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GLOBAL TRENDS

&

IMPLICATIONS FOR RECYCLERS

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Overview

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CHANGES GALORE

The recycling industry is facing a rapidly changing world in which trade patterns are shifting, technological disruptions are accelerating, and the global focus on climate change mitigation seems unstoppable. What does this mean for the future of the recycled materials industry? How might these developments disrupt the business and regulatory environment in which metal, paper, plastic, and other recyclers operate? This special report will attempt to shed light on the possible futures the industry faces as well as the potential ramifications for business practices, market pressures, and the competitive landscape. The report has two parts: (1) a discussion of several high-impact global **trends** , and (2) an exploration of the likely **implications** of these trends upon the recycled materials industry.

The first section explores the trends affecting the global context in which all business decisions are being made. These are pressures that seem likely to persist for the foreseeable future (5+ years), and the possibility of a rapid reversal or change to the direction of these trends is small. While there are many potential trends that could be included, the report hones in on a few that are likely to have disproportionate impact upon the industry. It is by no means intended to be complete, but is instead best thought of as the start of an important conversation about the future.

Specific trends considered in this report include the (a) consistent focus on climate change mitigation and the corresponding pressure to electrify everything, (b) an increasing awareness of inequality and the resulting social trends around environmental, social, and governance (ESG) as well as diversity, equity, inclusion, and belonging (DEIB) efforts, (c) the accelerating role of technology and the corresponding increase in data that accompanies the march towards widespread digitization, and (d) the escalating US-China great power rivalry that is bifurcating the world into two global economic ecosystems, one led by China and the other led by America.

Many of the trends discussed in this report are readily apparent in corporate boardrooms, at dinner party conversations, among journalists, on magazine covers, and by glancing at the agendas of industry association conferences. They are also the topics that generate the latest thought leaders, bestselling books, and around which podcasts are launched. Lastly, these developments come off as urgent to leaders and demand attention from decision-makers.

The second section of this report focuses on potential implications for the recycled materials industry. Ranging from changes to human resource demands to competitive strategies, these pressures might meaningfully disrupt the recycling industry. By the end of this report, readers should appreciate how global trends will create future risks and opportunities for recyclers.

It's critical, however, that we remember the wise words of American baseball legend Yogi Berra: "It's tough to make predictions, especially about the future."

Part I

GLOBAL TRENDS

Global trends are developments that will likely persist for the foreseeable (5+ years) future. This section focuses on the four trends that seem most relevant to the global recycled materials industry: (1) The unstoppable focus on **CLIMATE CHANGE, SUSTAINABILITY, & ELECTRIFICATION**, (2) An increasing awareness of **INEQUALITY, INFLATION, & SOCIAL PRESSURES**, (3) The accelerating role of **TECHNOLOGY, DIGITIZATION & DATA**, and (4) The escalating US-China great power rivalry and the **GEOPOLITICAL REALIGNMENT AND SHIFTING TRADE PATTERNS** it is producing. There are many other trends that could impact the industry, but for the purposes of this report, these are the most relevant.

CLIMATE CHANGE, SUSTAINABILITY, & ELECTRIFICATION

The consistent focus on climate change mitigation stems from an emerging consensus that the planet is facing mounting risks from rapidly rising carbon dioxide levels in the earth's atmosphere. Widespread efforts to halt climate change have emerged and tend to focus on minimizing carbon emissions. Considered by many an existential risk to human life on planet earth, climate change has galvanized governments, companies, and individuals to promote behavioral change at all levels of society. The objective is to achieve a sustainable system.

The United Nations has organized conferences to coordinate a global response to addressing climate change, an endeavor that began in the early 1990s and continues through today. The 2021 conference of parties (COP) resulted in the Glasgow Climate Pact (GCP), a set of agreements that includes efforts to build resilience to climate change, to curb emissions, and to provide $100 billion annually to developing nations (with resources from developed nations) to help them achieve these objective. The focus remains on reducing emissions, with the ultimate goal being a containment of global temperature gains to 1.5 degrees.

One of the agreements made in Glasgow was a commitment to move the global automobile fleet towards zero-emission vehicles. Signed by one hundred parties, including many auto manufacturers, the agreement seeks to have all new vehicles and vans sold in leading markets to be zero-emissions by 2035 and in the rest of the world by 2040.

