

Plug-In Planes, E-Trains, and Autonomous Vehicles:

How Environmental, Social and Governance Practices are
Changing the Purpose of Business©

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This publication is for my many supply chain colleagues,
business associates, students, and other rule breakers that know
we can make a difference.

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The author is not providing legal advice.

This publication will be updated on a regular basis as information, practices, and technologies evolve. Go to www.larryberglund.com

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Executive summary

If you are in a business involving goods and services, you are aware of supply chains. Major global events have been impacting supply chains for years: the shift from a fossil fuel energy supply to renewable; the digitalization of information; the electrification of transportation; the need for decarbonization to reduce emissions; eliminating plastics and waste; the pandemic; the circular economy; global warming; and environmental, social, and governance (ESG) policies.

The pandemic exposed the lack of resilience in sourcing strategies. The circular economy is a decade old and is gaining traction to affect how we view resources and design. ESG is showing us that we can prosper with dignity and respect. Developing supply chains with responsible materials and labour practices is possible. Addressing environmental concerns in a sustainable business model requires challenging the status quo. These changes require national and international interventions by business and thought leaders and governments.

The ESG blueprints and road maps have been written. We now need more companies and governmental agencies to adopt the best and leading solutions to ensure a planet which is going to sustain our collective ecosystems. The solutions are not secrets. The United Nation's Sustainable Development Goals are readily available; the International Labour Organization conventions are market-tested; the 2007 United Nations Declaration on the Rights of Indigenous Peoples reflects the acknowledgement in social obligations; the ISO 14001 for environmental and 26000 social value standards are well known; leading brand managers and manufacturing companies are sharing their processes and technologies; industrial associations are advocates for better methodologies; investors and stakeholder voices are being heard; the principles of the circular economy are working; innovative logistics are driving down costs and improving services; disruptive technologies are shaking the status quo; and the expectations of consumers and customers demand affordability and availability.

Supply chain managers have been part of the transactional process in all sectors. As Artificial Intelligence and the Internet of Things expands exponentially, the role of supply chains needs to adapt to be relevant as well. There will always be a cost of goods to consider but it will be a much broader view with the total cost of ownership internalized as much as possible. See Addendum IV for a TCO Worksheet.

This article looks at the many touch points in supply chains in multiple sectors and discusses how ESG in changing the purpose of business. It looks at potential winners and losers in the markets and the shift in power by early adopters. The metrics for success in business must include objective financial and non-financial reports.

Whether your organization has embraced ESG or is considering on adopting many of the practices, the content is to support a continuum for ESG to flourish.

And ESG is not without its detractors. This is an important part of the discussions and debates.

What got us here won't get us to where we might be going. But we are leaving behind much of the traditional industrial strategies and forging new partnerships to achieve what is possible and necessary through supply chain strategies. This will result in massive investments to move to renewable energy sources. The risks are steep as are the rewards to those who do so successfully.

ESG is not comparable to moving from horse drawn carriages to automobiles. ESG is a global shift affecting generations of peoples and facing the multiplicity of problems which can be attributed to anthropogenic actions. There is a burning necessity to correct our direction and get it right, in the time remaining.

The clock is ticking.

The Purpose of business

Business decisions have been influenced by the theory of the *Invisible Hand*. The Invisible Hand is an economic term coined by Scottish economist Adam Smith over two hundred years ago. The basic premise is that people will do business with each other in a free market that best decides the price of goods and services. An unfettered free market does not want any government intervention. This concept upheld the idea that when everyone works for their own self-interest, we will collectively be better off.

We can now see the shortcomings of the Invisible Hand, which originated in a time with slave labour, a privileged few controlling commerce, harsh working conditions, child labour practices, and an absence of environmental responsibility. Natural resources were seen as being infinite but also worth fighting wars over. The Invisible Hand directed the expansion of the Industrial Revolution.

Fast forward to the 21st Century. Many of the shortcomings of the Invisible Hand have been eradicated in the marketplace – but not all. We acknowledge that government intervention is necessary to enforce responsible business practices. We complement the Invisible Hand with a term this author refers to as the *Indivisible Hand* of government. The Indivisible Hand guides and, out of necessity, monitors the Invisible Hand to stimulate social and economic interests being realized in a sustainable manner.

Any model which is primarily profit-based from a Supply side needs to be effectively balanced by the Demand side. Supply chain practices, built on the Invisible Hand values, were aimed at attaining the lowest cost. This theory seemed to make sense until we looked deeper into the supply chain and found that the lowest cost came at the expense of social values, environmental degradation, and the erosion of long-term economic development.

Until more recently, business management training was primarily based on Smith's theory that as long as a product was legally sold, the market would set the price and should not concern itself with the public welfare – that was the job of government. Public sector procurement also followed the Smith theory, where the lowest cost from a tendering process must deliver the best value. Procurement decisions were largely one-dimensional – with economic interests being the first choice.

However, in the 1980s, quality management started to drive value, which in turn affected costs. Investing in quality management practices was primarily a means to ensure economic benefits would accrue. Environmental interests followed quality management rather reluctantly – until we could connect environmental benefits with sustaining profits. Social procurement practices didn't hit the procurement radar until the early 2000s.

Procurement, which is a transactional tool of the Demand side, needed to redefine the value proposition to go beyond the lowest cost and be based on values of a larger stakeholder base. Procurement in private and public sectors began realizing that the lowest cost was not a sustainable model. The Indivisible Hand, through legislation and by supporting international standards, has been transformative in affecting how we think of value. We need a three-dimensional model with *economic* and *environmental* interests meeting the *expectations* of stakeholders.

The Invisible Hand favoured market transactions that benefited a small group of stakeholders. This led to the idea that profits should trump principles. The courts had to intervene to establish laws on conducting business. Business ethics and codes of conduct emerged to signal a change in behaviour and practices. The Indivisible Hand favours a market transformation that reflects the values of the majority of its stakeholders.

We could surmise that business created the problems we are trying to resolve today but that is too simple. We could also say that business will get us out of the problems we are in today. Again, not entirely true. There will be a constant push and pull by business as ESG issues surface, receive attention, and morph into newer challenges. It's how we as a people have progressed globally. Commerce created wealth and it can support sustainability and inclusivity. It will be an asynchronous movement between developed economies and emerging economies. Where the developed economies have benefited from a technical advantage, the emerging economies have the opportunities to access and accelerate these benefits.

It's been a decade since Harvard's Joseph Henrich coined the term, *WEIRD*. Western, Educated, Industrialized, Rich, and Democratic. This term captures the attributes of western business. If you are reading this, you are likely WEIRD. Being WEIRD is not good or bad. It's part of our evolutionary path. ESG is a stepping stone along the path.

The shift in the purpose of business has gone from making profits at any cost to making profit with a sense of responsibility for all stakeholders, protecting environmental interests, and building social capital.

Supporting the shift to more responsible business practices is the United Nation's Sustainable Development Goals (SDG). These (17) goals act as a touchstone for actions to address global issues which we are all directly or indirectly connected with. We are either contributing to these problems or are recipients of the actions taken by others for which we have little control. Solutions require global cooperation focused on these outcomes which were developed in 2015 with 2030 as a major timeline for alignment. The UN SDGs are:

1. No poverty
2. Zero hunger
3. Good health and well-being
4. Quality education
5. Gender equality
6. Clean water and sanitation
7. Affordable and clean energy
8. Decent work and economic growth
9. Industry, innovation and infrastructure
10. Reduced inequalities
11. Sustainable cities and communities
12. Responsible consumption and production
13. Climate action
14. Life below water
15. Life on land
16. Peace, justice and strong institutions
17. Partnerships for the Goals

Addendum II provides a checklist for an organization to see how it aligns with the UN SDG goals.

The balance of this paper will weave through these themes from a supply chain and business perspective.

Introduction to the circular economy

The Ellen MacArthur Foundation has been accelerating the transition to a circular economy since its inception in 2010. The circular economy is based on the (3) principles:

1. Eliminating waste and pollution;
2. Circulating products and materials; and the
3. Regeneration of nature.

This is in stark contrast to the conventional linear model which is based on consumption of materials and resources rather than their conservation.

To remain competitive on a cost basis, leading companies recognize that with changes in legislation, consumer demand, technology and environmental standards, they must be looking ahead to remain financially viable. Our economy and quality of life has been based on unfettered consumption. Now we are looking at conservation of resources while coping with mutating viruses. The transportation sector functions in a global market with international agreements and extended supply chains, originally intended to supply goods at the lowest cost.

Circularity in supply chains is providing solutions to decades of myopic strategies where resources were seen as being infinite. A sustainable economy means we practice *economic decoupling* on a mass scale. Ergo, economic growth without a corresponding increase in consumption in energy and resources, nor in environmental stress. Greenhouse gases are killing profits and the planet. The circular economy is one of the means towards sustainability and is not a solution in itself. It is a framework to build from.

The widely referenced 7R Model, which forms the basis for design of products in the circular economy, includes:

1. Recycle
2. Repair
3. Reuse
4. Repurpose
5. Refurbish
6. Reduce
7. Rethink

We respectfully add a number 8. *Responsibility*. Addendum III provides a self-assessment on alignment of an organization's products and values with the 7R Model.

Authors Velenturf and Purnell describe a sustainable circular *society*. This is one which maintains environmental quality and economic prosperity for current and future generations. Their value framework considers (3) components:

- A. Social and individual well-being: Create conditions that offer equity in realizing quality of life that at least meets human rights standards for all;
- B. Environmental quality: Using resources within planetary boundaries, enhancing natural capital within and across generations;

C. Economic Prosperity: Collective organization of fair access to resources within and across generations to enable social and individual well-being and enhance environmental quality.

Across all sectors is the presence of logistics to deliver raw materials and ship finished goods. In the areas of logistics, we can see many of the circular economy principled actions taking place within a complex business ecosystem. Logistics has been defined by the Canadian Manufacturers and Exporters (CME) as the management and coordination of transportation, inventory, strategic sourcing, global trade management, forecasting, compliance mandates and performance measurement across global value chain partners. Per CME, the sector is largely affected by six main factors: globalization, increasing logistics complexity, rising risk, increasing labour costs in the developing world, sustainability, and growing volatility.

Plastic packaging is now a target for 2025 to be 100% reusable, recyclable or compostable according to the US Plastics Pact. In addition, the average recycled content or responsibly sourced bio-based content in plastic packaging will be 30%. Plant-based materials such as polylactic acid (PLA) and polyethylene furanoate (PEF) are showing promise as alternatives to PVC. Plant-based beer bottles came on the market in 2020 but it remains to be seen if these will become scalable solutions for many other food and beverage items.

Bottles made from paper have been on the market for a couple years. Out of Denmark, The Carlsberg Group was one of the first in 2019 with bottles made from paper and wood fibre. The bottle uses the PEF polymer film as a liner to contain liquids. Coca Cola has launched paper beverage bottles in Europe using PEF liners. Consumers play a big role in the acceptance of paper over glass containers. The paper bottles are fully biodegradable. If it's possible to stop the usage of PVC-based plastic bags from consumers, it may require an industry and governmental edict to increase the conversion to renewable paper containers.

In late 2022, UBC's faculty of forestry created a bioplastic from grass which only uses the waste stalks. Corn, which is a food staple, has been used for many plant-based plastics, but the grass option has a lower impact on food supplies. Grasstic, the UBC product, holds great promise due to it being renewable, plentiful and biodegradable in soil and water in the form of a biopolymer call xylan. Grasstic has been made into packaging replacing single-use plastics. Other breakthroughs from UBC are bioplastics made from kelp and wood fibre. These are scalable, sustainable products which support the circular economy principles.

A significant Canadian government policy was announced in December 2022, to ban the manufacturing and import of many types of single use plastics. The food service and packaging industry's lack of concern due to perceived price imbalances, invited government intervention which creates the "even playing field" for all sellers of packaging products. Now there will be renewed investment into optional packaging products for the food sector and retailing in general for compliance. This will likely incur some price adjustments in order to address the importance of protecting our biodiversity and ecosystems. This strategy again, aligns with the circular economy values. Stopping the problem at the source through the responsible design of products and the use of biodegradable materials.

