

## Review

# Catalysts for Green Economy: How Business Models of Start-ups in Environmental, ESG, and RE100 Technologies Drive Global and Domestic Economic Growth

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**Abstract:** The linear "take-make-dispose" economic model is unsustainable, driving a global business shift towards sustainable development. This review examines the innovative business models of environmental, social, and governance (ESG)-focused and RE100 start-ups, contrasting them with traditional models centered on short-term financial returns. Sustainable start-ups integrate environmental and social impact with financial viability, redefining success. In this review, how these novel approaches influence global and domestic economies is analyzed, and their capacity to foster new markets, attract green investment, create specialized employment, and drive systemic change is explored. Case studies of Ørsted and Apeel Sciences highlight successful transitions and challenges, such as those faced by Solyndra and Terracycle, emphasizing market competitiveness and scalability. These business models emphasize "net-positive" impacts, integration of AI, ML, and IoT for optimized resource use, and advanced circular economy models. Scalability, affordability, cross-sectoral collaboration, strong policy frameworks, and diverse capital availability are required to maximize economic impact and accelerate the global transition to a sustainable economy.

**Keywords:** Green economy, Global economy, Start-up, Business model, ESG, RE100, Environment

## 1. Introduction

The traditional paradigm of economic growth is characterized by a linear "take-make-dispose" and resource utilization. The paradigm is recognized as unsustainable amid climate change, resource depletion, and growing social inequalities. This has transformed global business to focus on sustainable development as a core strategy (Eccles *et al.*, 2014). Such transformation has been driven by start-up companies developing or running businesses related to environmental protection, adherence to the environmental, social, and governance (ESG) criteria, and 100% renewable electricity (RE100). Such start-ups are actively reacting to environmental pressures to proactively shape a new economic future. The distinct business models adopted by these sustainable start-ups are altering the way of creating, distributing, and maintaining economic value. Traditional start-ups mainly pursue short-term financial returns, while green and ESG-focused start-ups integrate environmental and social impact alongside financial viability, redefining the essence of a successful enterprise.

This review delves into the history of traditional start-up business models and analyzes the innovative business models employed by environmental, ESG, and RE100 start-ups. The effects of the business models are analyzed quantitatively and qualitatively to assess how these novel approaches influence global and domestic economies and explore their capacity to foster new markets, attract unprecedented levels of green investment, create specialized employment, and drive systemic change across established industries. Through case studies, the economic effects are identified, including successful factors and challenges. The future of the business models is projected, and strategic recommendations are proposed to maximize economic impact and accelerate the global transition to a sustainable economy.

## 2. Traditional to Sustainable Business Models

A business model describes the rationale of how an organization creates, delivers, and captures value (Osterwalder and Pigneur, 2010). Start-up business models reflect economic paradigms, technological advancements, and societal values.

### 2.1. Traditional Business Models

Traditional start-up business models focus on maximizing financial returns for shareholders. The value proposition is a new product or service, designed for efficiency, scalability, and market dominance. In the product or service sales model, the direct sale

of goods or services (e.g., software licenses, hardware sales, retail products) and revenue derived from transaction volume are important data. To advertise products or services, media, websites, and e-commerce platforms are used and major revenue comes through such advertising activities. Revenues are recurring from access to a service or content (e.g., magazines, early software-as-a-service). The traditional start-up business models assume transactions between buyers and sellers with a commission. The economies of scale and reducing per-unit costs are important to maximize profits. As an exit strategy, rapid growth for an acquisition or initial public offering (IPO) is emphasized, with less emphasis on long-term systemic impact beyond the core product. In the model, quantitative analysis is conducted using metrics, including customer acquisition cost (CAC), lifetime value (LTV), burn rate, monthly recurring revenue (MRR), and market share. The success of a business is assessed by revenue growth, profitability, and investor returns. While many traditional start-ups have contributed significantly to economic growth through job creation and innovation, their business models do not inherently embed environmental or social considerations. Externalities, such as pollution or resource depletion, are unaccounted for in the model for core value propositions or revenue streams.