In early 2022, IPCC chair Hoesung Lee stated "I am encouraged by climate action being taken in many countries. There are policies, regulations and market instruments that are proving effective." In April 2022, the IPCC issued a report entitled "*Climate Change 2022: Mitigation of Climate Change*" that urged governments around the world to urgently work to reduce emissions.

The global focus on climate change is unlikely to disappear in the foreseeable future. Instead, it seems to be expanding, and has spawned a movement calling for environmental, social, and governance (ESG) standards to be used by socially conscious investors in screening their investments. As will be discussed later, ESG standards are not limited to efforts at addressing climate change and seek to address social challenges as well as environmental concerns.

One obvious development inspired by these dynamics is the rapidly rising demand for alternative energy production. And while solar and wind continue to get more efficient every day, there are still many places in the world where the sun does not shine regularly and the wind is inconsistent. The timing mismatch between production and consumption of energy is driving escalating demand for power storage and batteries. Because batteries themselves are subject to a supply chain of critical ingredients that are distributed unevenly around the world, materials such as lithium, nickel, cobalt, copper, and steel are also feeling the pressure of increased demand.

Metals manufacturing is another area of focus. Given the heavy use of coal in steelmaking, it's not surprising that efforts to reduce its carbon footprint are underway. This process began in the 19th century with the development of the Electric Arc Furnace (EAF). While EAFs are responsible for over 70% of steelmaking in the United States, they account for less than 30% of global steel production. This disconnect suggests a very bright future for the recycled ferrous metal market. At the same time, the use of (renewable) hydrogen as fuel to replace coal in the integrated steelmaking process shows promise and is gaining attention and momentum. Expect similar developments in the months and years to come.

The focus on tailpipe emissions is creating a seemingly unstoppable drive to electrify. From lawnmowers to vehicles, batteries are replacing internal combustion engines (ICEs) and adding to battery demand, further fueling the demand for many critical ingredients, including those mentioned above, as well as rare earths that are essential for permanent magnets, etc.

It's important to note, however, that electrification does not, by itself, reduce emissions. Electricity itself is often produced from fossil fuels and producing more electricity often generates more carbon. Further, we must also consider the carbon footprint of battery production. We must focus on the true (rather than just tailpipe) impact on climate change to have real impact. Driving an electric vehicle charged from a coal-fired power plant may, under certain circumstances, be worse for the environment than a modern, fuel-efficient gasoline vehicle.

INEQUALITY, INFLATION, & SOCIAL PRESSURES

Capitalism is an economic system that — despite its warts — has improved the lives of more people and driven more innovation than any other economic system. Yet the increasing emphasis on equality of outcomes (rather than equality of opportunities) is a natural outgrowth of unsustainable economic inequality — and one might argue a threat to the capitalist system.

For decades, business strategists, academics, and various consultants have counseled the public to focus on free trade and open markets within a globalized economy. A rising tide, it was promulgated, will lift all boats. Except in many nations, it just didn't happen. American middle-class families had stagnant incomes for decades while a growing pie was disproportionately consumed by Chinese citizens and the world's wealthiest people. Working class citizens the world over are expressing frustration due to a promise withheld, and a firm belief that the rising tide didn't lift their boat. Protectionism, nationalism, and redistribution bubbled up from these developments.

It has long been believed that inequality is the Achilles heel of capitalism. Inequality, pushed to its extreme, leads to social unrest, a possibility that is best captured by calls for workers of the world to unite. Labor unions are the modern manifestation of prior solidarity movements. Early warning signs of these dynamics emerged with the Occupy Wall Street movement and continue through the present with unionization efforts expanding across industries and geographies.

Unfortunately, many signs point to inequality getting worse. The COVID pandemic exacerbated the gap between those with and those without. Service and hospitality industry workers were particularly hard hit by the lockdowns, while the world's wealthiest saw their investment accounts swell as monetary stimulus drove asset prices ever higher. The current inflationary environment is also compounding the problem. It's critical to note that inflation is a *de facto* regressive tax that affects poor and working-class families more dramatically than the wealthy, given the larger share of their budgets spent on necessities. It is also a tax disproportionately paid by those on fixed incomes, such as retirees. The raw ingredients of unrest are present.

