenue streams through services like repair, remanufacturing, and recycling. The circular economy thus provides a framework where both environmental objectives and economic success can coexist. It offers a pathway for sustainable development that does not require halting growth but rather transforming how we think about production and consumption. By integrating environmental responsibility into the core of business strategies, the circular economy has the potential to foster long-term competitiveness while simultaneously addressing the urgent need for environmental protection.

REFERENCES

- Bonneuil, Ch., & Fressoz, J.-B. (2016). *The Shock of the Anthropocene: The Earth, History and Us*. New York: Verso Book.
- Commoner, B. (1972). *The Closing Circle: Confronting the Environmental Crisis*. London: Jonathan Cape LTD.
- Ellen MacArthur Foundation (2012). Available at: Ellen MacArthur Foundation.
- Ellen MacArthur Foundation (2015a). *Delivering the Circular Economy – A Toolkit for Policymakers*.
- Ellen MacArthur Foundation (2015b). *Growth Within: A Circular Economy Vision for a Competitive Europe*.
- European Commission (2015). *Closing the Loop: Commission Adopts Ambitious New Circular Economy Package*.
- European Commission (2016).
- Eurostat (2013).
- Geng, Y., & Doberstein, B. (2008). Developing the Circular Economy in China: Challenges and Opportunities for Achieving 'Leapfrog Development'. *International Journal of Sustainable Development & World Ecology*, 15(3), 231–239.
- Heede, R. (2014). Tracing Anthropogenic Carbon Dioxide and Methane Emissions to Fossil Fuels and Cement Producers. *Climatic Change*, 1(122), 229–241.
- IMD World Competitiveness Scoreboard (2015).
- Lévy, J.-C. (2009). *L'économie Circulaire: L'urgence Écologique?* Paris: Presses des Ponts et chaussées.
- Lévy, J.-C., & Auzé, V. (2014). *L'Économie Circulaire: Un Désir Ardent des Territoires*. Paris: Presses des Ponts.
- Morgenstern, R.D., Pizer, W.A., & Shih, J.-S. (1998). *The Cost of Environmental Protection*.
- OECD (2008). *Measuring Material Flow and Resource Productivity, Synthesis Report*.
- OECD (2009). *Resource Productivity in the G8 and the OECD*.
- Parkin, S., Sommer, F., & Uren, S. (2003). Sustainable Development: Understanding the Concept and Practical Challenge. *Proceedings of the ICE, Engineering Sustainability*, 3(156), 19–26.
- Satterthwaite, D. (2009). The Implications of Population Growth and Urbanisation for Climate Change. *Environment & Urbanisation*, 2(21), 545–567.
- Sobkowiak, L. (2011). Wielkie Problemy Wielkiego Kraju: Gospodarowanie Wodą w Chinach.
- Statista (2015). The Largest Producers of CO2 Emissions Worldwide in 2015.
- Taylor, R.E. (1986). EPA Offers Aid for Firms to Cut Hazardous Waste. *Wall Street Journal*, October 31.
- The Climate Group (2014).
- The Economist (2015).

Toxics Action Center.

U.S. Environmental Protection Agency (2007). *Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts and Figures 2007*.

United Nations (1987). *Report of the World Commission on Environment and Development*.

World Bank (2013). *Global Waste on Pace to Triple by 2100*.

World Resources Institute (2014). *6 Graphs Explain the World's Top 10 Emitters*.