## 2.2. New Business Models of Environmental, ESG, and RE100 Start-ups

The increase in environmental consciousness, coupled with advancements in clean technologies and a growing recognition of ESG by investors, has fostered new business models. These models reflect more than compliance or corporate social responsibility (CSR) initiatives and integrate sustainability into the value proposition and revenue generation. In terms of value proposition, environmental or social problems (e.g., climate change, resource scarcity, social inequality) are presented in the business model along with market demands. Their "green" or "impact" credentials are a fundamental part of their offering. While employing traditional revenue streams, they innovate to monetize sustainability in revenue models. In product-as-a-service (PaaS) and circular economy models, they offer functionality, retaining ownership for repair, reuse, and recycling (e.g., leasing solar panels, offering lighting as a service) instead of selling products or services. This ensures durability and resource efficiency (Bocken, 2016). To enhance resource efficiency and save costs, start-ups provide technology or services that enable customers to reduce resource consumption (energy, water, materials). This involves monitoring, optimization, and automation (e.g., smart building management systems). Several start-ups are generating revenue by transforming waste products or by-products into valuable new materials or energy (e.g., converting food waste into biogas and plastic waste into new textiles). By monetizing positive environmental/social impact (e.g., selling carbon credits generated by their operations, offering premium pricing for sustainable products due to consumer willingness to pay), waste-to-value/upcycling models are included in the business model. Data-as-a-service (DaaS) is often included in the business models of start-ups that comply with ESG. Platforms and analytics are often supplied to measure, report, and improve their ESG performance, catering to increasing regulatory and investor demands. By emphasizing research and development (R&D) in clean technologies, sustainable supply chain management, and life-cycle assessment, extensive collaboration with academic institutions, non-governmental organizations (NGOs), and larger corporations is included in the business model (Ferasso et al., 2020). It is crucial to scale up the business model, involving partnerships with incumbent industries, governments, and international organizations to accelerate adoption and overcome regulatory hurdles. The new business models consider broader stakeholder consideration beyond just shareholders, including environmental groups, local communities, and employees, recognizing their role in long-term value creation. Quantitatively, these new business models are evaluated by measuring traditional financial metrics and impact metrics, such as CO<sub>2</sub> emissions reduced or avoided, the amount of water saved and diverted from landfills, renewable energy generated, the number of green jobs created, and ESG ratings and compliance scores. The ability to quantitatively demonstrate financial viability and positive environmental/social impact is an important parameter of successful start-up business models to attract ESG-aligned investment (Friede et al., 2015).

## 3. New Business Models and Economic Influence

### 3.1. Contribution to Global Economy

The business models of environmental, ESG, and RE100 start-ups wield significant influence on global and domestic economies through mechanisms that combine financial viability with sustainability objectives. The environmental, ESG, and RE100 start-ups contribute to the creation of new industries (e.g., direct air capture, sustainable aviation fuels, and circular economy platforms). The global economic size can be enlarged, rather than reallocating existing market share only. The global market for green technology is projected to reach trillions of dollars, driven largely by these innovations (BloombergNEF, 2023).

The increase in ESG investment (USD 50 trillion by 2025) (Bloomberg, 2021) leads to the growth of start-ups. Their business models are created to attract capital by demonstrating clear environmental benefits alongside financial returns, and reorient global financial flows toward sustainable development, contributing to long-term economic resilience and reducing systemic

environmental risks that could otherwise destabilize the global economy. Morgan Stanley (2024) stated that sustainable funds generally outperformed traditional funds, suggesting that the integration of ESG factors in business models led to superior financial performance, attracting more capital. The capital inflow into climate technology reached record highs, demonstrating investor confidence in these business models' scalability and profitability (PwC, 2023).