Containing inflation requires a combination of fiscal sobriety, a reduction of monetary stimulus, and higher interest rates. A policy that pursues constraints on spending, more restrictive liquidity conditions, and a higher cost of capital will likely slow economic activity. The risk of stagflation is real and one we should not dismiss. More likely, it seems an economic contraction will reduce demand, a process that should reduce inflation as rates, prices, and activity fall. Further, improvements along global supply chains may allow for inflationary bottlenecks to break.

The combination of high inequality and high inflation places a disproportionate burden on society to produce safety valves to keep the democratic capitalist system intact. Social pressures to lessen inequality and reduce the risk of revolutionary activity are building, finding broad and receptive audiences globally.

One idea being put forward to combat inequality is to transform our capitalist society from shareholder-focused to **stakeholder**-focused. Financial returns, it is believed, must be balanced by purpose and a sense of mission. It is no longer adequate to focus exclusively on shareholder returns. Companies, it is argued, must be run for the benefit of the environment, their employees, and the communities in which they operate.

The Diversity, Equity, and Inclusion (DEI) movement is one manifestation of these pressures. Equity and justice pressures are leading to a wholesale reinterpretation of systemic biases, generating new and emerging challenges for businesses in all industries. Addressing these issues, both individually and holistically, can present both opportunities and challenges to traditional business models. History suggest avoidance is not a wise strategy. For now, business leaders must be prepared to spend more time and money to address society's social and other non-economic concerns.

TECHNOLOGY, DIGITIZATION & DATA

In almost all walks of life, we are witnessing technology adoption at increasing rates. Our rapidly digitizing world and the internet of things promises to connect everything with everything else. Sensors will be ubiquitous, with wide ranging implications. The volume of data will explode. Ethical and analytical questions will arise around the use of data, but it seems undeniable that the growth in data will create many opportunities for forward-thinking businesses and managers alike.

One positive that often gets overlooked here is the impact of technology on inflation. Because many new products and services are making our lives better and more efficient, technology has exerted downward pressure on prices. By allowing greater output with the same (or fewer) inputs, technology is effectively increasing supply. As technology infiltrates more and more industries, we are likely to see continued growth in productivity and supply. While this has the ability to increase activity, it will also put downward pressure on the demand for labor, and correspondingly reduce consumer purchasing power. Yes, we are focused on inflationary pressures today, but the unstoppable march of technology suggests a long-run risk of deflation.

Sensors are now embedded in virtually every product and the volume of information being captured about every action on planet earth is staggering. The internet of things, in which all devices become "smart," are connected to the internet, and have the ability to communicate with every other device, is spurring a host of policy and ethical questions. What are valid uses for this data? Who owns the data?

In a now famous example that illustrates the power of data, Target's analytics team designed a marketing campaign that predicted — based on purchasing behavior — a woman was expecting a child even before she realized she was pregnant.[1] We are all leaving digital breadcrumbs behind with every action and inquiry and today's tech companies (described by some as "surveillance capitalists") are looking to monetize the trail. Data protection and ownership laws are spreading globally and across state lines as privacy considerations gain more attention from policymakers and citizens alike.

The implications for these developments on the business and corporate sector are numerous. Cyber risks are heightened, and companies are starting to make significant investments to protect company and client data.

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[1] https://www.nytimes.com/2012/02/19/magazine/shopping-habits.html

Data protection complicates the electronics recycling industry as the impetus for recycling and reuse of critical materials embedded in today's devices runs headlong into the need to destroy client data in disposed electronics. Computer technology is now embedded in all sorts of tools in everyday use: automobiles, household appliances, and even thermostats and doorbells. As data storage and/or data access functions are increasingly included in technology, the electronics recycling industry will need to navigate the inevitable onslaught of policies and mandates that will regulate the recycling and reuse of electronics across borders and over time.

In many ways, technology can be considered the great wildcard. Innovation and human ingenuity have repeatedly proven to break conventional wisdom's assessment of future trends and there is no reason to believe that this won't continue. Might technology impact our thinking around climate change with the development of unlimited clean energy, such as might be possible with fusion? Or could geo-engineering breakthroughs make our current focus on emissions appear useless? One thing remains certain: technological advancements are far from over.

GEOPOLITICAL REALIGNMENT & SHIFTING TRADE PATTERNS

Russia's 2022 invasion of Ukraine demonstrated how dramatically geopolitics could upend the global business environment. The world's reaction to the unprovoked conflict was to deploy economic sanctions against Russia, a major producer of oil and gas and the most important source of energy for much of Europe.

