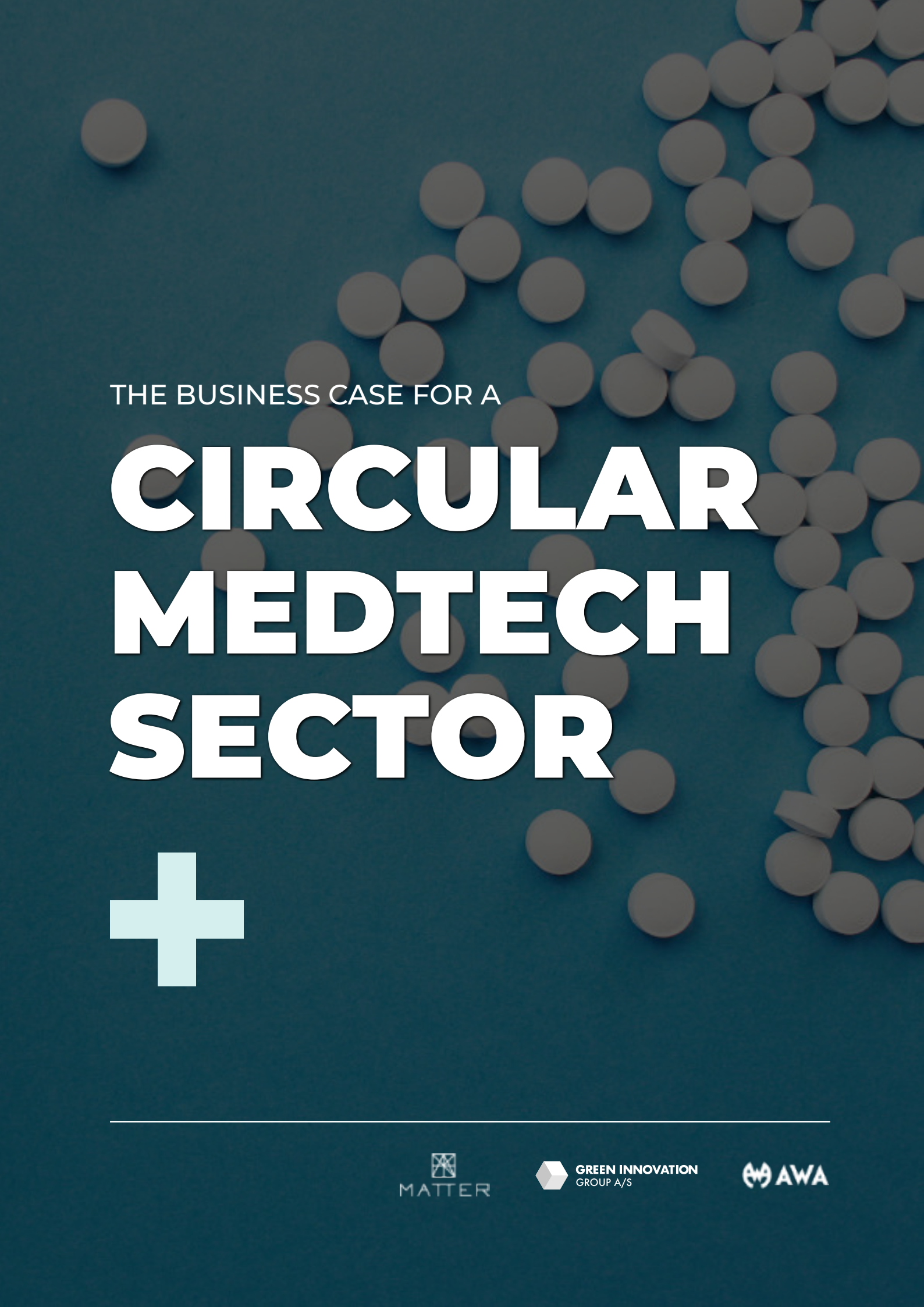

THE BUSINESS CASE FOR A

CIRCULAR MEDTECH SECTOR

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1

EXECUTIVE SUMMARY

That we face severe environmental challenges on a global scale is increasingly obvious. Images of melting glaciers and extreme weather feature regularly in news all over the globe. The growing awareness that both public and private actors need to act decisively to fulfill our responsibilities, comes not a moment too soon. The pharmaceutical and medtech sector has been relatively overlooked in public debate about environmental footprints of different industries. The sector is generally focused on improving human health and thriving, which invariably intersects the responsibility for decelerating and reversing environmental pressures.

This whitepaper demonstrates that the efforts of private companies towards circularity can in fact lead to a more sustainable medtech sector. Sustainable solutions in the field have the potential to not only reduce greenhouse gas emissions, but importantly also address a range of issues related to pollution and waste. The effects should benefit natural environments and human health alike, and bring the industry in line with the scope of international agreements on sustainability such as the Paris Agreement of 2015.

The core tenet of this paper is that sustainable development need not be relegated to altruistic aspirations; rather the move towards circularity constitutes a solid business case for competitive medtech companies. As an example, Phillips has announced it's aspirations to generate 25 percent of sales from circular products, services and solutions by 2025.