As major companies commit to RE100 and broader ESG targets, they rely on these start-ups for solutions. Such reliance leads to sustainability throughout global supply chains, increasing efficiency, reducing waste, and mitigating risks associated with resource scarcity and regulatory changes. Companies with robust ESG practices are often facilitated by green tech solutions and tend to have lower costs of capital and higher operational efficiency, enabling higher valuations (Amel-Zadeh & Serafeim, 2018). This incentivizes large companies to partner with green start-ups, generating revenue for the latter. The innovations developed by these start-ups (e.g., advanced battery technology and artificial intelligence (AI) for energy management) have spillover effects, benefiting companies in other industries and accelerating technological diffusion globally. This enhances global productivity and competitiveness.

### 3.2. Contribution to Domestic Economy

The environmental, ESG, and RE100 start-ups are creating new, often high-skilled, jobs in research, engineering, manufacturing, installation, and services related to clean energy, circular economy, and environmental management. These jobs are often localized, contributing to regional economic development. The renewable energy industry alone created millions of jobs globally, with significant proportions in manufacturing and project development, where start-ups play a crucial role (International Labour Organization, 2023). For every dollar invested in green infrastructure, more jobs were created compared with fossil fuel investments (World Resources Institute, 2021). Start-ups offer solutions for energy efficiency, waste reduction, and water conservation, which lower operational costs, enhance productivity, and ensure competitiveness in global markets. This is particularly vital for energy-intensive industries. Dobbs *et al.* (2011) estimated that companies improved operating profits by up to 60% in resource efficiency through collaboration with green start-ups. To enhance energy security and reduce imports, RE100-aligned start-ups develop and deploy renewable energy sources to reduce reliance on imported fossil fuels, improving energy security and reducing trade deficits. Investment in solar and wind farms by start-ups reduces the need for imported oil and gas, keeping capital within the country and stimulating local economies. Many green start-ups are emerging in specific clusters (e.g., renewable energy hubs and biotech parks), fostering regional specialization, attracting talent, and creating dynamic innovation ecosystems. While it is difficult to quantify directly in GDP terms, the improved public health outcomes (e.g., reduced healthcare costs from lower pollution) and enhanced environmental quality resulting from these start-ups' activities contribute to societal well-being for long-term economic prosperity (WHO, 2007).

## 4. Successful and Challenged Business Models

The business models of environmental, ESG, and RE100 start-ups significantly influence global and domestic economies through distinct mechanisms that often combine financial viability with sustainability objectives. In this review, successful and challenging cases are analyzed as follows (Table 1).

### 4.1. Success Story: Ørsted (Denmark)—The Utility Transformation

While not a "start-up" in the typical sense at its inception, Ørsted (formerly DONG Energy) transformed from a fossil fuel-intensive company to a global leading company in offshore wind energy. Its business model shifted from generating power from coal and gas to developing, constructing, and operating large-scale offshore wind farms. This transformation was driven by a strategic commitment to decarbonization and a recognition of the long-term economic viability of renewables, which provide large-scale, reliable, and increasingly cost-competitive renewable electricity to national power grids (Ørsted, 2024). Their expertise in complex offshore project management became a key differentiator. Through long-term power purchase agreements (PPAs) with governments and large companies (RE100 signatories), stable and predictable revenue has been ensured. They also sell projects at various stages of development.

Ørsted's transformation has solidified Denmark's position as a global leader in green energy technology and fostered a robust domestic supply chain, creating thousands of specialized jobs in engineering, manufacturing, and operations, and significantly contributing to Danish gross domestic product (GDP) through exports of expertise and technology. As the world's largest offshore wind developer, Ørsted has been instrumental in driving down the cost of offshore wind globally, making it a viable and competitive energy source. The company contributes to global decarbonization and helps countries achieve their renewable energy targets. Their

business model's success provides a blueprint for other utilities to transition to renewables. Ørsted's market capitalization surged as its green transformation progressed. In 2023, the company reported USD 11.5 billion in revenue, with a significant portion derived from its renewable energy activities (Ørsted, 2024). Their investments in offshore wind have exceeded tens of billions of dollars, creating a massive economic multiplier effect.