Taking a step back, it's worth noting the Russia-Ukraine war is part of a larger narrative that includes echoes of The Cold War. An emerging China-Russia-Iran alliance is exerting influence across numerous domains as new fault-lines emerge between autocracies and democracies. Countries are being asked to pick sides, resulting in shifting geopolitical alliances. It's worth noting, for instance, that India recently abstained from condemning Russia in a UN General Assembly vote while also offering to buy Russian oil in rubles.

Another noteworthy event was Saudi Arabia's acceptance of Chinese renminbi for oil shipments bound for the Middle Kingdom. And while these recent actions are worth highlighting, the elephant in the room is the rapidly escalating US-China rivalry, perhaps the most consequential development facing business leaders over the long run. What began as a US-China trade war has intensified into full- spectrum, multi-domain great power conflict. The dynamic is far more than a mere trade war — it is a space race, a

currency war, a military rivalry and arms race, a technology conflict and, ultimately, a war of values.

As countries around the world choose which telecommunications equipment (Huawei or not?) they use to upgrade their networks, they are picking sides. And communications equipment is just one domain in which this dynamic is playing out. Similar choices are being made in finance and other industries. The world seems to be splitting according to national values.

One possible outcome of this bifurcation process is the emergence of two global economies, one led by the People's Republic of China and the other led by Western democracies. In such a scenario, multilateral organizations such as the World Trade Organization, World Health Organization, and even the United Nations may cease to function as effective global institutions. The "rules based" international world order is changing in front of our eyes. Globalization will not die, but it will be very different.

In a world dominated by two ecosystems, trade patterns will shift and create new markets and opportunities. Existing businesses will face new challenges. The pandemic highlighted the fragility of tightly coupled supply chain strategies and brought risky geopolitical fault lines into the spotlight. And when scarce resources were allocated by producer nations based on national allegiances, companies around the world quickly acknowledged the need for multiple sourcing approaches.

Corporate strategies are changing to reflect this emerging reality. The mantra of lowest-cost, just-in-time, most efficient supply chain strategies is increasingly out of fashion. Most-dynamic, just-in-case, and resiliency- focused approaches are now in favor. Flexibility and agility are displacing the religion of efficiency, with significant implications for trade patterns and market access. Supply chains are rapidly shifting as corporate boardrooms adapt to the new world in which they operate.

The American industries with the greatest dependence upon China - semiconductors, pharmaceuticals, rare/critical materials, and consumer goods will rapidly decouple from the Middle Kingdom and develop capacities in friendlier geographies. Likewise, China will probably seek to reduce its dependence on American agriculture by securing food from countries such as Ukraine, Russia, and others more sympathetic to its values.

Regardless of how these dynamics play out, it seems certain that as geopolitical alliances shift, so too will trade flows.

Part II

RECYCLING INDUSTRY IMPLICATIONS

Global trends, by their very nature, create both opportunities and risks for business leaders and companies in virtually every industry throughout the economy. This part of the special report focuses on the specific implications of global trends for the recycled materials industry.

The pressure to increase recycling continues unabated. Countries are focused on reducing their dependence on potentially hostile nations and are seeking to minimize imported materials. The desire to reduce the extraction of natural resources and protect the environment add to this dynamic. Expect more attention on recycling from countries, companies, and citizens alike. This presents enormous opportunities and challenges to the recycled materials industry, several of which are highlighted below.

ENVIRONMENTAL JUSTICE

An increasing number of social and regulatory pressures affect the business environment and manufacturers – including those in the recycled materials industry, in particular. Near the very top of this list is environmental justice (EJ), which seeks to connect fairness and equity with environmental standards.

While not a new movement, the current administration is placing more emphasis on ensuring federal agencies consider environmental justice principles when making regulatory and other decisions. It's even formed a new Office of Environmental Justice and External Civil Rights within the US Environmental Protection Agency (EPA). Many states and localities are pursuing similar efforts.

Environmental justice is defined by EPA as the "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with

respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. This goal will be achieved when everyone enjoys the same degree of protection from environmental and health hazards, and equal access to the decision-making process to have a healthy environment in which to live, learn, and work."

While the concept of environmental justice (indeed, any form of justice) is widely accepted, the method of addressing the subject generates debate and disagreement. Will manufacturers be forced to move or adjust operations? Could investment dollars deployed be stranded due to shifting social and regulatory thinking? Facilities located in geographies that are labeled EJ communities will face increased scrutiny and risks that might limit growth or disrupt operations. Recyclers must engage with the communities in which they operate to demonstrate their desire to be good neighbors and visibly contribute to the sustainability of the areas in which they operate.