It is of note, that in the same week which the Canadian government announced the banning of single use plastics, fast food giant Tim Hortons announced it will be switching to wood and fibre cutlery in early 2023. Hortons is concurrently trialing redesigned food wrappers to reduce 75% of the material requirements and hot beverage lids which are easier to recycle and repurpose. Great example of the circular economy principles and an acknowledgement of corporate ESG actions.

While many community stakeholders feel that the ban on plastics was long overdue there is another side to this argument. A group of plastic manufacturers is making a legal challenge to have a judicial

review which it hopes will lead to dismissing the regulation banning single use plastics through the Canadian Environmental Protection Act (CEPA). The industry organization is the Responsible Plastic Use Coalition. In 2021, they challenged the term “toxic” under the CEPA and this case is still before the courts. Toxic is defined as being “immediate or long-term harmful effect on the environment or its biological diversity.”

The automotive industry is sending signals that by the end of this decade the conversion to electric vehicles will be well underway towards affordability for a larger consumer base. Electric and autonomous vehicles will complement the electrification of the mass transit systems in rural communities. One critical part of the electrification is the source of energy to charge batteries. If energy comes from a fossil fuel base (coal, oil) instead of a hydro (water), the emission reductions could be very low.

The construction and excavating industry have plug-in cranes. These pieces of equipment have the same lifting capacity as their diesel-powered cousins. But, no emissions, quiet operating, 4-hour battery power when unplugged, keep on operating when plugged in, and with electric motors, fewer parts for maintenance. The circular economy is pushing all designs to be more responsible and affordable.

One significant downside to the current design of batteries in EVs is that in an accident, even slight damage to the battery pack can lead to the vehicle being written off by insurance companies. This is a significant cost to insurance companies which must be borne by the consumers. A March 2023 Reuter’s article, by Sean Tucker, noted that while Ford and GM have taken steps to make battery packs easier to repair, Tesla with its Model Y is almost *unrepairable*. The entire car is often written off. As we get more and more EVs on the road and more accidents involving EVs, this is going to push insurance rates up and require some serious redesigns to solve the problem. An EV battery pack could cost 40-50% of the vehicle’s sticker price.

There needs to be a balance between the economic interests of a few players and the larger interests of a healthy society. Transportation modes all contribute to the GHG emissions through some form of energy consumption either in manufacturing or operations. The consequential pollution impacts our air, water, and land resources as well as our health and well-being. Looking for ways to reduce the anthropogenic impact is in our collective interests.

The Global Logistics Emissions Council (GLEC) produced a 2019 Framework which indicates that emissions are tracking to greatly exceed current levels unless actions are taken to correct the trend. Their comparison from 2015 to 2050 is as follows:

Logistical Emissions Source	2015 %	2050 %
Inland waterways	2	2
Rail	3	2
Air	6	6
Sea	27	34
Road	62	55

Outsourcing of logistics, warehousing, and distribution (LWD) services is a growing trend for its reduction of investment by customers and the access to expertise provided by the 3PL service providers. The primary activities of service providers are customer service, planning/demand forecasting, inventory management, warehousing, logistics communications, material handling, packaging, and transportation.

Transportation plays an integral role in our economy and will continue to do so. The infrastructure investments and maintenance costs require government and private sector attention. AI, the IoT, Big Data, telematics and algorithms are the means of improving logistics practices.

In the bellwether state of California, there is pushback on the social side of autonomous vehicles. In February 2023, the VP of the International Brotherhood of Teamsters, which represents 500,000 commercial truck drivers, wants a national transportation policy which addresses potential job losses. California has legislation governing self-driving cars and delivery vehicles under 4536 Kgs. Now they are looking at rules which allow autonomous semitrucks up to 36,287 Kgs to operate on the roads.

According to Sylvain Rouche in a 2021 Supply Professional article, 80 per cent of global merchandise trade, by volume, moves via maritime transit and account for 3% of CO₂ emissions. Sea levels rising threaten 14% of the world's largest ports. Moving away from oil-based energy will require increased investment in technology and fuel option strategies.

Environmental, social, and governance policies are being deployed by progressive and purposeful organizations. ESG while not a panacea is seen as an effective means of transitioning from a fossil fuel-based economy to one based on more renewable based energy supplies and significantly reduced resource consumption. ESG and the circular economy are not opposing strategies – they are complementary strategies. This enables sustainable economic growth by decoupling production from the environmental impacts and social stress caused on a global basis as we acknowledge that resources are finite and we only have one planet.

The financial risk for investors of new technology must also be considered. While the circular economy is delivering scalable solutions to minimize environmental impacts in many products, not all investments in technical options are successful. Governments will need to incentivize industry and investors through more innovative funding and loan mechanisms.

Resilience in supply chains

Business risks are something to avoid. In supply chains, risk is never completely removed. The number of touch points or links in a supply chain add to the potential risks, should one of these connections fail. As supply chains tighten, there is an increased level of interdependency on each link. As referenced earlier, car manufacturers are curtailing or delaying production because of the chip shortages on a global basis. Geo/political events add to the level of uncertainty which increases the challenges and risks but also invites opportunities. Resilience has been a void in the supply chain.

The prophetic Stanford University professor Hau Lee proclaimed in 2004 that cost effective and lean supply chains will not provide sufficient competitive advantages, which seems counterintuitive. Lee opined those successful operations require agility, adaptability and alignment-the essence of resilience. His Triple A theory was put to the test and found many takers at the time.

His message on resilience was lost as more companies sought more business from fewer suppliers to get the lowest cost. Single sourcing from the lowest cost producer became the mantra. Asian suppliers benefited from the outsourcing of products which increased the level of logistical challenges. A series of events caused a pause in the pursuit of the lowest cost. The 2020+ pandemic exposed the weakness of single sourcing as it was not resilient.

Inventory management has been the buffer for shortages, but historical patterns are not applicable or reliable for a post-pandemic recovery. Critical shortages literally halted production, such as in the micro-chip impact in the automotive manufacturing sector and computers. Long-term, there may be a requirement to balance offshore supply with domestic availability-which will make logistics more complex.

The trend of single sourcing from the lowest cost producer led to many shortages of supplies and

materials during the 2020-22+ pandemic epoch. As we try to recover, we have to consider options which lead to a more *resilient* supply chain. While pandemics of that scale are rare, we have faced other issues from SARS to financial market turmoil to labour shortages in many sectors. It is probable we will face other market conditions which are beyond the control of an individual company or government to control. Leading organizations prepare and profit through the execution of effective planning across their operations to service their customers. The nascent circular economy strategy is becoming the conduit for success.

The demand side (buyers) can look to some of the large retail manufacturers (suppliers) and how they pivoted with omnichannels to distribute products and develop multiple sources. The hit to the economy due to a lack of a resilient supply chain strategy will have a ripple effect for a few years. Undoubtedly, resilience will be supported through onshoring and supported through the many technologies being used. Resilience requires a combination of high-level technical investments for real time access to supply chains and pipelines as well as flexible manufacturing. The long-term availability of the supply of goods and services will have serious implications for IT security risks and geopolitical agreements affecting trade. Distribution channels, from a resilience and risk perspective, must be assessed for efficiencies and economic advantages. Those business partners which work out the new channels with the complexity of more robust technical solutions will gain market share, at the expense of their competitors. Resilience may beat lowest cost. An empty shelf of low-cost goods isn't as beneficial as a shelf full of actual products.

Resilient supply chains are using end-to-end visibility to be proactive in supply chain risk management. This requires the buyers, suppliers (and their suppliers), logistics, customers and consumers to be connected in real time. By being able to foresee where the cause of disruptions will probably occur, alternative solutions can be developed. Resilience correlates to diversity of supply. If you have all your eggs in one basket, the interdependency of the partners moves from a strength to a weakness.

Stanley Black & Decker (SBD) reduced their SKUs by 50,000 as reported in Supply Chain Dive in late 2022. SBD have embarked on an aggressive cost cutting across its inventory and operations. While the pandemic may have been the trigger, this type of response is required to ensure a financially sustainable company. The SBD strategy will have followers as increased standardization of product lines, battery-based designs, and closer supplier relationships contribute to agile operations. Being flexible to meet demands by customers and adapt to commodity price fluctuations requires pivotal decision-making.

Inventory buffers assist with resilience but have limitations. Only if there is enough stock on hand are they effective. We saw how inventories simply delayed the inevitable during the pandemic. One IT option to avoid outages is the development of *digital twins*. Digital twins are a virtual clone of a real supply chain system. It allows a firm to introduce problems and see how the firm could respond if it actually occurred. Twins allow for “what-ifs” before the real “ifs” happen. Engineers for example, design new products in 3 D images and can use alternate materials and see the results before going into production and have them fail. Twins allow supply chains a similar visibility, albeit, virtual to draw plans before actual problems are incurred when it may be too late.

From a non-technical perspective, breaking down managerial silos and having integrated teams from design, finance, operations, suppliers, and strategic sourcing greatly helps to build resilient supply chains. Increased accuracy of forecasting by teams reduces the costs of uncertainty. The VUCA era thrives on disconnected teams.

The 2020 Gartner report, *6 Strategies for a More Resilient Supply Chain*, has big implications for logistics companies. The strategies include:

1. Inventory as a buffer
2. Manufacturing diversification
3. Multi-Sourcing
4. Near shoring
5. Platform, product or plant harmonization
6. Ecosystem partnerships

Each of these strategies is going to make the supply chain more complex. Those carriers that have connectivity with their shippers in real time and can deliver on time, are going to be the winners. Efficiency is going to rely more and more on digital networks. 3PLs which invest in technical solutions will undoubtedly attract the attention of shippers with sharp pencils.

The other side of resilient supply chains is unfolding in early 2023 – the rapid decrease of online consumer spending and a slowing economy. Another chapter in adapting to market trends as quickly as possible and retaining customers.

ESG in supply chains

ESG requires that sourcing decisions be passed through a filter for their values, prior to determinations being taken. This exercise invites input from various stakeholders to ensure commitments align with organizational strategies. Governance practice leads to consistency and continuous improvements to demonstrate responsible actions.

Behind the ESG messaging, is the acknowledgement that the desired outcome is social justice for all. Social justice has not been adopted as a truly global value but is a value expressed and aspired to in the WEIRD economy. Social justice seeks to ensure a distribution of social benefits, not just in law but in spirit and voluntary actions. It's a melding of rights and responsibilities. For supply chain decisions it requires a scrutiny of how the material extraction, labour content, production and process methods support the well-being of all stakeholders. Even where social justice may not be recognized under various ideological/political regimes, this does not allow buyers a license to exploit these jurisdictions in terms of social and environmental values for economic advantages.

Factored into the resilient strategies is the need to ensure ESG policies and practices are effective. ESG practices are driven in the supply sector by the largest player on the demand side, public procurement. If the weighting on environmental and social values continues to be overshadowed by pricing, the supply side will not move the needle. Whether they are a small municipality or the Department of National Defence, if governments don't demand a higher commitment to achieving GHG reductions, waste free water supplies, or resource conservation, the supply side won't invest in more sustainable solutions.