Additionally this paper sheds light on how businesses can produce the sustainable innovations needed for the developments outlined above. We illustrate how the much needed frontier innovation happens in startups and small and medium-sized enterprises (SMEs), outmatching established corporates in speed and agility. On the other hand, corporates possess networks of influence, technology, and capital needed to implement and scale sustainable innovations.

Ultimately, the illustrative case of the Novo Nordisk Innovation Challenge 2019-2020 shows how an ambitious incubator and accelerator process facilitates valuable collaboration between an established industry player and the ecosystem of startups. The process saw dozens of relevant startups joining the program which resulted in four of five finalists establishing pilots with Novo Nordisk, following an intense course of product development, prototyping and testing to market criteria. In total, the innovation challenge, when done right, constitutes a key tool in the efforts towards a circular medtech sector.

2

THE NECESSITY

of Sustainability in Pharma, and the World

The effects of climate change, perhaps the most complex issue facing modern society, affect every aspect of human life, including health on an individual and societal level.[1] The medtech sector is rarely mentioned when we talk about the ever-increasing pollution rates and environmental damage different industries and our consumption habits have caused over the years. Furthermore, surprisingly few researchers have investigated the greenhouse gas emissions of the sector. Yet a recent study found that the global medtech sector is not only a significant contributor to global warming but is also 13 percent more greenhouse gas emissions-intensive than the automotive industry, despite being 28 percent smaller.[2]

Pollution caused by healthcare production comes in a variety of forms, including:

- general waste
- medical waste
- hazardous waste
- non-renewable raw materials
- environmental pollution

For example, a study from the U.S. found that 90 percent of households put their unwanted medicines in the regular trash bin or water stream.[3] Solely in the U.S., an additional 50,000 tons of waste per year is estimated to be generated from home healthcare products.[4]

Currently, pharmaceutical companies face several challenges to making their organizations more environmentally-friendly. For instance, lack of guidance and sorting metrics of healthcare waste have caused most individuals to create their own way of handling the waste.[5] Another pertinent issue to pharma companies is the challenge to comply with existing regulations and standards,[6] which has caused low prioritizing of greener solutions, and therefore lack of green implementations.[7] Rushed manufacturing and outsourcing production have also contributed to the aforementioned lack of sustainable solutions currently being utilized to reduce waste output.

3

CIRCULARITY

in MedTech Addresses Sustainability Goals

The medtech sector needs to change course in order to address the exponentially increasing environmental challenges.[8] One way could be to change the industry towards a Circular Economy (CE) model, with specialized help from innovative startups. For this reason, the CE model can be seen as a specific case study for exploring sustainable options in the pharmaceutical industry.

The need for CE was identified in the 1960's, when Barry Commoner (1917-2012), an American cellular biologist, politician, and one of the leading environmentalist spokespersons of his time, recognized issues with the linear economy. In his book 'Closing the Circle' (1971) he wrote: "we have broken out of the circle of life, converting its endless cycles into man-made linear events: oil is taken from the ground, distilled into fuel, burned in an engine, converted thereby into noxious fumes which are emitted in the air."[9] Since then, CE has been discussed widely and has attracted increasing interest in academia as well as in the business community.[10] CE can be seen as an approach to foster sustainability within society and as one form

of sustainable business models.[11] Furthermore, it is also discussed as a critical element of sustainable development[12] or as a concept absolutely necessary for sustaining economic growth in a sustainable way.[13] The goal is to have a green economy which offers innovative employment opportunities, improved wellbeing, equal resource use and access for all generations, in the present as well as in the future.[14]

The most distinguished and well-known definition of CE has been outlined by the Ellen MacArthur Foundation, which introduce CE as "an economy that is restorative and regenerative by design,"[15] meaning that raw materials shall not become discarded waste.[16] A 'closed loop economy' will not generate excessive waste as any waste becomes a resource,[17] because when a product reaches the end of its life, the materials are used again and again. The concept is based on three principles; firstly to redesign products and manufacturing processes not to produce waste and pollution, secondly to keep products and materials in use, and lastly, to regenerate natural systems.[18]

It is possible to view CE as a model to highlight the necessity of implementing more sustainable solutions into the pharmaceutical industry. Sustainable solutions based on CE can help reduce the pollution from the pharmaceutical industry by encouraging the repurposing of old products towards more innovative, environmentally friendly solutions. Additionally, CE creates further value by keeping the resources within the economy,[19] generating revenue-earning opportunities for pharmaceutical companies in areas from which they might not traditionally obtain revenue.

3.1 THE ROLE OF IPR FACT BOX

Interview with

Mikkel Roed Trier,

European Patent Attorney & Partner, AWA Denmark.

Which part does intellectual property (IP) play in a green transition of the medtech sector?

The green transition in medtech can be accelerated by helping medtech SMEs get their innovative ideas to the market and profit from them. IP is key to achieving this: when used properly and strategically, IP provides a great incentive to invest time and money in innovation. Which is something the large medtech companies have already realized.