Recent developments confirm the urgent need for recycler engagement to address EJ concerns. The 2022 Inflation Reduction Act allocates $2.7 billion to environmental justice efforts, suggesting that a focus on local environmental impacts will continue for some time. And while local and national concerns remain primary, there is also growing attention being paid to cross-border environmental justice.

Many questions are being raised. How should we handle end-of-life environmental costs associated with recycled, refurbished, and resold electronics that are sent to the developing world? The rich world's infatuation with the latest gadgets produces an endless stream of usable electronics that, once refurbished, can be sold at compelling prices to emerging markets consumers.

These devices must be managed responsibly when refurbished or recycled. The recycled materials industry must continue to work with its counterparts globally to help address environmental impact and workplace safety. Doing so will not only benefit recyclers in emerging markets but also the communities they serve and ultimately, the countries within which operations are located.

Regulatory intervention in the markets for second-hand refurbished technology will almost definitely have an effect on recyclers. Including externalities (such as end-of-life disposal costs) into the transaction will likely raise prices and shrink the market. Certain markets may even close to exports of recycled electronics, impacting trade flows and further disrupting markets. Under certain scenarios, prices may plunge in some markets while they rise in others.

ELECTRONIC RECYCLING & DATA PROTECTION

As more and more products store digital information, the electronics recycling industry will need to spend more time and effort on data protection and security. The internet of things is producing an explosion of smart products that are emerging to be depositories of personal data and information. Pressure will rise to assure that data protection is embedded into electronics recycling. And because of constant upgrades, the volume of electronics to be recycled or prepared for reuse will also grow.

Further, the universe of electronic devices is rapidly expanding beyond traditional categories. Consider the fact that today's automobiles are *de facto* computers on wheels. This means that vehicles contain inordinate amounts of personal information, ranging from simple address books and contact information to private data such as where the driver has been, when he or she has been there, and who that person may have called or texted while on that trip or once arriving at the destination. What if such data was connected to other identifying information about the driver?

The implications for auto recyclers and shredders are enormous. What advance activities must now be conducted prior to shredding a vehicle? Is a magnetic data deletion process adequate to assure the safety of sensitive personal information? Will it be safe, prudent, or economic to use shredders to recycle electric vehicles? Similar questions arise when looking at today's smart refrigerators and other appliances.

The appropriate disposal and recycling of the numerous data depositories in today's products presents both risks and opportunities for today's recycling industry.

MATERIALS SCARCITY & NATIONAL PRIORITIES

The global effort to decarbonize and "go green" will require an increasing supply of raw materials, of which recycled materials will emerge as an ever more important source of high quality renewable resources. The recycled materials industry is part of the solution to creating a secure, stable, and greener manufacturing supply chain.

Across the board, manufacturing with renewable resources is significantly more energy efficient than producing the same products from raw iron ore, trees, oil, or other natural resources that must be extracted or harvested. Similarly, it stands to reason that the

carbon footprint of manufacturing products from recycled materials is smaller as well. The implications for the industry are obvious: demand for recycled materials will have a strong tailwind for years to come.

Another factor that will lead to more demand for recycled materials into the future is the increased global focus on net zero as an emissions target, an effort which will likely include greater electrification. Electrification of our transportation systems and other infrastructure is very materials-intensive, requiring significant increases in the supply of copper, aluminum, lithium, cobalt and steel. Rare earths and critical minerals are also needed. This may lead to increased pressure on supply chains and higher commodity prices, spurring greater innovation to recover even greater amounts of recycled materials from manufactured products, batteries, packaging and other sources.

These dynamics are global and will lead countries to think about how materials are sourced, both domestically and from abroad. For example, iron ore is a valuable resource that need not be imported (with an accompanying carbon footprint) unnecessarily. Wouldn't it be easier to recycle steel? National mandates might emerge requiring the use of recycled steel or limiting the export of recycled materials — developments that could drive a meaningful drop in the volume of trade in certain commodity materials. Export restrictions or import bans could be regular occurrences, and regulations dictating recycled versus raw material usage may prove increasingly important.