Common references for sustainable practices in supply chains are the basic ILO conventions. These include:

- Freedom of association
- Right to collective bargaining
- Elimination of force and compulsory labour
- Abolition of child labour
- Elimination of discrimination

Many leading organizations use these ILO conventions as a framework for policy development. As an example, the global company, Unilever takes the ILO conventions and emboldens them in their Responsible Sourcing Program Principles. With 60,000 suppliers and 150,000 employees, its governance practices are commendable. Under a decade of leadership from CEO Paulus Polman, Unilever set a standard in advancing ESG which few other organizations have realized. Their sourcing principles are stated as:

1. Business is conducted lawfully and with integrity
2. Work is conducted on the basis of freely agreed and documented terms of employment
3. All workers are treated equally and with respect and dignity
4. Work is conducted on a voluntary basis
5. All workers are of an appropriate age
6. All workers are paid fair wages.
7. Working hours for all workers are reasonable
8. All workers are free to exercise their rights to form and/or join trade unions or to refrain from doing so and bargain collectively
9. Workers' health and safety are protected at work
10. Workers have access to fair procedures and remedies
11. Land rights of communities, including indigenous peoples, will be protected and promoted
12. Business is conducted in a manner which embraces sustainability and reduces environmental impact

Sustainable solutions don't necessarily translate into higher costs. They do contribute to environmental initiatives and social values being realized, which is the long-term desired outcome. We don't sacrifice safety over cost – why would we try to save money at the expense of other sustainable practices?

With respect to environmental issues, we know that many causes of our problems have reasonable solutions which we have agreed to undertake. i.e., the depletion of the ozone layer was attributed to aerosol propellants such as chlorofluorocarbon (CFC). As an industry, the producers of the aerosol products agreed in cooperation with the Canadian government, to phase out the use of CFCs 40+ years ago. During this phase out period, they then turned to the use of hydrofluorocarbon (HFC) as the propellant of choice. HFCs are not as harmful environmentally as CFCs but contribute to the GHG emissions causing global warming and have not resolved the ozone depletion. The industry again agreed to *phase* out HFCs which are common in HVAC systems. 40-50 years to phase out harmful emissions is a proxy for ignoring the problem in the first place.

Stakeholder interests are growing in the private sector. The challenge is to leverage transference in favour of more sustainable solutions resides in governments ensuring ESG practices are included in the criteria evaluations with an appropriate level of weighting. As the need for increased efficiencies in logistics and distribution ramps up with new technologies, the balance to ensure ESG is concurrently being addressed is a challenge. Social costs are being incurred as technology replaces workers. Where earlier disruptive technologies created openings at new entry level points for workers, we are seeing robotics becoming the new entry level point where machines only need apply.

The status quo in organizations and within procurement teams can be self-limiting. What worked for us last week, is likely what we are going to continue with next week, until it doesn't work. If everyone is buying it and the government approves its use, it must be OK. With reference to the CFCs, HFCs, silica dust, hydrochloric / muriatic acid issues, the status quo is slow to change. The common default is we can't afford to change. At one time we couldn't afford to remove the lead from gasoline; we couldn't afford a health care system; and we couldn't afford to remove trans fats from food products. It turns out, we couldn't afford not to.

A rather innocuous appearing governmental procurement tool is the procurement card (P-card). The P-card was intended to reduce the administrative costs for buying low value goods. Enter Amazon. Based on conversations with procurement professionals in the public sector, they are seeing staff and managers searching the Amazon site for *deals*. Their only measure of value is their budget. If it costs less to buy an item from Amazon, they are doing a good job. Their time isn't included in the search. Shipping may be. Duties may be. It's what gets charged to their P-card that matters.

Which causes us to reflect on local sourcing opportunities and trade agreements. In discussions with procurement colleagues in the Lower Mainland of BC, conservatively there could be \$300M per year in spending through P-card programs within the public sector. We can't have local preference for suppliers under the trade agreements but when we think of the P-card flexibility, there are options. Referring to the Lower Mainland values, if only 10% of the P-card buying was redirected at *local* suppliers, it could redistribute \$30M to locally owned and operated businesses. It doesn't negate trade agreement obligations. To an SME sector, \$30M is a meaningful amount of money. Public sector organizations may need to look at their P-card guidelines and ensure that *local* sourcing is the first option and foreign-online is not. Multiply the example dollars by the rest of the Canadian market and it becomes a significant dollar value. It does require a conscious change in spending practices. P-cards may bypass local suppliers and small-medium businesses which, ironically in part, pay the taxes which pay the government staff. Using the circular economy vernacular, time to rethink the use of P-cards.

The S in ESG invites a discussion on how the circular economy might impact jobs in general and social benefits. The transition will likely boost employment where there are more physical labour activities such as those related to extending product life involving repairing, remanufacturing, and repurposing products for other uses. A 2020 OECD publication, *Labour Market Consequences of a Transition to a Circular Economy: A Review Paper-Environmental Working Paper #165*, indicates that the circular economy could add 2% more workers which will help to offset job losses where increased production efficiency and technology is displacing workers.

The opposite of job creation is job destruction where labour is not required through a variety of actions such as banning products which are discontinued or not seen as being as responsible (aerosols); job substitution occurs where one labour activity is directly replaced by another (landfills to recycling). The transition to the circular economy would involve all types of job activities but the aggregated value appears to be slightly positive for labour roles.

Agricultural waste traditionally has been burned. There was no purpose for the tonnes of waste left behind after crops were harvested. It was a cheap disposal method which compounded the GHG problem. Vancouver-based Social Print's founder and managing partner, Minto Roy, created a better solution to the residue waste from sugar cane – turn it into paper. The product is Sugar Sheets which serve the same function as pulp-based paper. Trees are valuable carbon sinks. The opportunity to repurpose agricultural waste instead of cutting trees, which are more important as a construction material, makes economic and social sense. Social Print creates jobs and reduces the environmental stress. If we have to use paper, we now have alternatives to mitigate deforestation. Social Print is a good example of a company which sees ESG as a scalable opportunity and continues to attract customers for its Sugar Sheets. Repurposing waste into an advantage which mitigates environmental degradation and increases employment.

ESG is growing in business practices as externalities increase. Externalities are such issues as GHG emissions, climate change, health and safety practices, inclusivity, equity, or continued use of toxic chemicals. The social license of a business is granted by its employees, stakeholders, regulators, customers, and the community at large. Companies which adapt a sense of purpose mitigate the risks of externalities through their policies and seek to build their social capital.

McKinsey & Company in an October 21, 2022 article, identified 5 steps towards prioritizing sustainable business opportunities.

Step 1. Assess the value prospects which make attractive investments;

Step 2. Identify important technology and infrastructure enablers which could be applied to existing assets and practices to give an advantage;

Step 3. Base priorities on climate impact and technological maturity where there are big wins which are attainable;

Step 4. Align with future policies and regulations set by leading countries with publicly declared commitments;

Step 5. Define a strong business case and plan for a 5–10-year window which factors uncertainty into the models.

VUCA, the acronym coined in 1985, captures the market conditions of today. Volatile, uncertain, complex, and ambiguity. Sustainability through the circular economy will not be a linear process but convoluted with many unintended consequences and unexpected breakthroughs along the way.

Non-governmental organizations (NGOs) act as “global monitors” for international corporate behaviours. Where larger corporations evade or disregard ILO labour conventions or environmental standards, NGOs are capable of creating a lot of unwanted attention for CEOs. They do so through social media and through annual general meetings and in all sectors. Their intervention has led to dramatic changes in the fast fashion world.

CEO of BlackRock Inc., Larry Fink, stated “The power of capitalism is driven by mutually beneficial relationships between you and the employees, customers, suppliers, and the communities your company relies on.” BlackRock has well-defined principles on investing based on ESG and climate risk in their 2022 BlackRock Investment Stewardship outlining their global principles. Purposeful leadership, with accountability, will drive the changes in the market to achieve the intended outcomes.

ESG readiness and its continuum

There is no substitution for homework. Engaging with key stakeholders such as interest groups, NGOs, Indigenous Peoples, community groups, elected officials, government ministries, key suppliers, and other vested parties is part of the research. A literature review could be conducted and a synopsis of the pros and cons developed. Talking with leading organizations which have navigated the route successfully bear listening to.

An overview of a senior management reflection on ESG status has been included with a detailed questionnaire in Addendum I. Whether an organization has adopted ESG or is considering ESG, the questionnaire shares pragmatic ideas and ensuring success with ESG. Competing interests such as cost management, staffing, policies, sales and marketing, governance, and efficiency to impact social and economic development are taken into account.

The outcome of preparatory work is to draft the compelling narrative and business plan to move forward or to promote continuous improvement on the ESG journey. Boards of Directors will need buy-in and legal counsel is advisable.

A first-of-its-kind lawsuit, was launched by a European investor group against 11 of Shell’s directors in an alleged climate mismanagement case. In February 2023, ClientEarth, an environmental law charity, filed the suit which could have implications for how companies address emissions. In this instance, it is for not factoring in Scope 3 emissions in its energy transition strategy. Shell has increased its investments in renewable energy and low-carbon technologies. The subsequent court rulings will be

watched closely by many companies. Shell posted a \$40B profit in 2022.

Supply chain policies

The G in ESG is addressed through a procurement policy as the framework. The policy represents the gravitas of the governance practices as to how an organization's strategies will be applied in decision-making. Policies which embrace ESG temper the traditional models which were price-based. ESG policies are value-based. Policies should be written as a comprehensive document as opposed to drafting an ESG component to add on to an existing procurement policy. An organizational policy should be inclusive of and convey:

- ESG values
- Community and cultural commitments
- Business ethics and professionalism
- Fiscal and social objectives
- Administrative and executive responsibilities
- Spending authorities
- Exceptions or exclusions
- Supplier performance and conduct
- Definitions for internal and external stakeholders
- Fairness, integrity, accountability, and transparency

Staff conduct and supplier code of conduct are codified within a policy. An adjunct within an ESG supply chain policy is to state the job title of the person responsible for the policy. This implies within that person's job *description*, ESG responsibilities are a part of their accountability for performance. Without an ESG reference or some acknowledgement of sustainability within a job description, it does not support a mandated commitment. The executive responsibility and reporting are denoted in the policy. The policy must align with corporate values and strategic objectives. Policies are a means of messaging to all stakeholders on an organization's values and expectations. Policies should be ratified by senior executives and or Boards.

Policies can be aspirational and inspirational and align with organizational mission and value statements. The importance of policies is to set clear expectations around sourcing options. To support a procurement policy there should be a complementary policy guide. A guide provides details on how to interpret the policy with procedural instructions. Procedures are affected by leading practices or technical advancements, whereas, policies are more strategic. Procedures are relatively easy to amend, while policies are not. All the more reason to ensure policies are relevant to all stakeholders.

Non-compliance by staff or suppliers with a policy should result in consequences. Without the latter we invite bending the rules to fit the situation and undermine the organizational reputation and ESG commitments.

Business ethics

Trust is the engine of business. Deontological theory expects us to "do good." The intent is captured in the phrase the Golden Rule, treat others as you would like others to treat you. We trust each other to act in ways which achieve the greatest amount of good because people benefit from the most good. Trust is the currency of a business professional.

ESG integrates deontological theory and stakeholder theory. Stakeholder theory requires that the

interests of investors, employees, communities, and legal requirements be respected when making business decisions. Studies have shown that companies which perform well against their competitors often have a strong sense of commitment to values and ethics. As stated in *Good Company*, typically the best performing companies outperform the overall stock market. Over several years, companies within the same industry which adopted many of the trust-building attributes outperformed their competition. Corporations which put their staff and customers ahead of their shareholders are meeting shareholder expectations.

In his book *Level Three Leadership*, Professor James G. Clawson talks about an individual's VABEs. Our personal values, assumptions, beliefs and expectations which become a part of our view of what we think of as the way the world should be. These are well-defined by the time we enter the work place. Real world experiences can cause us to revise our VABEs in order to be more effective along our career path or when leading others. Personal conduct should be congruent with organizational values for long-term relationships.

The culture of an organization is its persona. Their persona is reflected in its corporate actions and is affected by the beliefs, values, vision, practices, behaviours, and messaging. The leadership is expected to ensure the culture is adaptive to meet the expectations of shareholders and stakeholders. The leadership's audio must sync with its video – what you heard should be seen in its actions. What was acceptable in terms of social interactions between people even 10+ years ago was significantly and rightly challenged by the Me-Too movement. The Indigenous Truth and Reconciliation is about respectful relationships. The precursor to this was the 2007 United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). Corporations have a global presence and the UNDRIP impacts their strategies and cultures. Business ethics are a work-in-progress. For supply chains, sourcing of materials and labour and needs to be part of their procurement policy and practices.