What are the most over-looked ways of deploying IP strategically to strengthen the business in medtech?

Large medtech companies are already experts in the strategic use of IP. Medtech SMEs are typically not. What's most important for a medtech SME in terms of IP is to decide an early IP strategy that matches the company's overall strategy. The most overlooked way for medtech SMEs to use IP strategically is to use an early, good, and broad patent application to open doors to investors, partners, buyers, etc. When the technology has achieved success, the patent will be gold.

How will the landscape for IP in medtech have changed in 2030 compared to the early 2020s?

In 2030 the number of IP rights owned by medtech SMEs will hopefully be much higher, which will have contributed extensively to the green transition of the medtech sector.

Which steps could be taken from a legislative/regulatory angle to accelerate the green transition in medtech via IPR strategies?

My first recommendation would be to take steps to further optimize the IP systems based on the needs of the users, including SMEs. One such step could be to investigate which changes to the IP systems would make investing in the green transition more attractive to medtech. Second, I recommend significant public funding of research in and IP protection of sustainable medtech. Third, public authorities and anyone who has the ability and opportunity should do their part in raising medtech SMEs' awareness and knowledge of IP and the value it can provide – the present report is a good example of how non-public players can contribute to this.

Three concrete recommendations for innovators in medtech:

1. It's never too early to think about IP
2. Make sure IP is an integral part of the business strategy
3. A broad patent application is a great start for new ventures to build confidence with investors

4

EFFECTIVENESS

of Sustainable Solutions in Reducing Pollution

In general, the effectiveness of sustainable solutions and circular economies in reducing environmental impact cannot be understated. Two key examples demonstrate this capability. One CE approach relevant for the medtech sector is green chemistry, which uses renewable raw materials, eliminates waste and avoids the use of toxic and hazardous reagents and solvents in the manufacturing and application of chemical products. Pharma companies that are practicing green chemistry in their processes show impressive results towards minimizing waste and it has also shown to be cost-efficient because reductions of waste are related with significant cost savings.[20] Another area in which the effectiveness of sustainable solutions in reducing pollution is "pollution prevention" which is when emphasis is placed on minimizing the leftovers of pharma production rather than finding more efficient ways of processing waste.[21] The production begins with raw materials, and caution should be taken when choosing these materials and the ways to extract them.[22] Pharma companies can additionally increase the products' end-of-life recycling rates by using raw materials in a smarter way or using innovative new materials.[23] By doing that, the companies can additionally reduce their dependence on raw materials and at the same time minimize waste generation.[24] A tangible opportunity for companies could be to focus on recyclable, light-weight packaging consisting of renewable materials.[25] For example, a study showed how a simple product, a reusable surgical gown, could have significant sustainability benefits.[26]

According to this study:

“Reusable surgical textiles offer substantial sustainability benefits over the same disposable product in energy (200–300 percent), water (250–330 percent), carbon footprint (200–300 percent), volatile organics, solid wastes (750 percent), and instrument recovery. This has now been verified in all six available life cycle studies. Other factors including cost, protection, and comfort are reasonably similar. The large environmental sustainability benefits of reusables allow nurses, physicians, and hospitals to make substantial improvements for this industry. It is no longer valid to indicate that reusables are better in some environmental impacts and disposables are better in other environmental impacts.”[27]

(Overcash, 2012)

From these examples, it is clear sustainable solutions can drastically reduce the extent to which the business of pharmaceutical companies and other healthcare organizations pollute the environment. By implementing a greater number of sustainable initiatives, pharmaceutical companies may save lives in other ways, not only through medicine, but also by slowing climate change.

5

THE BUSINESS CASE for a Sustainable MedTech Industry

Aside from environmental benefits, there are immense business benefits to the concept of CE and sustainability in general, such as reduction of dependence on natural resources, in particular non-renewables, prevention of the loss of valuable materials and reductions in costs due to cutback in waste management as well as in pollution. Two more examples illustrate how sustainable solutions and a CE approach can generate financial gains for pharmaceutical companies.

One CE opportunity has been present since the 1980s in the U.S. Namely, a focus on increased recycling of pharma products through reprocessing,[28] which started because of the increased costs of the products.[29] Additional benefits naturally followed since the reprocessing of pharmaceuticals decreases the amounts of waste ending up in landfills.[30] In the beginning, small operators worked from their garages to refurbish single-use pharma products, and now it has become a separate industry with $100 million in revenue in 2005.[31] With an already existing industry, it has the potential to grow even bigger. In the U.S., the pharma reprocessing companies save almost 1000 tons of

pharma waste annually from landfills or incineration.[32] According to a market analysis, the refurbished pharma equipment market is expected to reach almost $12 billion by 2021.[33] The circular strategy has been successful due to the high value of the equipment – the refurbishment costs are generally relatively small compared to the overall cost of the product.[34] The system is designed in a safe way which does not create incentives to return pharma products that are not fully functional or sterile.[35] Though besides reprocessing, the medtech sector has been excluding the end-of-life process of pharma products. Even though this strategy has economic and ecological benefits and is spread over multiple other industries, like car and electronics, the studies on opportunities and initiatives of product lifetime extension re-

In another example, it can be that there are substantial economic benefits to be gained by integrating green chemistry into research and development as well as manufacturing; lower material inputs, reduced costs from waste disposal, reduced energy demand and improved utilization of manufacturing capacity. According to Veleva et al.