Many commodities may face similar regulatory and trade pressures. Possible materials that could acquire national significance include battery materials such as lithium, nickel, and cobalt as well as rare earth materials that power electrification via permanent magnets and defense applications.

This points to a world of increasing competition for scarce resources. The implications for the recycled materials industry are likely to be quite positive as governments seek to reduce imports, reuse already imported commodities, and recycle disposed products—all in a quest to reduce dependence on other countries and increase self-reliance and national flexibility.

DYNAMIC BUSINESS MODELS

Just as countries will seek to minimize their dependence on other nations for scarce resources, so too will companies around the world try to reduce risks emanating from long supply chains that cross international boundaries. But the vulnerability of

dependence on others may also enter the industry's own value chain, as seen by the entry of automakers into the recycling segment in India. General Motors provides another example, having recently announced investments to create a battery recycling ecosystem in North America to secure its supply of materials needed to reach its goal of 100% EV production by 2035. Expect similar developments as companies prioritize resilience and self-reliance over efficiency.

What if companies are forced (or take it upon themselves) to think about the externalities associated with the end of the produced products' lives? Might petrochemical companies enter the plastics recycling business as a new form of petrochemical "production"? What does this mean for today's recyclers of industrial and consumer materials? Disruption and shifting business models are a virtual certainty: today's business leaders must think about how industry structures will change in response to the global trends that are creating the business environment.

Labor markets will also shift as technological innovations demand professionals within the industry have ever broader ranges of capabilities. The workforce must be up-skilled, putting recycling into direct competition for scarce talent. But given the increasing desire of younger workers to work for companies and in industries that align with their values, HR managers in the recycled materials industry are uniquely positioned to present opportunities in terms of the industry's social and environmental stewardship roles. The recycled materials industry should emerge as a highly-desired destination for tomorrow's most promising professionals.

Conclusion

LOOKING FORWARD: NAVIGATING UNCERTAINTY

John Kenneth Galbraith captured the essence of forecasters. There are, he notes, two types: "those who don't know and those who don't know they don't know." And while those words ring true to anyone who has faced an uncertain future, it doesn't mean that we can't think about the futures that might unfold.

Navigating uncertainty requires we think in terms of trends, developments those trends might produce, assumptions underlying those beliefs, and possible scenarios that can impact our world. Rather than generating a correct answer, per se, the goal of thinking about the future should be to increase our awareness of the pressures that are likely to produce change.

In this short report, we've thought a bit about the global trends that are producing the context in which all developments are taking place. But that doesn't mean we can't call some of these trends into question. What happens, for instance, if society is able to produce a breakthrough energy technology that gives us unlimited clean energy? Think this is a crazy idea? Think again. Scientists at the Lawrence Livermore National Laboratory recently achieved a major breakthrough (in the form of "burning plasma") that may ultimately make fusion energy possible. The outcome of this endeavor may be unlimited clean energy, effectively replicating the power of the sun, in a power plant.

How might such a development change the planet's focus on climate change mitigation? Would we continue to focus on carbon emissions? Or how might the geopolitical alignment change if one nation was able to harness the power of fusion while others

compete over scarce energy resources? What would the implications be for metals, paper, plastics, electronics and the recycling of other materials?

Perhaps that's a jump too big to make, but what if technology were able to capture carbon or effectively stop climate change? Once a distant concept and the subject of movies such as *Geostorm*, geo-engineering is gaining momentum. There is now a burgeoning field of scientists and engineers working on adaptation. Let's not forget that the 1991 eruption of Mt. Pinatubo in the Philippines lowered global temperatures for years simply by sending particulate matter into the atmosphere. Might some Silicon Valley startup or academic lab produce a jet fuel additive that can safely recreate this effect?

Pointing out these potential developments is not to suggest that climate change is not real or that we should not focus on reducing emissions, but rather to note that while the global trend to mitigate environmental impacts seems virtually certain in the short run, it may not be so in the medium-long term. We must think about the assumptions underlying our analysis.

There are an infinite number of "what if" scenarios that we can produce that could dramatically change the expected future that the recycling industry likely will face. What if capitalism is abandoned as inequality leads to an overwhelming wave of socialism globally? What if the US-China rivalry turns into a hot war with kinetic conflict? What if

bioengineering efforts extend human life to 200+ years? Might we become a multi-planetary species?