Responsible leaders set the ethical expectations of staff and communicate through ethical messaging and conduct. In the case of Timberland, CEO Jeff Swartz was made aware of the sourcing of hides for leather from the Amazon rainforest in 2009. Swartz worked with Green Peace to release a policy requiring its suppliers to not purchase cattle which were raised in newly deforested areas of the Amazon. This policy had a significant affect on leather, beef, and other products in Brazil. Any cost implications were completely secondary to doing the right thing to ensure brand protection and customer loyalty.

Codes of conduct are a guide at best. They set acceptable parameters within which decisions should be made by individuals. The Supply Chain Canada's professional code reinforces the professional behaviour and conduct which a supply chain professional should exhibit in practice. The Code serves as guidance for its members and reflects on the profession as a whole. While it may not prevent acts of indiscretion, it provides an appropriate level of response where the behaviour or conduct of an individual may detract from the integrity of the profession.

The electronics industry has its Electronics Industry Citizenship Coalition Code of Conduct. Many of the larger electronic brands are signatories to the code. While the intent of the EICC code is good, it has not prevented the questionable practices of sourcing raw materials such as coltan from the Democratic Republic of Congo (DRC). We could surmise that cost pressures necessitate securing the materials first and applying the code second. The Organization for Economic Co-Operation and Development (OECD) has condemned the practices being conducted in the DRC. The Canadian government participates on various OECD committees. In 2008 the OECD Guidelines for Multinational Enterprises states, "*observance of the Guidelines by enterprises is voluntary and not legally enforceable.*" It asks that MNCs meet the softer expectations of society while promoting commercial interests. Money versus morals. The sanctions for noncompliance of a code should serve as a deterrence to act more responsibly.

One of the critical metals for EVs is cobalt. It's been estimated that the DRC contains 50% of the global supply of cobalt. Cobalt extraction in the DRC is fraught with human rights issues. ~15% of the cobalt extraction is provided by artisanal groups. Artisanal miners are individuals who earn less than \$10.00 per day and use their hands with no other equipment, health or safety protection in this dangerous work. Artisanal operations often use child labour. Amnesty International has been monitoring the DRC and little has changed to provide rights to cobalt mining workers even in larger mining operations. Amnesty reported that the Tesla mining supplier, Glencore, has not adequately addressed the concerns of its workers for safety and health, since it signed a contract in 2020. While Glencore does not buy from artisanal miners, conditions remain deplorable in most DRC operations. The DRC is one of the richest countries in the world in terms of precious and critical materials.

Professor Leigh L. Thompson emphasizes that the presence of a formal ethics and compliance program in no way guarantees effective ethics management. Employees must believe that formal policies actually guide behaviour – they are not just platitudes in a manual. Interpersonal ethics is the way in which we treat others. Bullying behaviour or cheating directly harms others. People may feel uncomfortable speaking up during a meeting. Intimidation or the abuse of power are examples of unethical interpersonal behaviours.

In 2007 Harvard professor Max Bazerman's research led to an acknowledgement that *once the ethical line has been crossed, an institutionalization of corruption can occur in which unethical acts become a part of daily activities and people often have a vested interest in remaining quiet*. Unequivocally the research showed that incremental steps of unethical behaviour largely went unnoticed. This may cause individuals to escalate these activities, unintentionally with no malice to defraud, until it must be dealt with. A former Imperial Tobacco employee admitted to a decade-long scheme to ship tax-free cigarettes into the US where they would be smuggled back into Canada for sale.

In 2013 SNC Lavalin paid a significant price for its unethical conduct. The World Bank barred SNC and 100 of its subsidiaries from bidding on any of the Bank's development projects for the next ten-years! An unintended outcome of SNC bribing public officials in Cambodia. The RCMP was already probing the SNC activities in Libya, Algeria and Bangladesh. SNC knew about its ethical choices but chose to not make the right decisions at the right time. In 2018, the Canadian government introduced the use of deferred prosecution agreements. This waived the sanctions against SNC Lavalin.

ESG requires that policies and business practices have strong governance. Allowing indiscretions in ethical conduct undermines the integrity of the organization and its senior management credibility.

Supply chain management skills

STEM jobs (Science, Technology, Engineering, Mathematics) will increase in an attempt to transform businesses into circular economy models. As ESG and the circular economy continue to entwine in values and principles, this affects the skill sets required for individuals to be successful in managing more complex supply chain issues. Where the historic focus has been on transactional proficiencies, the future prerequisites will use a different set of attributes.

Robotics and AI will continue to displace low skilled and repetitive types of manual labour. These technologies will also impact professional services. Legal counsels are already applying AI, cognitive learning, and machine learning to conduct research and predict legal outcomes. In supply chains, jobs which are directly involved with optimization of materials; products which extend product life cycles; and logistical efficiencies will be in demand.

For supply chain professionals, based on numerous studies, including the *Circular Jobs Initiative*, the need to have effective soft skills such as interpersonal acumen. The ability to collaborate with multiple

supply chain partners; problem solving; negotiations; conflict resolution; team building; supplier development; emotional intelligence; systems thinking; total cost of ownership; and green skills. The latter being aimed at reducing the anthropogenic activities on the environment. Adapting to a hybrid set of skills which bridge technical and social values will be highly desirable.

Aside from the perfunctory supply chain skills, the need to fully understand: implementing social procurement; navigating trade agreements to engage with social enterprises; adapting to environmental strategies; balancing local and global economic development sourcing opportunities; utilizing digitalized formats such as blockchain; operating cradle-to-cradle distribution for resource recovery; and aligning policies with operational responsibility and accountability.

AI bots, such as, ChatGPT could replace procurement staff responsible for drafting competitive bid documents, contract agreements, risk assessments, evaluations, and other types of business documents. It's only a matter of time, before ChatGPT and its imitators are implemented in more organizations requiring higher volumes of documentation.

Implementing ESG in an organization

1. Create the business imperative narrative and embed ESG in policies and practices. Work with 3rd party experts in the various aspects of ESG where your internal resources may be lacking. Define what the organization wants to do such as Net Zero emissions for 2030. Assign roles and responsibilities for senior executives and the management team. Have a communication plan go out to all stakeholders. Ensure strategic operational and financial plans will be viewed through the ESG lens prior to actions being taken.
2. Measure the current environmental footprint for a baseline to set targets. Develop a risk mitigation plan which aligns with the corporate governance and Net Zero targets. Set the KPIs and incentives which reward responsible behaviour across the organization.
3. Address where training of staff will be required and draft policies which support a Net Zero initiative. Set a timetable for how Net Zero strategies will impact jobs and processes. Get the buy-in from staff and look for the quick wins to encourage the replication of success.
4. Build relationships with governmental agencies, NGOs, industry competitors and partners to build the capacity for continued sustainability initiatives. Do what you can within your sphere of influence to positively impact your stakeholders.
5. Report out in an objective and transparent manner on all ESG metrics. This includes progress to date and gaps for continuous improvement as part of the governance commitment. Work with 3rd party experts to provide insights as to where more can be done. Look for international, industry, or bona fide standards of compliance to achieve and become a recognized leader.

An example of a large organization taking on a strategic Net Zero plan was unveiled by Walmart. This type of an approach applies to large and small initiatives where organizations are implementing ESG. Their approach recognizes that ESG requires a full supply chain effort and support when beginning the implementation to adapt practices and make a difference.

Walmart launched its Project Gigaton in 2017. An aggressive program requiring Walmart's suppliers and stakeholders to reduce 1B metrics tons (gigaton) of GHG emissions by 2030. They created a compelling vision and acknowledged their leadership role to drive change across the supply chain. This strategy includes providing suppliers with access to renewable energy with Schneider Electric and a supplier financing program with HSBC to enable early payment of invoices and lending advantages. The partnerships with its suppliers are tied to a supplier's ability to actually reduce their GHGs in operations using science-based targets and their CDC scores.

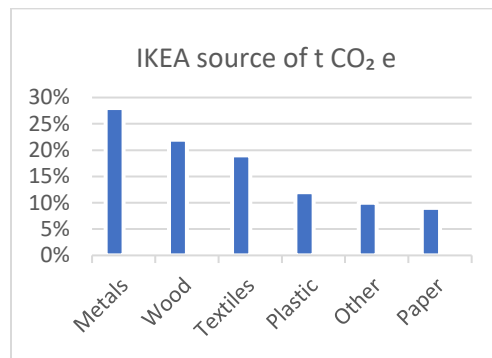
Walmart’s Project Gigaton is based on six pillars which its supplier partners can commit to where possible:

1. Energy – use renewable energy sources with little or no carbon emissions
2. Nature – reduce emissions at the farm level and mitigate deforestation practices
3. Waste – reduce all types of materials going to landfills
4. Product use and design – increase use of sustainable materials and recycled content
5. Packaging – to source sustainably and adopt circular economy production processes
6. Transportation – to reduce emissions and total miles of trucking

These commitments align with the circular economy principles and use disclosure as a key reporting mechanism to encourage continuous improvements.

Global retailer IKEA, in its Climate Report FY22, is aggressively reducing its carbon footprint by increasing the sourcing of renewable materials. IKEA reported a 12% reduction on its CO₂ emissions climate footprint from base year 2016 with a 15% reduction in total by 2030. Commitments include bio-based glues for wood-based products; 100% recycled content in key materials; cellulose-based textile fibres; and 100% renewable energy at our material suppliers, such as board factories and paper mills. IKEA uses the circular economy as its road map for designing problems out of its supply chain. The complexity for IKEA is to implement changes while operating 400+ stores in 49 countries with 9000+ products being produced from 40 factories with 1000 suppliers. IKEA’s CEO, Torbjörn Lööf, reported in 2017 that it affects only 30% of emissions in its supply chain. Reducing Scope 3 emissions is an issue with their climate footprint. Finding alternative materials is a constant balancing act between availability, affordability, and quality.

IKEA’s carbon footprint based on types of materials, which could model other similar home furnishing retailers, charts as follows:



ESG and executive compensation

A 2022 Conference Board Report, suggests that due to increased attention to ESG by multiple stakeholders and concurrent interests in stakeholder capitalism, Boards are linking executive compensation to financial and non-financial outcomes. Incentives are related to ESG performance measures. Boards are also concerned that ESG can meet the expectations of shareholders and a company’s performance.

CNN business writer, Moira Ritter reported in July 2021, that the average S&P 500 CEO made ~300 times the average worker’s salary, according to the AFL-CIO’s annual Executive Paywatch report. This equates

to an average US\$15.5 Million. Meanwhile the average production and nonsupervisory worker earned US\$43,512. Stakeholders continue to challenge this disparity which contributes to the apparent have and have-not perspective. A 2020 SHRM report talks about the executive pay difficulties and shareholder protection. Issues such as clawbacks and cause definitions to address nonfinancial performance issues; trying to adjust compensation for performance in volatile markets; and incentives to hit strategic goals such as improved performance under diversity, equity, and inclusion (DEI) objectives.

Research suggests that have at least 1-2 years of operational experience with ESG targets before using them to assess the executive's ability to deliver on them. It takes time to develop and compile appropriate data and determine the actual impact on ESG goals. Boards are also concerned that the reporting can be justified and demonstrate increased value by introducing ESG values. Some argue that ESG is not about impact but simply a risk management issue.

The trend appears that 65-70% of the S&P 500 are rewarding executives for achievements in reaching DEI goals; with only ~20% of the S&P 500 shifting attention to reducing the carbon footprint and emission reductions. While this is a slight increase, it is not a resounding endorsement.

In a major rebrand, Nokia, the former Finnish phone seller, launched its new business platform in early 2023. CEO Pekka Lundmark, sees Nokia leading in the digital transformation and wants to *develop ESG into a competitive advantage*. Pekka got buy-in from Nokia's leadership team on its investment as a technology leader.