"Research has found that both internal (top management commitment, cost savings) and external (regulatory requirements, stakeholder pressures) are driving greater adoption of green chemistry by the pharmaceutical industry with the pressures to reduce prices, cost savings from green chemistry are becoming increasingly important. Such savings stem from more efficient production, reduced energy and material costs, waste disposal fees, improved employee health and safety, and lower insurance premiums. For instance, Merck reported an estimated annual savings of $14 million from the improved process for Primaxin."[37]

(Veleva et al., 2018)

In your view, what are/would be the main drivers for your company to adopt green chemistry? (please select the top 3) (34 companies)

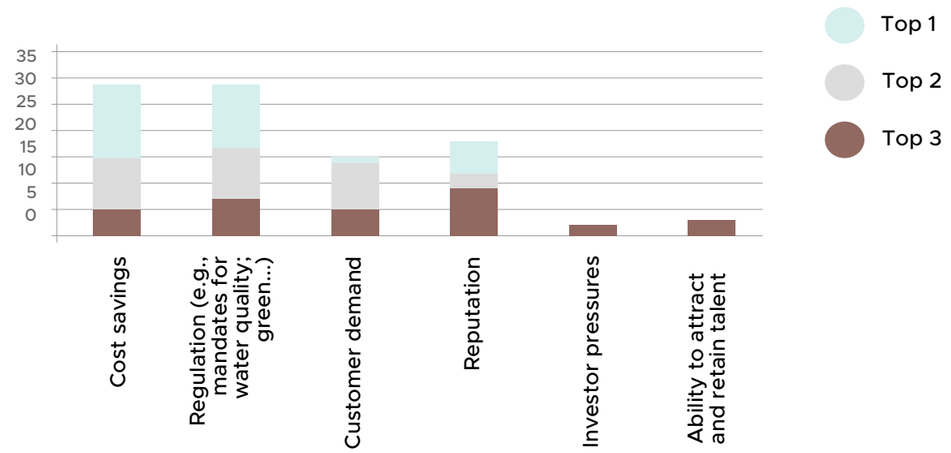


Figure 1. Main drivers for adopting green chemistry by pharmaceutical companies.

Source: Veleva et al. (2019)

This conclusion is backed up within the Veleva study, within which researchers found that cost reduction was the major motivation for large pharmaceutical companies to improve their sustainability, closely followed by consumer expectations for sustainability (Fig. 1).

Not only is the opportunity to save money a compelling reason to invest in sustainability efforts, there is also a significant opportunity to expand revenue within new markets for sustainable solutions. For example, waste generated in the medtech sector creates substantial costs since the general waste and the hazardous waste often get mixed, which opens up an opportunity to ensure that the different waste streams are not mixed.[38] Hence, the global waste management industry is slowly growing, reaching a growth rate of 2.7 percent and a value of $85.8 billion in 2018.[39] The industry is expected to have a value of $91.2 billion in 2023, an increase of 6.3 percent since 2018.[40] Sorting of recyclable waste and circularity of home healthcare devices are new fields that are still being explored. There is a need to design new strategies in order to expand circularity of pharma products.[41]

Given the more widespread implementation of telehealth as a result of the COVID-19 pandemic, the health IT solutions market offers great promise for revenue growth with relatively little environmental destruction (given the nature of its virtual existence). One study found that "the healthcare IT market is expected to grow at a CAGR [compound annual growth rate] of 13.8 percent from 2019 to reach $511.06 billion by 2027."[42] Other factors in the growth of the global healthcare IT market are e.g. "increasing awareness on the value of digital health, shift towards value-based care, rising use of big data in healthcare management, high return on IT investments in the industry, and rising incidence of chronic diseases."[43]

Interviews conducted in the research for this paper indicated other areas of sustainable healthcare innovation that are ripe for development. Various economic benefits were mentioned as an opportunity CE offers. A highlighted point is that some alternative molecules for plastic are cheaper than using oil as a raw material. There are already customers who want to pay for these circular solutions, which shows that stakeholders see the value in them. Investors are also looking for more circular businesses to invest in, because they see that the markets are about to change. Additionally, over half of the interviewed startups also identified the opportunity of potential new markets. Furthermore, because of the only growing demand for pharma products, there is a massive number of products going into the market.

For instance, a new market opportunity in pharma, where sustainable alternatives could be easier applied, is the outer packaging, which is not directly in contact with chemicals or setting up distributed recycling facilities. A CE business model also allows the business to engage with stakeholders in new ways, which can create value. Furthermore, the market potential supports another new opportunity, market demand as six startup representatives and one large pharma company representative addressed the demand from their business to business (B2B) customers. A representative from Pond, a biomaterial startup, stated that “we are just hitting the market at the right time, because everyone is literally looking for an alternative.” There is a massive opportunity in creating products that will have a higher margin, which will improve the profitability of businesses.