Thinking about such possibilities can be fun, but business leaders operate in a world where decisions must be made today. In trying to navigate through an uncertain future, many of the world's most successful leaders resort to some form of strategic planning. What could be more prudent than sitting down with your morning coffee, pulling out a financial model, and making sure the numbers work out for next year? Want to hire another sales person? Run it through your base case to see if the numbers still work.

This all sounds nice, but there's a catch. We tend to think of planning as a process for making plans. What if I told you that committing to ***planning*** is the best choice you could make, and that committing to a ***plan*** is just about the worst. Sound contradictory? It's not.

You see, planning is often practiced as a way to calculate, predict, and lock in. We build the spreadsheets, model the projections, and make long-range hire/fire or build/buy/rent decisions based on these calculations. But, as we know, our assumptions will inevitably be over-simplified, the data shoddy, the predictions inaccurate. That's just reality. So might we be doing a disservice by committing to plans? If we treat plans as sacred, we'll likely make bad decisions. We'll be disappointed. And we won't be better off. The sad reality is that plans are self-imposed tunnel vision.

The antidote to this disease is planning. While creating a plan and sticking to it can lead you astray, the act of planning may be the solution. Planning invites and encourages us to consider various future scenarios and to brainstorm possible actions. It is most successful when it occurs as a process rather than a product. **We need to emphasize planning over plans**. Through planning, we voice diverse opinions, survey the range of possibilities— including seemingly unlikely extremes—and evaluate scenarios that may seem far-fetched.

Planning multiplies perspectives and expands considered possibilities, rather than reducing them. Plans generate a false sense of certainty; planning highlights, acknowledges, and emphasizes uncertainty. People who embrace planning are better thinkers because they consider multiple perspectives. They don't fool themselves into thinking they're always right.

Consider the case of Shell Oil. In the mid-1960s, the company implemented a program called Unified Planning Machinery (UPM), a model-driven computer-generated financial

system. UPM generated a plan, but it did not promote planning. Around the same time, Shell also introduced a planning operation called Long-Term Studies. It was an almost polar opposite of UPM. This group explored a range of future scenarios and considered the ramifications of various oil prices, for instance. They shunned a supposedly precise numerical forecast and instead considered alternatives, one of which they hoped would ultimately be approximately right.

Shell soon recognized that creating a plan was almost useless, but that incorporating planning into an operation was invaluable. Scenario planning helped Shell navigate the turbulent 1970s better than its peers, who hadn't taken the time to meditate on such extreme possibilities as an oil price shock. The result: while other international oil companies struggled to survive, Shell thrived.

Planning is about broadening our mental maps. As the head of Long-Term Studies at Shell in the 1960s put it, "You are trying to manipulate people into being open-minded." And if that isn't the best way to prep for an uncertain future, I'm not sure what is.

About the Author

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Dr. Vikram Mansharamani is a global trend-watcher who shows people how to anticipate the future, manage risk, and spot opportunities. He is the author of ***THINK FOR YOURSELF: Restoring Common Sense in an Age of Experts and Artificial Intelligence*** and ***BOOMBUSTOLOGY: Spotting Financial Bubbles Before They Burst***. He has been a frequent commentator on issues driving disruption in the global business environment. Vikram's ideas and writings have also appeared in *Bloomberg, Fortune, Forbes, The New York Times* and a long list of other publications. *Linkedin* twice listed him as their #1 Top Voice for Money, Finance and Global Economics and *Worth* has profiled him as one of the 100 most powerful people in global finance. Millions of readers have enjoyed his unique approach to connecting seemingly irrelevant dots.

Vikram has taught classes on financial instability, economic inequality, corporate governance and business ethics, and global challenges to undergraduate and graduate students at Yale and Harvard universities. In addition to teaching, he also advises several Fortune 500 CEOs to help them navigate the radical uncertainty in today's business and regulatory environment and currently serves on the board of Werner Enterprises, one of America's largest trucking companies. He has a PhD and two Masters degrees from MIT a Bachelors degree from Yale University, where he was elected to Phi Beta Kappa, and earned his Commercial Drivers License after completing a course at Roadmaster Drivers School. Vikram lives in Lincoln, NH with his wife, daughter, son, golden-retriever, and two cats, one of which he believes may be clairvoyant.

About the Special Report

This report was commissioned by ISRI in December 2021 and is the product of research conducted by Dr. Mansharamani and his team during the first half of 2022. The research was a collaborative effort with meaningful input from ISRI leadership and many ISRI members.