Diversity

A model for global diversity and inclusion is provided by The Conference Board. The CFB suggests that the competencies be integrated into an organization's business operations. The competencies include:

- Change management
- Diversity, Inclusion and Global Perspective
- Business acumen
- Strategic external relations
- Integrity
- Visionary and strategic leadership
- HR disciplines

Professor Paul Larsen, from the University of Winnipeg, summarizes the motivators of supplier diversity as follows:

- Improves organization's community impact
- Improves organization's social standing
- Broadens the supplier base
- Improves corporate image/brand reputation
- Matches demographics of consumers in target markets
- Creates new business opportunities
- Improves organization's supply chain performance

Diversity in itself, is insufficient to drive values. The culture of the organization will need to demonstrate why diversity is important to its success in the future. Diversity in an organization is most effective where values are aligned across the workplace.

The key to diversity bringing advantages to the organization is to have a common agreement on

what value means. If people within an organization do not have a common concept of value, their individual diversity can lead to incongruence or passive engagement. As individuals, they will interpret value as they personally define it. As an example, is spending to be focused on the lowest cost or is it on the best value?

Procurement practices need to ensure that best value is the organizational view and aligns with country-based values. Without a common understanding of what value is, we invite bias in decision-making. Staff may choose to not buy products from a company because of a negative headline or internet story – regardless of what may actually have occurred. We lose the potential synergy found in diversity when we haven't clearly defined value. The divergence of opinion on what value means, detracts from the collective actions. Respect for diversity is one of criterion in change management

Diversity in the supplier base invites opportunities for 3rd party audits to ensure value for money. As discussed, NGOs provide monitoring but more intensive audits are often required for detailed inspections. There are many such service providers in the private sector, such as, Bureau Veritas, INTERTEK, QIMA, SGS, and UL. They provide factory inspections for compliance with standards, quality and the use of fund audits.

At the risk of overstating the issues, a large part of the shortages in products over the past years can be attributed to single sourcing from major brands. Retailers are now rethinking sourcing strategies and are seeking smaller, diverse suppliers. There will be questions on quality and capacity but empty shelves are not working either.

This shift to what is referred to as “open calls” for new suppliers and products to make a pitch to retailers. Open calls are a shift in attitude that more ideas are needed. Breakthrough thinking comes from good competition in the market.

It also goes beyond marketing and encourages more local supply or near shoring of supplies which previously favoured low-cost, foreign suppliers. Long-term, it will be an interesting outcome from the pandemic to monitor as a trend or a one-off event.

As a definition of diversity, generally it's being an organization which is 51% owned, managed, and controlled by visible minorities or Aboriginal persons. Leadership in the indigenous supplier community is being led, in part, by the Canadian Council for Aboriginal Business (CCAB). The CCAB is aware of the under-representation of 60,000 Indigenous enterprises in Canada. Economic reconciliation is a desired goal of the CCAB with corporations and governmental agencies. They act as an intermediary for Aboriginal businesses. Suncor's COO, Mark Little, sees the participation by Aboriginal businesses in its supply chain as a means to build the communities it operates in. The CCAB see the opportunity to manage wealth instead of poverty for the Indigenous people.

The Canadian Aboriginal and Minority Supply Council (CAMSC) are a strong advocacy group which facilitates expansion of Aboriginal and minority-owned businesses. Since 2004, CAMSC as a not-for-profit organization, certifies and develops diverse suppliers to contract with corporate and government buyers. Concurrently, they help larger organizations connect with the certified suppliers they represent.

The demographics of the workforce in trucking are part of the resilient strategy discussions and the need for diversity. Driver shortages can impact capacity and service levels. Traditionally the trucking sector has been a male-dominated role. As in construction, women have a great opportunity to enter a relatively recent career path. Taking on the role of driving, with less focus on being able to physically handle cargo, drivers need to be tech savvy and ensure safety at all times. Amplify finds it challenging to attract and find higher quality drivers which meet their expectations when turnover occurs. The driving profession has been under rated as a career option. Amplify are actively trying to hire women for driving positions. The COO references that the average age of drivers in the industry is closer to 50 years of age.

While at Amplify, the average age is ~28 years.

The Women's Trucking Federation of Canada (WTFC) was formed in 2015. The WTFC is evidence of the continued growth by women as truckers-be they drivers, mechanics, and executives. In February 2023, the BC Ministry of Social Development and Poverty Reduction announced \$1.6M in funding for a free truck driver training course for women. The 6-month program is open to women who are unemployed with a Class 5 licence through the YWCA's Changing Gears Program. In BC they project ~12,000 vacancies to replace retiring drivers.

Employee well-being

Staff turnover rates and workers leaving the employment ranks is contributing in part to the inflation rate and supply shortages in late 2022. For those who stay in the workplace there is an increased level of stress. In a *Deloitte Insights Magazine* for Summer 2022, worker well-being is based on physical, mental, financial, and social aspects. A pre-pandemic poll by Gallup showed that 31.5% of employees are engaged in their jobs; 51% are not engaged; and 17.5% are actively disengaged. The workplace is not getting better with most complaints about the amount of workload and the extended workday hours being incurred.

This certainly adds to the cost of suppliers as a low employee well-being can be related to lower productivity and higher health care costs. Attracting and retaining good workers is critical. Studies show that the greater the affinity people have with their employer values and their personal values, they will make a greater commitment to the interests of the employer. The workers feel valued and have less turnover.

Employee well-being is part of the new ESG holistic. A 2014 study on well-being by Deloitte showed the top 5 triggers for retention include flexible scheduling, telecommuting (now referred to as working remotely), designated office space for wellness, reimbursement for well-being expenses, and healthy snacks. Fast forward to 2023 and we see that flexible scheduling and working remotely were necessitated by the pandemic.

The 2014 study concluded "*well-being is becoming a core responsibility of good corporate citizenship and a critical performance strategy to drive employee engagement, organization energy, and productivity.*" One could conjecture, that today there can be a sense of complacency with employee well-being programs and when opportunities arise for them to move on, they jump at it. It may cost an employer an incremental amount for the retention tactics but it can cost far more when they walk out the door.

The well-being of employees is being tested in early 2023 as market conditions adjust to a slower demand. Google, which its founders Page and Brin went on record as saying in 2004 "expect us to add benefits rather than pare them down over time" dumped thousands of staff in January through a terse email and has been clawing back health benefits and other perks. Google has devolved from being the *new school* to going old *school* corporate-wise. Well-being just met its alter ego, affordability.

Author Patrick Lencioni reiterates the need for *healthy* organizations as well as being *smart*. Ensuring the *healthy* organizational values such as good morale and low turnover among employees is as critical as having the *smart* attributes of effective technology, marketing, finance, and strategy. Sustaining a smart and healthy organization is no easy feat based on most corporate records to date, otherwise more companies would have lasting success.

Business with a purpose

Interest in the environmental issues in general began in the mid-1960s. The attention to the social factors in business began ~20-years ago. The City of Vancouver enacted the first Ethical and Sustainable Procurement Policy in Canada. This action led to social procurement policies and practices in many sectors with the use of 3rd party services through social enterprises. Social enterprises are *businesses with a purpose*.

Social procurement

Social procurement can include fair trade products; living wage programs; local economic development; apprenticeships; community enrichment; supplier diversity; business ethics; environmentally responsible products and services; and building social capital. Social procurement is *the shift from making good deals to making deals that do good*. Today more private sector, publicly traded companies and public sector organizations are embracing social purchasing practices.

Social procurement aligns with several of the UNSDG goals of 1. No poverty; 3. Good health and well-being; 8. Decent work and economic growth; and 10. Reduced inequalities.

ISO 26000 Social Responsibility guidelines use (7) core subjects for organizations to address to engage in ESG-based actions. These are:

1. Organizational governance;
2. Human rights;
3. Labour practices;
4. Environment;
5. Fair operating practices;
6. Consumer issues; and
7. Community involvement and development.

Where most ISO standards are *compliance-based*, these are *guidelines* only. ISO 26000 aligns with the UN SDG goals, similar to social procurement above, with the addition of 8. Gender equality; 9. Affordable and clean energy; and 13. Sustainable cities and communities. ISO 26000 sets an expectation of good governance in organizations which adopt the guidelines.

Social enterprises

Social enterprises are operated by business entrepreneurs. Social enterprises do not displace conventional, profit motivated suppliers in a community. Social enterprises complement the supply side in the market. Their role is to find ways in which people who are systemically barriered have opportunities to be represented in the workplace. Meaningful work is a basic human desire. Where a for-profit company trains and hires for efficiency in service delivery, they can be reluctant to hire individuals who potentially appear to be less efficient. Social enterprises are able to provide the skills and types of work best suited to the needs of a barriered individual. For-profit companies which do work with social enterprises, demonstrate their sense of care and commitment to a community through their business practices.

Social enterprises are a new supplier base for supply chains to work with for goods and services. With labour shortages in all sectors, SEs are filling the gap. In BC, Embers Staffing, also an SE, specializes in skills development and training, which connects workers with companies. Many of these workers were people facing systemic barriers to traditional employment. Founder, Marcia Nozick, began Embers in

2001 with a mission to create economic and employment opportunities for people in Vancouver's Downtown Eastside. In 2018, Embers employed 1900 people and paid \$6.5M in wages and benefits.

One of the stronger advocates for the advancement of social procurement is Buy Social Canada. It's Executive Director, David LePage, has built a credible program for implementing social procurement into organizations. The BC Social Procurement Initiative pioneered the development of training programs on social procurement in the BC public sector for several years.

Social enterprises (SEs) are not-for-profit organizations which represent the well-being of individuals which face systemic barriers to employment. Barriers may be attributed to being new immigrants, lack of transit, elder/child care needs, criminal records, availability for hours of work, Indigenous biases, or other impediments to holding a full-time job.

Would your organization hire an ex-convict? Likely not. However, Purpose Construction out of Winnipeg, does. As a social enterprise, Purpose Construction trains barriered individuals to qualify for construction work, pays them living wage rates, and helps them to return to full time work—often in the private sector. Purpose Construction builds social capital in a community. With a shortage of skilled trades, Purpose Construction can supply a pool of workers to meet the demand in the market without government subsidies.

Living wage rates are based on the local community costs to afford a living. It is based on (2) adults with (2) children; (1) child in FT Day care; (1) child in pre- and after-school care; adults each working 35-40 hours per week; (1) parent taking an education after work hours: groceries; transit pass; and rent. LW rates exclude: credit cards, loans or debts; retirement savings plan; owning a home; children education savings plans; elder care; and any costs “beyond the minimal required for recreational, entertainment or holidays.” Each community has a LW rate for its specific economic conditions. Many cities have adopted LW rates in Canada since 2011. The City of New Westminster, BC was the first to do so. The City of Vancouver initiated its LW policy in 2017 and abruptly stopped its LW program in January 2023.

It costs ~\$120,000 per year in Canada to incarcerate an individual, with an average age of 30, based on a variety of Federal government statistics and the Office of the Parliamentary Budget Officer. There is a 60% probability of recidivism, within one-year, if they have spent one term in prison. While social programs have difficulty finding adequate funds to deal with early *prevention* for youth at risk, we always find the \$120K for their *treatment*.

One of the early and continuing success stories in the social enterprise sector, is CleanStart Property Services CCC Inc. In the Vancouver lower mainland, CleanStart, in 2015, paid \$233,000 in wages to its barriered employees. This resulted in a social return on investment (SROI) of ~\$1M per year in the local economy. In 2020, CleanStart contributed ~\$1.4M. CleanStart was the idea of its founder Dylan Goggs, who took a new way of looking at how business can contribute to social values. CleanStart began in 2010 with one truck and handful of employees, many of whom faced systemic barriers to employment. It has become a very successful business and has encouraged and resulted in many other social enterprises to be formed.