The trends identified above are aligned with the information contained in the graphic below, which indicates that the market for sustainable products and investments in them is growing across industries besides just healthcare. The graphic below depicts a sizable uptick in investments over the course of eight years, supporting the hypothesis that there is a great deal of opportunity for increasing revenue streams within the context of sustainable solutions. Investment in sustainable solutions will continue to be an integral part of healthcare’s future, and an area in which pharmaceutical companies can expand their business.

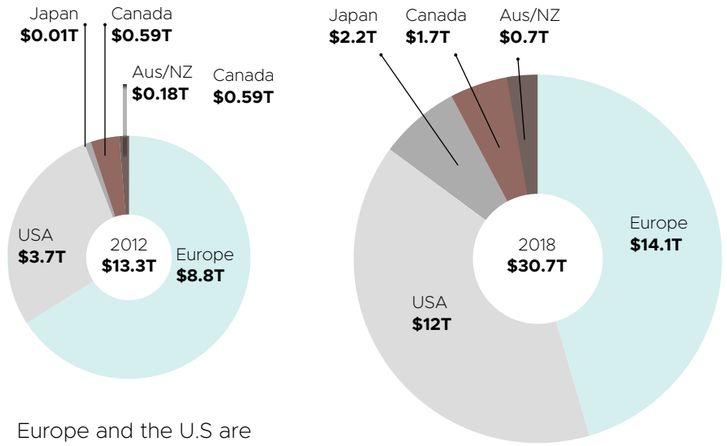
Not only is increased market potential a glittering incentive for developing more sustainable solutions, it also serves corporate social responsibility goals, particularly in healthcare. The core responsibility of the industry is to improve access to medicine, including its affordability, as it can directly influence people's lives.[44] However, this responsibility must also be balanced by a commitment to promoting, protecting and preserving environmental health. Interest in making a commitment to sustainable action has been reflected in research studies, which show an uptick in both consumer and corporate interest. To this end, one researcher wrote:

"Studies show that 90 percent of Americans are more likely to trust and stay loyal to companies that actively work to make a difference in the world and 88 percent of consumers would buy a product with a social or environmental benefit. [...] The hospital of the future is going to be just like Intel, where its socially conscious business model is recognized on a wider scale. Hospitals today may not think that health care consumers are thinking about care from a corporate responsibility lens. But it's only a matter of time until they wake up and ask their health care providers where they stand on key values and the causes they believe in."[45]

(Cohen, 2017)

Global growth in sustainable investments (USD trillion)

Europe is well ahead of the sustainable investing curve, and specific legislation is fundamentally shaping the industry.



Europe and the U.S are the biggest players in sustainable investing.

Japan's proportion of sustainable assets increased by an impressive 200-fold.

Source: Global Sustainable Investment Alliance (2019)

These attitudes were also present in the attitudes expressed by interview subjects who participated in this paper's research efforts. Four startups addressed public demand as a driving force of progress. Consumers are more educated now than ever before about the importance of environmental sustainability, and do not want to contribute to environmental disasters. Additionally, the promotion of a positive public image is also an opportunity CE can create. Both startups and established corporates highlighted how CE looks good, feels good and, in general, it is just cool to be green.

In support of these trends, the Harvard Business Review found that concern for environmental issues was reflected in physical sales of products. According to their findings, "products that had a sustainability claim on-pack accounted for 16.6 percent of the market in 2018, up from 14.3 percent in 2013, and delivered nearly $114 billion in sales, up 29 percent from 2013. Most important, products marketed as sustainable grew 5.6 times faster than those that were not. In more than 90 percent of the CPG [consumer packaged goods] categories, sustainability-marketed products grew faster than their conventional counterparts."[46]

Furthermore, statistics from a 2011 McKinsey & Company paper confirm specific concern amongst executives regarding sustainability initiatives, particularly with specific concern around their corporate social responsibility reputation.

With regards to the healthcare industry, the actions of pharmaceutical companies signify their growing regard for sustainability issues. In recent news, many pharmaceutical companies, including Novo Nordisk, AstraZeneca and Novartis are making company-wide commitments towards creating sustainable solutions, which can increase intra-industry competitiveness. Although the graphic to the right was drawn from a study on general sustainability efforts, data from the survey on which this study was based included respondents from the healthcare industry. Although this graphic was created in 2011, it is helpful in demonstrating how sustainability efforts may boost a company's competitive

Return on capital	Achieving higher prices or market share because of sustainable products	13	
	Improving employee retention and/or motivation related to sustainability activities	11	Finance (3), health care/pharma (2)
	Managing impact of products throughout the value chain	13	Retail (1)
	Reducing emissions from operations	10	
	Reducing energy use in operations	10	Extractive services (3), retail (3), transportation (1)
	Reducing waste from operations	13	Retail (2), transportation (3)
	Reducing water use in operations	9	
Risk management	Managing corporate reputation for sustainability	20	Energy (3), extractive services (1), finance (1), health care/ pharma (1), high tech/ telecom (1), manufacturing (2), retail (3), transportation (2)
	Mitigating operational risk related to climate change	8	
	Responding to regulatory constraints or opportunities	13	Energy (3), extractive services (2), health care/ pharma (3)

1) Numbers 1, 2, and 3, in parentheses, indicate the first, second, and third most frequently chosen activities within each industry.