#### 4.2. Success Story: Apeel Sciences (United States) —Bio-Based Solutions for Food Waste

Apeel develops plant-derived coatings that extend the shelf life of fresh produce, reducing food waste throughout the supply chain (from farm to consumer). Apeel offers a natural, edible solution to food spoilage, thereby enabling farmers to sell more produce, retailers to reduce waste and increase profit margins, and consumers to enjoy fresher food for longer. This directly addresses a significant environmental problem (food waste is a major contributor to greenhouse gas emissions) and generates economic value. Their business model is a B2B model, selling its Edipeel® technology directly to fruit and vegetable growers, distributors, and retailers on a per-unit basis (e.g., per pound of avocados treated). They also offer services and data analytics related to produce shelf-life optimization. They have created jobs in biotechnology, food science, and business development and helped agricultural producers reduce losses and improve profitability. By reducing food waste, Apeel contributes to global food security by significantly mitigating greenhouse gas emissions associated with food production and decomposition. Retailers, such as Costco and Kroger, have adopted Apeel's technology, generating economic value across international food supply chains. Apeel has raised over USD 600 million in funding from investors, including Andreessen Horowitz, Viking Global Investors, and Temasek (Crunchbase, 2024). Their impact is evident in food waste reduction. Studies have indicated up to a 50% reduction in spoilage for treated produce (Apeel, 2024). This directly translates to increased sales for retailers and reduced disposal costs, contributing millions of dollars in economic value.

#### 4.3. Challenged Case: Solyndra (United States) —Solar Manufacturing Failure

Solyndra manufactured cylindrical thin-film solar panels to capture sunlight from multiple angles. Their business model relied on selling these innovative panels to commercial and industrial customers. They offered a unique, aesthetically pleasing solar panel that purportedly performed better in low-light or non-optimal angle conditions. They sold solar panels and provided associated installation services. Solyndra received a USD 535 million loan guarantee from the US Department of Energy to boost domestic solar manufacturing and create jobs. Its bankruptcy in 2011 led to over 1,000 job losses and significant taxpayer losses, becoming a symbol of risky government investments in green tech (Wald, 2011). The failure, alongside other early solar manufacturers, contributed to the perception that manufacturing green technology was inherently risky and difficult to compete with established Asian players.

Despite technological innovation, Solyndra's cylindrical panels were significantly more expensive to produce than traditional flat silicon panels, especially as global silicon prices plummeted. Their business model could not adapt to rapid market changes. Fierce competition with Chinese manufacturers, who rapidly scaled up production and drove down prices, severely undermined Solyndra's market position. Their claimed performance advantages did not appeal to customers as a sufficient willingness to offset the higher manufacturing costs. The value proposition did not outweigh the price disadvantage. The large upfront capital investment required for manufacturing, combined with slow market penetration, drained resources before profitability could be achieved.

#### 4.4. Challenged Case: Terracycle—Specific Challenges in Circular Economy Models

TerraCycle pioneered "hard-to-recycle" waste solutions, offering programs for consumers and companies to collect and repurpose items not typically accepted by municipal recycling (e.g., cigarette butts, coffee capsules). Its business model involved partnerships with brands that sponsored the collection and recycling of their difficult waste. They provided a solution for waste recycling to meet sustainability goals and enable consumers to recycle effectively. Their business model is a B2B one, charging brands for their specialized recycling programs. They also sold products made from recycled materials.

TerraCycle created a niche market for difficult-to-recycle materials, diverting waste from landfills and creating jobs in collection and processing. Despite being innovative, the "collection and send-back" model was challenging to scale efficiently, and logistics and sorting costs for diverse wastes were too high. Consumer engagement was another hurdle as their business model relied on consumer effort to collect waste, which proved less consistent than anticipated for mass impact. As the company focused more on brand marketing than solving waste problems at scale, questions about the genuine "impact" generated by the business model were raised (Lozanova, 2022). Financial Viability: While revenue-generating, the complex logistics and processing often meant thin margins, making sustained profitability challenging without continuous brand sponsorship.