SEs play a vital role in providing employment opportunities, job training, and ensuring a safe work place for people facing disabilities. There is a social return on investment when disenfranchised people gain meaningful employment, as shown in an empirical study by Ernst & Young with Atira Property Management in 2017. A financial return of \$4 to \$1 is not uncommon.

In July 2013, a new type of corporation was introduced by the BC Government. Community Contribution Companies, or CCCs, are hybrid corporations that bridge the gap between for-profit companies and non-profit organizations. Similar to non-profits, CCC's are setup to achieve a social purpose and must adhere to BC government law related to this. However, unlike non-profits, CCC's can attract equity investment

for growth and operate the same way as any other business. Non-profits and charities have restrictions as to owning and operating businesses and running social enterprises. The CCC model allows social enterprise businesses a legal structure to operate under.

CCC's must follow a number of BC government rules to ensure the majority of their profits and assets will always be directed toward a social purpose.

Social procurement, which is a progressive, value-based model for supply chain professionals, was referenced in the books, *Good Planets Are Hard to Buy* and *Plan It for Our Planet*.

Decarbonization practices

The 2015 Paris Agreement and the UN Framework Convention on Climate Change led to the target of 1.5°C limit above pre-industrial levels. The target supports the Net Zero campaigns and many businesses are trying to reduce their anthropogenic impacts on global warming. An April 2022 McKinsey Sustainability report highlighted (10) technologies to mitigate carbon emissions:

1. Renewables
2. Batteries and energy storage
3. Circular economy
4. Building technologies
5. Industrial-process innovation
6. Hydrogen
7. Sustainable fuels
8. Nature-based solutions
9. Carbon removal, capture and storage
10. Agriculture and food

Decarbonization is a two-fold strategy. First, significantly reduce the greenhouse gas emissions; and secondly, remove carbon from the biosphere by capturing emissions and increasing storage in agriculture and forests.

This will require rethinking how energy is created, how we maintain production and distribution of goods, and land management practices. The increased warming of the planet is largely attributed to power generation, industry, transport, buildings, and agriculture methods.

The electrification of society puts tremendous pressure on the demand for electricity. Currently, power generation from fossil fuels is accountable for 30% of the global CO₂.

This implies the need to for more renewable energy sources. A serious challenge for industry is the production of steel, cement, and chemicals where they require 1600°C+ which fossil fuels can easily achieve, whereas, electrical power cannot. Options include clustering of energy plants at concentrated sites for integration of processes. According to the Columbia Climate School, sustainable biomass can be used for some cement factories and steel plants. Steel is possible through charcoal combustion instead of coal, where charcoal is deemed to be a renewable energy source.

As Co-Chair of the Glasgow Financial Alliance for Net Zero (GFANZ), Mark Carney stated in an interview with McKenzie & Company in December 2022, there will be substantial *stranded assets* in the conversion away from fossil-fuel based companies. Coal plants and other high-emission assets will require bridge financing in some form as a sectoral pathway to wind down these operations to achieve the 1.5°C temperature reduction targets. Many of the coal plants have 30-40 years of remaining

operational time which will need to be incentivized to come to termination earlier than they originally intended. Financial institutions, under the guidance of GFANZ, will play a pivotal role in this economic transition. Phasing out fossil-based industries will require economic viability to ensure energy security. Financing options for energy infrastructures are not market ready.

In October 2021, the Science Based Targets Initiative (SBTi) issued net zero targets and global temperature reductions to pre-industrial levels of 1.5° C. The SBTi set best practices of introducing transition plans to deal with Scope 1, 2, and 3 emissions, short-term milestones of achievement, Board governance responsibility and executive compensation tied to achieving results. The SBTi is funded by IKEA Foundation, Amazon, Bezos Earth Fund, We Mean Business coalition, Rockefeller Brothers Fund and UPS Foundation.

Long time coal producer Teck Resources, in a response to the Investment Industry Regulatory Organization of Canada and the New York Stock Exchange, stated it is considering spinning off its steelmaking coal investments. This was announced in February 2023, as Teck looks at how it might reposition itself for resources which will be in demand in a lower emissions world. Teck divested its stake in Fort Hills oilsands to Suncor for ~\$1B. ArcelorMittal similarly invested \$1.8B in its Hamilton operation to remove coal in its manufacturing processes. ArcelorMittal, one of the largest steel producers has committed to replace coal-based ironmaking and associated steelmaking assets. It is using a technology referred to as direct reduced iron combined with clean hydrogen fueled electric arc furnaces. The DRI/EAF method is aimed at reducing CO₂ emissions by 60%.

Carbon sequestration involves capturing CO₂ removal and storage from the atmosphere. The two types of sequestration include biological and geological. Biological uses the natural carbon sinks such as reforestation, restoration of mangroves and wetlands, soil and water. Geological relies on the technologies to store CO₂ in underground rock formations. Carbon capture and storage compresses the CO₂ and it is then injected into rock formations for permanent storage. Capturing CO₂ during the production process allows for increased scalable solutions. In addition, is direct air capture and storage (DACS).

The federal government provides tax credits for companies which invest in equipment to capture CO₂ and for equipment to transport, store and use CO₂. Reducing industrial emissions through carbon capture, utilization and storage technology (CCUS) is a key governmental strategy to address climate change.

In October 2022, global giant Apple signaled that it wants its supply chain to be carbon neutral by 2030. Apple chip supplier Taiwan Semiconductor Manufacturing Company, stated they will be using 100% renewable energy, as reported in Supply Chain Dive. When leading brands like Apple make these commitments, it's a game changer with a positive ripple effect across many sectors. The Boston Consulting Group estimates that only 10% of companies were measuring their emissions, up 1% from 2021.

Renewable energy is going to continue to target wind and solar development, which show promising results to date. Challenges for these alternative energy sources are serious. Land availability being one. Germany has only ~9% of its land available which would be considered prime for onshore wind farms.

In the heart of Canada's oil and gas industry, Alberta is making strides in renewable energy. According to Nagwan Al-Guneid, Director of Business Renewables Centre Canada, says there is a surge with private energy developers into wind and solar projects. Southern Alberta and Saskatchewan have a propensity for high winds with an abundance of sunshine. Saskatchewan has a higher investment in solar projects. The increase in renewables is driven in part by the deregulation of the electricity market. Most provinces have control of energy rates.

In 2020, the Athabasca Chipewyan First Nation partnered with Concord Green Energy to build three solar-power farms in Southern Alberta. The \$145M investment will yield 150 gigawatt hours of clean electricity per year. This is significant as 1 gigawatt = 1B watts or capable of providing energy to ~300,000 homes. The project aligns with the Province of Alberta commitment to reduce dependency on coal-fired electricity generation; reduces need for diesel-powered generators for Chipewyan residences; demonstrates the leveraging opportunities with the UNDRIP for economic development and social well-being; and the commitment to the UN SD goal of clean and affordable energy; and the circular economy principles of energy and resource conservation. Scalable models can be used by BC First Nations-led clean energy projects to support Canada's net-zero targets.

In a 2023 Reuters report, Britain has successfully been harnessing wind power and brought the world's largest wind farm, Hornsea 2, online in August 2022. Wind power generates 26.8% of the country's electrical requirements. This resulted in a 5% reduction in importing electrical energy from France. However, gas-fired plants increased output by 1.8% over 2021-2022 to meet demand.

Many issues remain to harness wind power and other renewables to reduce fossil fuel dependencies. One is the technical expertise required to design and build wind and solar plants, operate and maintain them, facing labour shortages. Wind and solar energy compete for the supply of critical raw materials and rare earth metals which drive costs upwards. The International Renewable Energy Agency (IRENA) identified these problems in 2017. Juxtaposing the volatility of prices and governmental financial support compounds the transition options.

Thermal Energy Storage (TES) technology complements renewable energy sources. TES provides reserve power, energy storage, and increases the efficiencies where heating and cooling are necessary. TES can store heat or cold which can be accessed when required to balance the supply and demand of various forms of energy generation and technologies. Heating and cooling consume ~50% of energy requirements for buildings and in industry. Similarly, long-duration energy storage (LDES) ensures clean energy is available by capturing the waste or excess energy being produced and having the flexibility to draw from days, weeks, or months later. Solar and wind as energy sources have limitations dependent upon weather and seasonality. TES and LDES smooth the peaks and valleys associated with these forms of renewable energy and support decarbonization.

IRENA shared some interesting limitations on the use of hydrogen. Hydrogen is not an energy *source*; it is an energy *carrier*. Hydrogen must be manufactured as it does not appear naturally. Pipelines for hydrogen can cost 10-50% more than oil pipelines and currently there are few hydrogen pipelines for transporting the fuel. If hydrogen is produced from fossil-fuels, it adds to the GHGs – although it can be made from renewable electrical energy. The demand for low-carbon hydrogen is not strong. Hydrogen is primarily for road transit in fuel cell EVs and refueling stations. Some municipal fleets operate using hydrogen as they have a limited range of travel and can be fueled from a municipal station.

One company which has harnessed hydrogen for warehousing logistics is Plug Power Inc. They have successfully innovated fuel cell technology for material handling equipment. One example is for forklifts running on green hydrogen fuel cells. A refueling takes less than 3 minutes; zero emissions; voltage never drops whereas batteries will; no PPE required when refueling; ideal for 24/7 operations. Plug Power have fuel cell products for stationary power products and fleet vehicles. Plug Power can build on site hydrogen filling stations and also have a distribution system consisting of high-pressure tube trailers.

Compressed natural gas (CNG) has had some success in the markets. Several fleet operators use CNG for fuel and claim lower operating costs. The City of Hamilton runs ~130 buses on CNG to reduce emissions and save on operating costs. Ontario's Blue Water Recycling Assoc runs its fleet on Renewable natural gas (RNG) derived from cow manure. Innovative trucking company Hyliion, out of Austin Texas, is a

leader in electrified powertrain options for Class 8 semi-trucks. In 2022, Hylion partnered with Cummins Inc to utilize natural gas and electric engines in the Hypertruck ERX powertrain with onboard power generation to recharge batteries. CNG has not found favour with the general public commuters due in part to the price difference for a limited choice of CNG vehicles and fueling stations are not plentiful. Honda ceased the manufacturing of its Civic Natural Gas vehicles in 2015 due to low demand and lack of fueling stations.

Liquid natural gas (LNG) burns 40% fewer GHGs than coal when producing electricity. For many Asian countries, buying Canadian/American LNG could reduce their overall emissions. LNG is big contributor to our employment and the economy. LNG is used in some long-haul fleets but not for commuter vehicles due to onboard storage capacity, lack of filling stations, and ultimately insufficient sales.

E-Methanol produced from green hydrogen is another form of renewable energy which is low carbon. Where electrification may not be feasible in some industries such as cement and steel, e-Methanol could meet the technical requirements.

There is increased interest in the use of green-ammonia to compete with green-hydrogen. Ammonia has ~twice as much energy as liquid hydrogen by weight and ~nine times the energy density of lithium-ion batteries. With 90% of global trade linked to marine transport and the commitment by the International Maritime Organization to reduce emissions by 50% by 2050, from 2008 levels, greener energy could be the catalyst.

Energy, produced through nuclear *fission*, has been considered as a means of achieving carbon neutrality. Nuclear investments are included in the EU green Taxonomy. In Canada, Bruce Power and Ontario Power Generation (OPG) see nuclear energy as a key contributor to its Net Zero climate change goals. The companies have partnered to evaluate potential opportunities for deploying small modular reactors (SMRs). Of significant note in December 2022, was the historical, technological breakthrough to produce clean energy through nuclear *fusion*. This was achieved by scientists at the Lawrence Laboratory's facility in California. It will remain in an experimental mode until nuclear fusion becomes commercially viable as a carbon free, renewable energy source.

One renewable energy gap which Canada has not closed is in geothermal supply. Canada has very few geothermal energy generation installations or projects in place. We are one of the few Pacific Rim countries to not exploit geothermal as a renewable source. Consider that Iceland, 50-years ago was dependent on imported oil for energy and has now transitioned to geothermal energy. Geothermal investment has not caught the attention of government or investors, who compete against other energy sources with lower upfront costs. But in the long-term, geothermal could be the cleanest and lowest cost renewable energy source for much of Canada.