2) This group includes respondents from the coal, metal, oil, and gas extraction, petroleum and natural gas distribution, petroleum refining, and other mining subindustries.

Source: Bonini, S., Görner, S. (2011)

There are multiple ways pharma can reduce their carbon footprint and still fulfill its social responsibilities, including more sustainable manufacturing processes and more effective and safer medicines.[47] However, it is very resource-intensive to launch new pharma products to market in order to accommodate the health of people. The time frame from candidate identification of a product to its launch is around seven to nine years and in 2016, the cost of developing new pharma products was estimated to be 1.5 billion U.S. Dollars.[48] High entry barriers and long product development periods cause the industry to change slowly.[49] Hence, the sector severely requires novel approaches and disruptive innovation in order to survive.[50] With frontier innovators such as SMEs mainly working in that way and additionally possessing great agility.[51] they may play a crucial role in this transformation.

Moving beyond reputation

percent of respondents, 1 n = 2,956	Company is currently taking action	Company is more effective than competitors
Reducing energy use in operations	63	47
Reducing waste from operations	61	44
Managing corporate reputation for sustainability	51	57
Responding to regulatory constraints or opportunities	46	50
Reducing emissions from operations	43	48
Managing portfolio to capture trends in sustainability	38	56
Reducing water use in operations	38	46
Committing R&D resources to sustainable products	31	59
Leveraging sustainability of existing products to reach new customers or markets	28	61
Managing impact of products throughout the value chain	28	50
Improving employee retention and/or motivation related to sustainability activities	26	48
Mitigating operational risk related to climate change	22	41
Achieving higher prices or greater market share from sustainable products	18	52

Source: Bonini, S., Görner, S. (2011)

6

COLLABORATION

between Corporates and Startups Drives Sustainable Innovation

Unlike larger and slower companies that tend to lack behind market changes, entrepreneurs can bring new solutions to the market rather quickly.[52] Recently, efforts to reach out to the SME ecosystem from large companies seem to be increasing,[53] which could potentially help the industry to gain desperately needed agility in order to facilitate a new, more sustainable pharma landscape.[54] However, it is not enough only to focus on the products and making them more sustainable; it is important to integrate innovative procedures in all parts of the process from design, production, use, to end of life.[55]

Market leaders often favor rational investments as the financial structures seem more attractive; products generally have good margins and therefore, great profits. Moreover, they are often valued by the mainstream market and are used by the most profitable customers. Disruptive products are the opposite and therefore, most organizations only invest in disruptive innovation when it is too late. These challenges are all crucial for companies to be aware of in order to tackle them appropriately due to future survival. Furthermore, smaller companies with fewer set structures and management practices do not focus on the mainstream market, but rather on niche markets, develop products through trial and error. These processes are more likely to foster disruptive innovation than the practices of leading companies. Thus, smaller companies grow their customer base and niche markets become mainstream. At that time, it is too late for the large market leaders to follow.[56]

The traditional approach to innovation is closed innovation. In this approach, the ideas are created internally and then evolved into a concept to manufacture and commercialize through the vertically integrated structures inside the pharma companies.[57]

In this way, the pharma companies can protect their IP without the risk of revealing company knowledge and thereby get exploited.[58] This traditional business strategy has guided companies to develop defensive positions against the forces of competition, highlighting the importance of constructing barriers rather than promoting openness.[59]

Recently, industries in general have started experimenting with newer business models, based on harnessing the collective creativity through open innovation, which enables them to expand their value creation. Many of these experiments also address

sustainability.[60] As the pharma companies increasingly face innovation challenges, they too are trying out newer business models, like the open innovation model.[61] Structures of the medtech sector seem to be changing slowly as it has become more difficult for pharma companies to protect their internal knowledge because of an increase of easy accessible online information and the increased movement of employees between companies, taking their knowledge and insights with them.[62] The traditional form of closed innovation in order to protect IP is therefore decreasing, and additionally, research indicates that protecting IP does not automatically lead to success.[63] For those who wish to lead innovation and be frontrunners of their markets, an open strategy is an essential and valuable model.[64]

Open innovation requires a more flexible business model where innovation can be created in collaboration between internal and external ideas, knowledge and expertise.[65] A growth in partnerships across the pharma companies has already begun and some of them even look towards smaller companies or academical institutions.[66] R&D consortia, which is a form of open innovation, has grown radically within the last 20 years between biomedical companies.[67] Open innovation can be a valuable innovation model for big pharma companies to add flexibility, creativity and knowledge to keep up with the fast-paced environment the companies are operating in.[68] "The goal of open innovation is to tap into knowledge, expertise and creativity, external from the organization."[69]