Concerns were raised about the cost-effectiveness per pound of material recycled compared to traditional recycling, and whether the business model could genuinely stand alone without significant corporate sponsorship, highlighting a challenge in monetizing the "difficult" aspects of circularity at scale.

## 5. Business Model's Influence on Economic Growth

The analysis of business models in the environmental, ESG, and RE100 start-up ecosystem reveals their profound and multifaceted influences on economic growth.

The features of sustainable start-up business models act as accelerators for global and domestic economies. By integrating environmental and social impact, these models enable new revenue streams (e.g., carbon credits and green premiums) and cost efficiencies (e.g., reduced waste and lower energy consumption). This capture mechanism enhances their financial viability and attractiveness to a wider range of investors, including impact investors. Such a diversified value proposition provides a resilient business model, capable of navigating regulatory changes and evolving consumer preferences (Bocken *et al.*, 2014).

The emphasis on ESG factors in the business models (e.g., robust governance and ethical supply chains) inherently de-risks investments. Companies with strong ESG profiles are associated with lower volatility and better long-term performance, making them more attractive to institutional investors seeking stable returns (Friede *et al.*, 2015). This factor influences capital flows towards green sectors. Many business models thrive on collaboration and integration within larger ecosystems. For example, a start-up selling smart energy management systems for buildings stimulates demand for energy auditors, installers, and software developers. The circular economy models create demand for collection logistics, sorting technologies, and remanufacturing capabilities. These interdependencies generate significant multiplier effects within the domestic economy, fostering a network of green businesses and jobs. The emergence and success of these business models lead to a virtuous cycle with policy. As sustainable start-ups prove their economic viability, they incentivize governments to implement supportive policies (e.g., renewable energy targets, waste reduction mandates), which in turn further accelerate market growth and attract more investment. The RE100 initiative, driven by corporate demand, directly facilitates the cycle by creating a clear market signal for renewable energy projects, attracting investments in infrastructure like smart grids and battery storage.

The business models are shaped by evolving environmental challenges, technological advancements, and shifts in policy and investor preferences. Future business models need to aim for "net-positive" impacts, beyond reducing harm to actively regenerating natural systems and improving societal well-being. Regenerative agriculture models are necessary to restore soil health, biodiversity-focused businesses, and solutions for ocean cleanup and carbon removal that contribute to ecological restoration. The integration of artificial intelligence (AI), machine learning (ML), and the Internet of Things (IoT) is paramount for future business models in leveraging data analytics to optimize resource use, predict environmental impacts, and facilitate precise ESG reporting. It also enables efficient circular economy loops (e.g., AI-driven sorting in recycling and predictive maintenance for renewable energy assets). Such optimization enables new levels of efficiency and economic value. A wider adoption of enhanced models, particularly for high-value products (e.g., industrial machinery, consumer electronics), contributes to the reduction of material consumption, extends product lifespans, and creates recurring revenue streams. New business models are emerging around reverse logistics, remanufacturing, and material passports (Ellen MacArthur Foundation, 2017).

The creation of digital twins for industrial processes, urban infrastructure, and even entire ecosystems enables real-time monitoring of environmental performance, predictive analytics for resource management, and optimization of sustainable operations, creating a new layer of DaaS business models. With advancements in distributed ledger technologies, such as blockchain, future RE100-aligned business models facilitate peer-to-peer energy trading, localized microgrids, and transparent carbon credit markets, empowering individuals and smaller communities to participate directly in the clean energy transition. This democratizes energy access and creates new economic opportunities. In addition, as carbon pricing (carbon taxes, cap-and-trade) becomes popular, business models need to integrate these costs. Start-ups offering solutions enable companies to reduce their carbon footprint or generate verifiable carbon offsets according to the increased demand. This enables a quantifiable financial incentive for sustainable business models. Given the complexity of sustainable development, successful business models need to emphasize interoperability and platform approaches, allowing various green solutions to be seamlessly connected to existing technologies and deliver integrated value on platforms connecting waste generators with repurposes and renewable energy producers with flexible demand.