The transition from international oil and gas energy supply to renewables will, in all likelihood, involve the major oil companies. Their balance sheets can afford the investment; they have a history of running complex projects; they have experience with hydrogen fuels; they will maintain the backstop of supply until the various renewables can affordably displace fossil fuels. The gas and oil companies have taken stakes in renewable energy and will be poised to be the suppliers of *new* forms of energy as they exit from their legacy models.

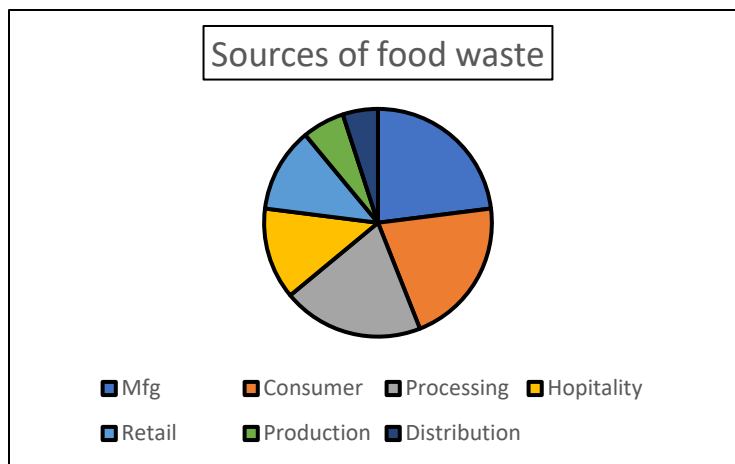
Carbon taxes are seen as the most efficient means of starting to meet the financial requirements of a decarbonized world. The tax on the volume of carbon emissions requires that producers factor this cost into their final goods. Therefore, everyone pays. Referred to as *internalized* costs as opposed to *externalized* – where society pays for the additional cost of disposal or cleaning up the air. The carbon tax makes for an even playing field. When all producers pay, all their customers pay and there is no advantage or disadvantage. A geopolitical challenge is where countries do not respect ESG goals and

allow producers to be exempt from carbon taxes and simply pocket the profits.

Food security and the circular economy

One of the global paradoxes having enough food produced to feed the world, yet 1Billion people do not have enough food. The inequity in food distribution is a major contributor to this problem. The developed economies have a surplus of foods which leads to waste, while the developing countries go without, for reasons of political and economic difficulties. It's been estimated that 40% of the entire food supply chain is being lost through waste.

The 2019 report *The Avoidable Crisis of Food Waste*, from Value Chain Management International, found that 66% of occurrences of food waste were from manufacturing, consumers, and processing; the hospitality sector accounted for 13%; and retail, production and distribution made up the balance of 23%.



Consumer behaviours, excess food production methods, and marketing campaigns have combined to create a lot of unnecessary food waste. The colours, sizes, and shapes of food influences our decisions as to what we should buy. Grocery stores set arbitrary standards as to what appears to appeal to consumers and culls perfectly nutritious foods due to their lower aesthetic image. Organic produce is more susceptible to artificial applications of selection criteria and increases costs. Waste which the circular economy sees as a resource, includes not only the products but the consumption of enormous quantities of water and nutrients to produce the goods.

Consumer food trends in developed countries often favour *fast* foods. Fast foods temporarily sate a feeling of being hungry but lack the necessary nutrients of a balanced diet. Processed meats and cheeses are costly yet convenient. Health and nutritional benefits take 2nd place. Obesity is a growing health problem which experts correlate to poor eating habits. The Canadian government's Canadian Risk Factor Atlas reported in a 2015-2018 survey, that ~26% of adults are living with obesity. People have become disconnected to the importance of how foods are grown, processed, shipped and consumed.

Local sourcing shortens the food supply chain which will reduce some waste, reduce pollutants, reduce over use of fertilizers, reduce transportation and storage costs, and packaging. Food security is an outstanding issue. According to the Food and Agricultural Organizations' definition, food security includes having consistent, reliable access to safe, nutritious food. When the availability, accessibility, nutritional quality and longer-term stability of food sources become strained or nonexistent, food

insecurity exists. Reducing hunger is one of the 17 UN Sustainable Development Goals (UNSDG).

Despite the problems associated with over use of fertilizers, there is the problem of attaining adequate supply of fertilizers due to geo/political problems. The agricultural industry is very dependent on fertilizers to maximize crop yields. A February 2023 report from Bloomberg Intelligence analyst, Alexis Maxwell, highlighted the reliance on Russia, Belarus and China for fertilizers. Canada's well-positioned to supply fertilizers from privately operated, Saskatchewan-based, Nutrien Limited but cannot meet the global demands which are required to sustain agricultural crops. Nutrien is looking at increasing production by another 40% by 2026.

Shortages of potash, phosphate, and nitrogen will continue to push food prices upwards. Morocco, with an estimated 70% of the phosphate reserves, is emerging as a global trading partner as the Russian-Ukraine war enters its 2nd year.

Ecosystems need to thrive. Over-fishing or farm-fishing leads to serious upsets to the balance in the ecosystem. Consider the problem of eutrophication. Eutrophication occurs when excess nutrients, such as fertilizers, are flushed into waterways and harbours. Cambridge University zoologist, David Willer has written extensively on this subject. Left untreated, sea life is killed off by depleting oxygen levels. Thanks to nature's bivalves (oysters, clams, mussels, scallops) they can restore the health of the water and ensure part of the marine ecosystem is sustained. Bivalves continuously draw waste nutrients out of the water as part of their food supply. While western economies view bivalves as more expensive proteins, bivalves will be part of the solution in food security. A major focus is on larger fish and sea products for commercial purposes. Biodiversity in the circular economy is essential and our ability to harvest bivalves can feed us, reduce emissions, and protect the biosphere.

It is encouraging to see the results of NGOs such as the Aquaculture Seafood Council (ASC) and their mission to ensure a supply of sustainable seafood products. Costco Wholesale in Canada is a supporter of the ASC. A random purchase of Kirkland brand shrimp in October 2022 showed that it was from India and there was no ASC certification. ~70% of shrimp from India is rate AVOID. AVOID means that the sourcing is questionable and may be due to overfishing, caught or farmed with poor management practices, or may be harmful to other marine life. Caveat emptor.

The food industry can be characterized as being an oligopoly where a small group of companies have a large control over the supply, demand, and pricing of all the products. Often this can be from the farm to the fork. If major food producers and sellers adopt ESG policies and practices, it will alleviate some food security issues. On the other hand, without their commitment, we may need more intervention by government agencies, which nobody truly wants. In late 2022, with food shortages the major food distribution companies are reporting record profits. That in itself is not bad, but these same companies have pled guilty in the past of pricing fixing on various items and commodities. Business ethics and corporate governance practices are inherently linked in food security discussions.

Indigenous communities have faced the issue of biopiracy for years. Biopiracy involves taking endemic plants or their seeds, used as a source of food or medicine, and monetizing them in the global market. Companies patent the new version of the plant or its genes without paying compensation in any form to the country of origin or its people. While biopiracy has been a gray area from a legal perspective, it is certainly a moral issue and a compromise on business ethics. The 2022 UN Biodiversity Summit drafted an historical framework to address biodiversity with the following recommendations being agreed to:

- Maintaining, enhancing and restoring ecosystems, including halting species extinction and maintaining genetic diversity
- "Sustainable use" of biodiversity - essentially ensuring that species and habitats can provide the services they provide for humanity, such as food and clean water

- Ensuring that the benefits of resources from nature, like medicines that come from plants, are shared fairly and equally and that indigenous peoples' rights are protected
- Paying for and putting resources into biodiversity: Ensuring that money and conservation efforts get to where they are needed.

A breakthrough in negotiations, as to how to care for our oceans, came about in March 2023 with the UN Convention on the Law of the Sea. After twenty years, a unified treat on protecting the high seas was reached. The high seas are those ocean areas outside of any one country's control. This is a turning point which acknowledges the need to curb the exploitation of the ocean's natural resources and how to share in this rich bounty. Mining of the ocean floor will eventually require an equivalent set of regulations similar to those for mining on the surface. While the real test will be on how to implement and monitor this policy, the step forward has been taken. For decades, commercial interests have chafed against the dependency of the sea to provide sustainable food supplies and protect marine biodiversity.

From an ethical perspective, when scientists discover a compound in the ocean that can treat a disease, who will profit from this type of discovery? In 2010, Japanese, European, and US pharmaceutical companies filed for a cancer treating drug derived from sea sponges. Developing countries usually don't have the resources or technologies to commercialize these findings, so should companies, within the Western economies control the rights because of their access to wealth?

Industrial agriculture with corporate farms continues to displace the small, family-owned farm businesses. Unfortunately, with the intent to reduce the cost of food products one of the trade-offs has been environmental degradation through concentrated animal feeding operations. Tonnes of animal waste seeps into the water table; air borne emissions are transferred to crops and can create E. coli infections. Antibiotics are required to keep CAFO animals healthy and promote growth.

Vertical farms are now being constructed. Literally like high rise apartments with various crops being grown on the levels. Vertical farms are touted as being better for the planet by producing quality products with a much higher yield and saving on water and land space. As the global population nears the 8-billion-mark, vertical farms are seen as a means to address a part of the sustenance requirements.

When we review the circular economy 7R Model we can see the rethink in sourcing proteins. The primary source in most of the developed world is through the meat industry. In the US it requires 18% of the land mass to raise livestock with 80% of plant proteins going to animal feed. The trend to plant-based protein consumption began ~2010 when Beyond Meat, through science and innovation, created new lines of plant-based proteins. This has led to a growing industry ironically controlled by the meat producing companies. Plant-based proteins, while meeting nutritional requirements for health, do not require as many resources to produce an equivalent level of proteins as meats. According to the Beef Cattle Research Council, it requires ~16,000 litres of water to produce a KG of beef, in contrast to 50% less water for plant-based proteins. The water footprint is dramatically smaller. Cattle emit tonnes of methane gas which adds to the GHG problems. Marketing programs and financial subsidies continue to favour meat-protein diets; while plant-based proteins are slowly taking market share with a lesser environmental impact.

Plant-based cheese products have attracted serious investors to Nobell Foods, including Bill Gates' Breakthrough Energy Ventures. Nobell has been able to produce casein from soybeans and is planning on launching a line of vegan mozzarella and cheddar cheeses. This is similar to the Beyond Meat technology where plant-based caseins can reproduce the tastes and textures of more conventional animal products. The soy-based cheeses will have a lesser environmental impact than dairy products, supporting the UN SDG of responsible consumption and production.

Investigative reporter Ella Nilsen of CNN, in November 2022, foreign-owned companies in Arizona are drawing vast quantities of water from the dwindling aquifer to grow alfalfa. The alfalfa is being shipped to Saudi Arabia as cattle feed. There is no legislation to limit the usage of water nor any way to track it. In 2018, Saudi Arabia banned the growing of crops for its cattle and dairy industry due to a drought. Buying crops from other countries, particularly the US, enables these Saudi industries to survive. This would appear to be an unsustainable means of providing food in the Middle East. Depending upon whom you ask, it would conflict with the UN SDG of responsible consumption and production.

ESG and chemicals

Per Randy Whitaker, CFO and co-founder of Viridis Chemical, and Bhavesh Patel, senior manager at HELM AG, along with Patrick Long, director in Opportune LLP, chemical companies are responding to pressures from investors, employees, and advocacy groups to advance the agenda on renewable and biobased products. With the production of renewable ethyl acetate on the market it makes products more sustainable. Companies which are closest to the customer such as personal care, cosmetics, and paint products are most interested in this technical development. From an ESG perspective, Viridis sees its renewable chemical lines finding traction in the market. HELM, being a German-based chemical distributor, recognized that it had to pivot to respond to the stricter European standards which are aligning with decarbonization policies. Patel stated that their three main pillars are decarbonization, using the circular economy principles to recycle more efficiently, and partnering with leading companies.