The leveraging of outside scientific expertise during open innovation processes improves the probabilities of big pharma to gain access to breakthrough discoveries.[70] As the rate and the amount of innovation keep accelerating in the many sectors of the industry, it is challenging for the companies to seize all of it.[71] In 2017, The Pharmaceutical Innovation Index (PII), which ranks a company's ability to deliver innovation to patients,[72] confirms that the ones which address R&D with a creative way of early-stage collaborations, lead the market.[73] A comparison between the dollars invested per approved drug developed by startups and big pharma was conducted to compare the R&D productivity of both sides. The results show that startups discover more drugs than big pharma, with less capital.[74]This suggests that startups are more efficient and cre-

ative with their R&D efforts than big pharmaceutical corporations.

Besides collaboration and partnerships, another type of open innovation is the acquisition of innovative companies. Traditionally pharma is placed as the fourth most common industry for acquisition targets.[75] Some of the dominant players of the industry have identified their strategy as acquiring early-stage businesses that could potentially supply overlooked niches in the market.[76] In general, approximately half of startups are acquired during the early clinical trials, and half in later-stage studies.[77] Since 2015, big pharma has made a total of 73 total acquisitions, out of which 23 deals are biotechnology, 13 are medical devices and equipment, and ten are drug development.[78] These consist of the most frequently targeted in-

dustry sectors, where creativity and innovation are increasingly needed.

There is a clear gap between ways of working in a large company compared to a startup, as startups typically have the willingness to take risks and work through trial and error with promising ideas that accelerate disruptive innovation.[79] Smaller companies, such as startups that focus on niche markets, do not need to worry about the large players in the market, which gives them more freedom and time to develop their technology. They are therefore more capable of pursuing emerging, growing markets even though they often lack resources and are not usually considered as a threat to the leading companies.