To boost global and domestic economies, future business models must be executed with a focus on the following.

- Scalability: Solutions need to move beyond niche applications to achieve mass market adoption and significant economic impact. This often requires modular designs, robust manufacturing processes, and effective go-to-market strategies.

- **Affordability:** Green technologies become cost-competitive with traditional alternatives, or offer such compelling added value (e.g., efficiency, resilience) that they justify a premium. The failures of Solyndra and KiOR highlight the critical importance of economic viability.
- **Cross-sectoral collaboration:** No single start-up can solve global environmental challenges alone. Business models must be designed to facilitate collaboration with large corporations, governments, and other start-ups across different sectors.
- **Strong policy frameworks:** Governments must enact clear, long-term, and consistent policies that incentivize green innovation, support market development, and level the playing field against entrenched, often carbon-intensive, industries. This includes funding, tax incentives, and regulatory clarity.
- **Diverse capital availability:** Beyond traditional investment funds, start-ups need access to patient capital, blended finance, and green bonds to support their often capital-intensive and long-horizon development cycles.

## 6. Conclusion

The business models of start-up companies developing or running businesses related to environmental, ESG, and RE100 technologies are transforming the global economic landscape. Moving beyond the singular profit-maximization focus of traditional start-ups, these new models embed sustainability as a core value and ensure value creation through efficiency, resource circularity, and positive environmental and social impact. Their influence is evident in the substantial redirection of global capital towards green investments, the creation of millions of green jobs, and the measurable reductions in emissions and resource consumption. Such start-ups are catalyzing innovation, fostering new industries, and building resilient, decarbonized supply chains. Success stories of Ørsted and Apeel Sciences underscore how strategically designed sustainable business models lead to remarkable financial returns alongside profound environmental benefits, serving as potent accelerators of domestic and global economic growth. The challenges faced by companies, such as Solyndra and Terracycle, offer lessons on the importance of market competitiveness, scalability, and robust economic viability alongside noble environmental goals.

The evolution of these business models is characterized by the integration of digital technologies, an emphasis on regenerative practices, and a continued stress on circularity. For these future models to maximally boost global and domestic economies, a concerted effort is required from all stakeholders: governments must provide consistent policy support, investors must continue to supply patient and green capital, and the start-ups must remain focused on delivering scalable, cost-effective solutions that demonstrably contribute to more sustainable and prosperous development. The transition to a green economy is an environmental necessity and enables economic opportunities through innovative business models.

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## Reference

1. Amel-Zadeh, A., Serafeim, G. (2018). Why and How Investors Use ESG Information: Evidence from a Global Survey. *Financial Analysts Journal*, 74, 87–103.
2. Apeel. (2024). *Freshness That Won't Go To Waste*. Available online: <https://apeelsciences.com/impact> (accessed on February 15, 2025).
3. Bloomberg. (2021). ESG assets may hit \$53 trillion by 2025, a third of global AUM. Available online: <https://www.bloomberg.com/professional/insights/trading/esg-assets-may-hit-53-trillion-by-2025-a-third-of-global-aum/> (accessed on February 15, 2025).
4. Bloomberg NEF. (2023). The definitive resource for clean energy investment Available online: <https://about.bnef.com/energy-transition-investment/> (accessed on February 15, 2025).
5. Bocken, N. M. P., & Short, S. W. (2016). Towards a sufficiency-driven business model: Experiences and opportunities. *Environmental Innovation and Societal Transitions*, 18, 41–61.
6. Bocken, N. M. P., Short, S. W., Rana, P., Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production*, 65, 42–59.
7. Crunchbase. (2024). Apeel Sciences. Available online: [https://www.crunchbase.com/organization/apeel-sciences/funding\\_rounds](https://www.crunchbase.com/organization/apeel-sciences/funding_rounds) (accessed on February 15, 2025).