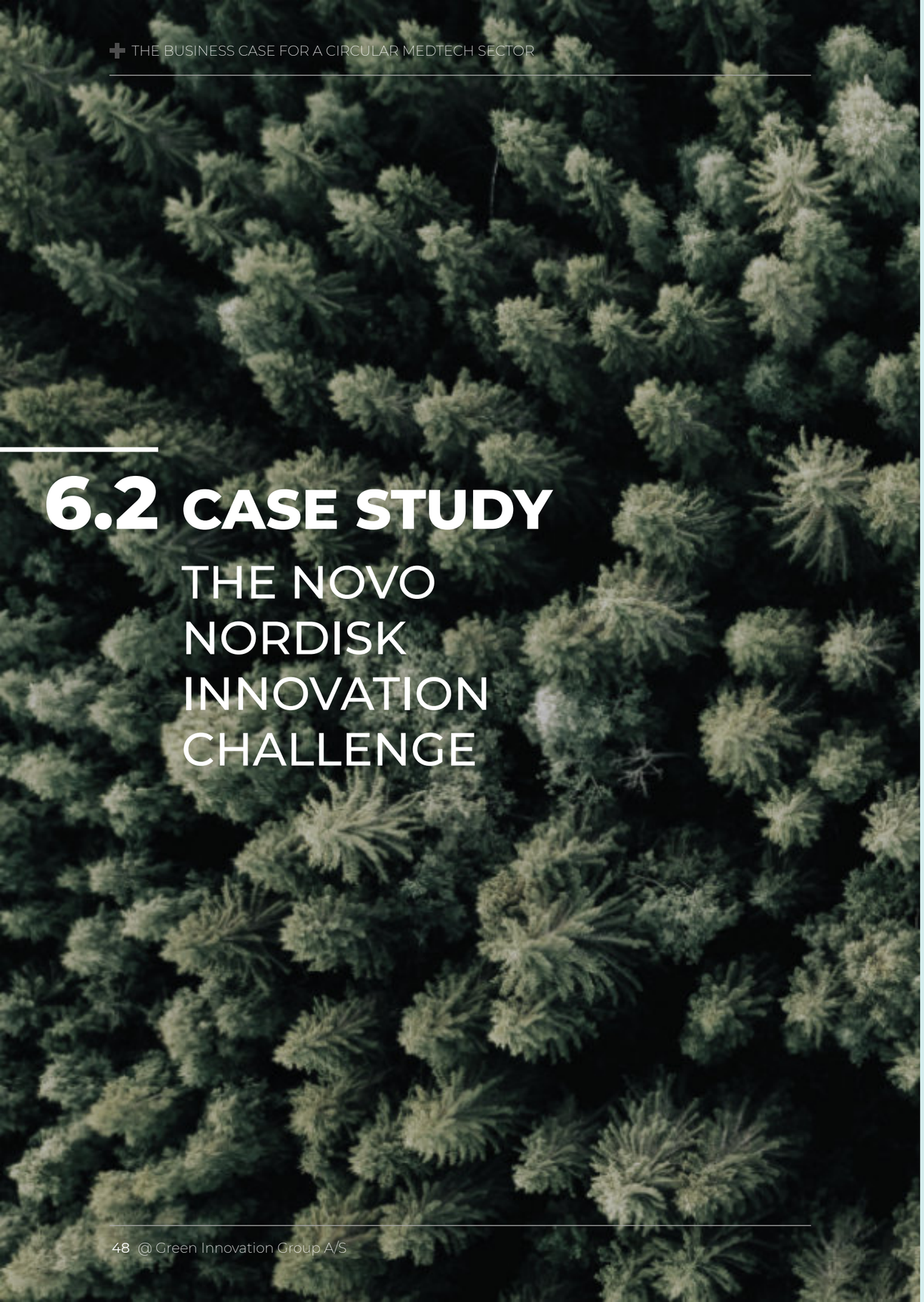
6.1 COLLABORATION BETWEEN SMES AND LARGE ORGANIZATIONS

In 2017, Unilever Foundry, a global platform for innovators and startups, released a report that predicted corporates and startups will work in the same physical space, side by side, by 2025. The report shed light on three critical factors driving the need for strong collaboration between startups and corporates: learning something new, improving efficiency, and solving business problems in new ways that have the potential to scale. The report also predicted startup and corporate collaboration will evolve from an optional extra to a business–critical investment in the next five years.[80]

This meshes with findings of the interviews conducted in the research for this paper. Both startups and corporates recognized the necessity of collaboration between the different stakeholders. Some startups had already established collaborations or partnerships with either large companies or universities, and those who had not, were very open and favored the construct. Krist from BioScavenge elaborated this by stating, "I believe the best model is to work together."

The value of these innovative partnerships has been recognized by pharmaceutical executives and frontier innovators alike. As one pharmaceutical executive, Kenneth Strømdahl, Senior Vice President for Device R&D at Novo Nordisk, noted:

> **In the past, we just did everything in house. Right now we're moving into new therapy areas in the company – and we need many more concepts than we've had in the past. We could take yet another ten or fifteen years to build up this new therapy area. Or we could try to tap into the broader environment of biotech companies and startup companies.**
>
> Kenneth Strømdahl, Novo Nordisk



6.2 CASE STUDY

THE NOVO NORDISK INNOVATION CHALLENGE

At Novo Nordisk, building a more sustainable business has been a priority for 20 years. But in 2018, leaders agreed that they could think even bigger than wind farms and carbon offsets.

The Circular for Zero initiative aims to reshape and develop more sustainable insulin injector pens. Each year, Novo Nordisk builds and distributes half a billion injector pens worldwide – many of which end up in landfills and take about 100 years to decompose. To address this problem, Novo Nordisk teamed up with MATTER and Green Innovation Group to host the 2019-2020 Novo Nordisk Innovation Challenge: a global search for solutions to help Novo Nordisk improve the recyclability and circularity of these pens.

Globally, 29 million people living with diabetes rely on Novo Nordisk's medicine. Novo Nordisk medicines and injection pens require huge amounts of energy, water and raw materials to produce and distribute – putting them on the frontline of plastic waste and water scarcity.

The value of this challenge was identified by an executive from Novo Nordisk: "at Novo Nordisk, we are shaping our business practices to deliver on our clear ambition to have zero environmental impact," said Kenneth Strømdahl, senior vice president for device research and development at Novo Nordisk. "By collaborating with MATTER and Green Innovation Group, we believe we'll find novel solutions that will enable us to reduce our use of resources and to more effectively design our devices for recycling after use."

Four out of the five participating SMEs ended up having pilot projects with Novo Nordisk. The solutions are breaking new ground in the efforts towards a more circular medtech sector. This collaboration thus serves as a model for how competitive corporates in the field can raise the bar on the sustainability of the industry, while simultaneously strengthening their network of suppliers and the offering towards the market.

CONCLUSION

Due to the aforementioned differences in structure, function and mission between larger organizations and SMEs, larger organizations and startups may find it challenging to collaborate in meaningful ways. However, frontier innovation incubators can be powerful tools in ensuring that both sides communicate and collaborate efficiently. Understanding the needs of all involved, is a necessity to bridge the gap between the two, thus establishing strong, reciprocal relationships between both sides. This takes the stress, miscommunication, and guesswork out of such partnerships, allowing companies to focus on their innovation-focused mission rather than on troubleshooting their relationships.

Although circular economies are not the only lens through which sustainable solutions may be viewed, they are a useful tool for conceptualizing how the healthcare industry might update its technologies and work towards more environmentally-friendly methods of production and sale. Pharmaceutical companies and the healthcare industry at large have a responsibility and a necessity to reduce its environmental footprint. However, there is hope for a shift in the industry's relationship to the environment; by leveraging the respective strengths of SMEs and larger organizations towards the common goal of sustainability, change is possible.

It is our hope that this whitepaper will encourage further collaboration among key industry leaders and SMEs for the purposes of generating innovative solutions and crucial partnerships, which have the potential to revolutionize the way pharmaceutical companies and other healthcare organizations operate in their respective environmental contexts.

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