8. Dobbs, R., Oppenheim, J., Thompson, F., Brinkman, M., Zornes, M. (2011). Resource revolution: Meeting the world's energy, materials, food, and water needs. Available online: <https://www.mckinsey.com/capabilities/sustainability/our-insights/resource-revolution> (accessed on February 15, 2025).
9. Eccles, R. G., Ioannou, I., Serafeim, G. (2014). The Impact of Corporate Sustainability on Organizational Processes and Performance. *Management Science*, 60, 2831–2852.
10. Ellen MacArthur Foundation. (2017). Towards a Circular Economy: Business Rationale for an Accelerated Transition. Available online: <https://www.ellenmacarthurfoundation.org/towards-a-circular-economy-business-rationale-for-an-accelerated-transition> (accessed on February 15, 2025).
11. Ferasso, M., Beliaeva, T., Kraus, S., Clauß, T. (2020). Circular economy business models: The state of research and avenues ahead. *Business Strategy and The Environment*, 202029, 3006–3024.
12. Friede, G., Busch, T., Bassen, A. (2015). ESG and financial performance: aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment*, 5, 210–233.
13. International Labour Organization. (2023). Renewable Energy and Jobs: Annual Review 2023. Available online: [https://www.ilo.org/sites/default/files/wcmsp5/groups/public/%40dgreports/%40dcomm/documents/publication/wcms\\_895772.pdf](https://www.ilo.org/sites/default/files/wcmsp5/groups/public/%40dgreports/%40dcomm/documents/publication/wcms_895772.pdf) (accessed on February 15, 2025).
14. Lozanova, S. (2022). Is TerraCycle Greenwashing the Waste Crisis? Available online: <https://earth911.com/business-policy/is-terracycle-greenwashing-the-waste-crisis/#:~:text=TerraCycle%20has%20been%20criticized%20for,isn't%20specific%20to%20TerraCycle> (accessed on February 15, 2025).
15. Morgan Stanley. (2024). Sustainable Funds Modestly Outperform in First Half 2024. Available online: <https://www.morganstanley.com/ideas/sustainable-funds-performance-first-half-2024> (accessed on February 15, 2025).
16. Ørsted. (2024). Annual Report 2023. Available online: <https://orsted.com/en/investors/ir-material/annual-reporting-2023> (accessed on February 15, 2025).
17. Osterwalder, A., Pigneur, Y. (2010). *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. Hoboken, NJ, USA: John Wiley & Sons.
18. PwC. (2023). How can the world reverse the fall in climate tech investment? Available online: <https://www.pwc.com/gx/en/issues/esg/state-of-climate-tech-2023-investment.html> (accessed on February 15, 2025).
19. Wald, M. A. (2011). Solyndra, Solar Firm Aided By Federal Loans Shut Doors. Available online: <https://www.nytimes.com/2011/09/01/business/energy-environment/solyndra-solar-firm-aided-by-federal-loans-shuts-doors.html> (accessed on February 15, 2025).
20. WHO. (2007). *Climate change: Quantifying the health impact at national and local levels*. Geneva, Switzerland: WHO Press.
21. World resources Institue. (2021). The green jobs advantage: how climatefriendly investments are better job creators. Available online: [https://www.ituc-csi.org/IMG/pdf/the\\_green\\_jobs\\_advantage\\_-\\_wri\\_nce\\_and\\_ituc\\_working\\_paper.pdf](https://www.ituc-csi.org/IMG/pdf/the_green_jobs_advantage_-_wri_nce_and_ituc_working_paper.pdf) (accessed on February 15, 2025).

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