Protocol Environmental Solutions, out of Vancouver, BC has been developing innovative chemical technologies for industry, eliminating the need for toxic products and dangerous methodologies. For the past decade, under its President and CEO Floyd Wandler, the patented product lines have targeted several critical sectors such as concrete, construction, commercial flooring, warehousing, welding, and marine industries. Protocol relies on new approaches to chemistry, science, and engineering to develop their *Smart Chemical Technologies*, proving that science can solve common industry problems, improving efficacy and reducing liability, while not compromising its ESG commitments.

Hydrofluoric acid remains a common toxic compound used to pickle and passivate stainless steel after welding. Hydrofluoric acid residue must be treated as a hazardous waste material. A drop in the eye will blind a person, while a drop on the skin results in horrific burns. A much safer alternative to these traditional, hydrofluoric acid products, is EnviroPaste™ or Elimitint™ (when sold under the Linde brand). Developed, manufactured and patented by Protocol Environmental Solutions, it is distributed by Linde and welding supply companies. The efficacy of EnviroPaste™/ Elimitint™ is better, safer and means less project liability. It has a ~50% lower total cost of ownership. Yet, the status quo supports the use of hydrofluoric acid.

Concrete etching and mechanical preparation methods either result in the creation of hazardous silica dust or involve the use of toxic hydrochloric /muriatic acid. As per WorkSafeBC, *“Silica is one of the most common hazards on a worksite, particularly in the construction, oil and gas, manufacturing, and agriculture industries. Silica dust can cause silicosis, a serious and irreversible lung disease. It can also cause lung cancer. Cutting, breaking, crushing, drilling, grinding, or blasting concrete or stone releases the dust. As workers breathe in the dust the silica settles in their lungs. Again, from Protocol Environmental Solutions is WashAway Xtreme™. It is water-based and fully biodegradable. Most importantly, it eliminates the silica dust problem on job sites. And, it is a ~50% lower cost solution with no health hazards!*

Protocol’s products are easily and safely applied to ensure the integrity of the original materials and extend asset life with significant cost reductions throughout the process and in the maintenance.

Protocol is appreciated by like-minded, conscientious business owners which enjoy the benefits of market differentiation, creating new jobs, addressing environmental concerns, work place safety and dramatically reducing operational costs. Rethinking how we solve technical challenges is a circular economy challenge which Protocol has overcome.

Ammonia is the key ingredient required in the manufacturing of fertilizers. One of the largest producers of ammonia is CF Industries with operations in Canada, the US and UK. CF Industries acknowledges the contributions to emission problems related to production and is making serious investments in blue and green ammonia processes. Blue ammonia is a low carbon model which utilizes carbon capture and storage to contain carbon dioxide emissions. Green ammonia uses an electrolysis system to generate carbon-free hydrogen from water. CF Industries view these alternative production methods as interim solutions to the reliance on fossil-based fuels to produce fertilizers. The economies of scale are not yet there to make the blue and green ammonias sustainable.

Drycleaning has used toxic chemicals for decades. One of the more common chemicals is Perchloroethylene (Perc). According to the Government of Alberta's Workplace Health and Safety Bulletin, Perc causes irritation of the nose and throat and central nervous system depression. Symptoms include drowsiness, dizziness, giddiness, headache, nausea, loss of coordination, confusion and unconsciousness. The International Agency for Research on Cancer (IARC) has concluded that perchloroethylene is probably carcinogenic to humans. There are more responsible options such as liquid silicone. And yes, liquid silicone costs more than Perc and invites pushback on price.

Cookware and textile manufacturers need to ensure their products do not contain per- and poly-fluoroalkyl related substances (PFAS) in California, beginning in 2025. PFAS have wide spread use and have been sold for decades under the Teflon brand. PFAS are used in the military, medical equipment, and are used to put out fires that involve oil and can be water resistant. PFAS have been linked to many health studies as they are bio accumulative and toxic. European Union member countries have proposed the ban of all PFAS unless it is "proven essential for society."

Family-owned and 90-years old, Cloverdale Paint, based in BC, provides insight into the challenges to adapt more ESG practices. The post-pandemic period created product shortages and increased price pressure. Cloverdale Paint fights to carve out its space in the market and competes with much larger MNCs in the commercial, consumer, and industrial coating market. Larger MNCs can afford to trial newer product alternatives and tend to set the market prices in the various regions they operate in.

Cloverdale Paint has made commitments on the environmental and social front. Their Social Responsibility statements reads: *We will provide a safe and healthy work environment for our employees and customers while continuing to minimize our impact on the environment. We support and encourage active participation in our local communities.* The latter is reflected in the company and family contributing \$1 million to the multi-sensory unit to help reduce agitation and anxiety and stimulate and encourage communication, the first of its kind for children and youth in a hospital psychiatric unit at the Surrey Hospital & Outpatient Centre Foundation.

On the ESG front, Cloverdale Paint is implementing actions on more sustainable logistics, packaging, and raw materials. They are currently framing their reporting model for quantitative and qualitative benchmarking.

ESG and Insurance

Risk management strategies are a key part of supply chain management. Under the larger corporate umbrella are a preponderance of issues. A shared risk for underwriters, cities, companies, communities,

governments, and society in general, are issues which threaten sustainable operations.

Under the UN Environment Programme's Finance Initiative, in June 2020, a collaboration with global insurance industry companies developed its *Principles for Sustainable Insurance* (PSI). The subsequent guide distilled risk into (4) principles to be adopted:

1. We will embed in our decision-making environmental, social and governance issues relevant to our insurance business.
2. We will work together with our clients and business partners to raise awareness of environmental, social and governance issues, manage risk and develop solutions.
3. We will work together with governments, regulators and other key stakeholders to promote widespread action across society on environmental, social and governance issues.
4. We will demonstrate accountability and transparency in regularly disclosing publicly our progress in implementing the principles.

At a high-level and from a supply chain perspective, the noted risk criteria included:

- Climate change
- Environmental degradation
- Protected sites/species
- Unsustainable practices
- Animal welfare/testing
- Human rights
- Bribery and corruption
- Poor corporate governance
- Poor product safety and quality

For each of the risk criteria the PSI guide provided detailed examples and references for mitigating the relevant risk.

ESG in construction design, materials and labour

When we consider the expenditure of materials and usage of labour in the industrial, commercial and residential construction sectors, these are among the largest drivers of emissions and consumption of resources. As the circular economy requires a rethink of designs, we can see progress in construction options.

The Canada Green Building Council (CGBC) has been a long-time proponent of green buildings. For over 20-years the CGBC has adapted the US-borne Leadership in Energy and Environmental Design or LEED® standards for the Canadian market. CGBC estimates that buildings generate 30% of all GHGs, 35% of landfill waste, and deplete 70% of the municipal water capacity. LEED's holistic approach to the construction of buildings is to lower carbon emissions, conserve resources and reduce the operating costs through sustainable practices. While developmental costs may increase to achieve a LEED Silver, Gold or Platinum rating, the total cost of ownership is reduced to the owners and the community enjoys the benefits for generations. Certified LEED buildings are rated on 9 credit categories:

1. sustainable sites;
2. water efficiency;
3. indoor environmental quality;

4. energy and atmosphere;
5. Location and transportation;
6. Innovation;
7. Regional priority;
8. materials specifications; and
9. education and awareness.

Provincial governments are impacting residential construction practices by setting energy efficiency standards and goals for builders. BC set 20% more by 2022; 40% more by 2027; and 80% more by 2032, which is the net-zero energy ready standard.

The movement to the innovative *mass timber* designed projects uses composite wood products rather than only traditional steel and concrete. The environmental benefits stand out such as renewable resources and wood is a natural carbon sink. The engineered composite materials are fire resistant as they tend to char on the surfaces as opposed to igniting, when a fire occurs. Structures using the mass timber design complement the traditional steel and concrete components in the foundation. High rise designs up to 18 floors are in many urban centres and continue to attract architects and developers. The Canadian Wood Council (CWC) supports the tall wood building concept. The CWC recommends an integrated approach throughout the design and construction phase with early supplier involvement on the material side. One of the first tall wood buildings was completed at UBC in 2017, which led to building codes being revised to accommodate the designs. Long-term costs of tall wood buildings are less costly than conventional steel, concrete and wood, as the energy costs associated with steel and concrete continue to increase.

Vancouver Island Construction Association CEO, Rory Kulmala, is pleased to see how their sector is tackling ESG issues. While the production of concrete does emit GHGs, the internationally recognized CarbonCure™ project enables thousands of tonnes of CO₂ to be captured and injected into the fresh concrete. The mineralized CO₂ strengthens the concrete and remains permanently in the material even after demolition.

Kulmala references the work done by the Building Owners and Managers Association (BOMA) who advocate for sustainable buildings. Their expertise addresses energy, water, air, comfort, health and wellness, custodial, waste, sites, stakeholder engagement, pandemic responses, and purchasing to maintain and operate the buildings. BOMA's guidance is based on Canadian-wide knowhow for the categories of Office, Enclosed Shopping Centres, Light Industrial, Open Air Retail, Health Care, Multi-Unit Residential Buildings and Universal structures.

Within the lower mainland of BC is an organization which deconstructs houses and buildings. Unbuilders Deconstruction Inc. has diverted 4M+ tonnes of salvaged construction materials for reuse; resells reclaimed lumber with carbon intact; creates 6 jobs vs 1 when demolition is used; and protects the heritage of a community. The cost of deconstruction is about ½ of the cost of a demolition. Rethinking how we replace older buildings is part of the circular economy principles.

From a labour perspective, construction projects are in short supply of skilled trades. Looking at social enterprises as a source of labour, Canadian-based Chandos Construction has successfully partnered with SEs to provide subtrades and qualified trades people on many projects. Further, Chandos endorses the Integrated Project Delivery Finance, Operate and Maintain model to build projects with a 10% social procurement commitment. The IPD FOM provides better scheduling, cost controls and increased local labour for the project owners, which are often small to medium-sized communities.

Nicole Burgess, CEO of Saskatoon & Region Home Builders' Association, (SRHBA) has been a key driver of ESG initiatives within the residential construction industry in Saskatoon & Region for many years. One notable example is through its ongoing engagement and delivery of the Canadian Home Builders' Association's (CHBA) Net Zero & Net Zero Ready program, which supports builders in constructing homes that are energy efficient and capable of producing as much energy as they consume. By providing a clear certification program for these homes, the CHBA has made it easier for consumers to identify and choose sustainable homes that align with their values and needs. The program has also helped to incentivize builders to adopt sustainable practices, which has been crucial in driving the industry's overall commitment to ESG considerations.

Increasingly builders and developers are adopting environmentally sustainable practices, such as green building materials and designs, installing renewable energy systems, and implementing sustainable landscaping. They are also reducing waste through recycling and reusing materials, as well as implementing eco-friendly waste disposal practices. The industry is committed to social sustainability, with builders designing homes and communities to accommodate diverse populations, integrating affordable housing units into their developments, and fostering social cohesion through features like parks, walking trails, and community centres. By taking a holistic approach to sustainability, the industry is demonstrating a commitment to addressing ESG challenges in a comprehensive and meaningful way.

Role of the consumer

If we look at the fast fashion industry, we can see the sense of entitlement, we, as the WEIRD consumers have encouraged. As long as it is legal to buy, we will buy what we want with little regard for how the garment was made or the individuals that made it. Authors Naomi Klein, Elizabeth Cline, Sofi Thanhauser, and others have documented the global problems created by cheap clothing. The WEIRD American consumer buys ~60 items of clothing per year. Brands such as Nike, Zara, H&M, and the Gap don't make anything but they have their product lines manufactured in steroid-paced speed factories across the globe.

Reporting on working conditions and the use of supplier codes of conduct have not been overly effective to address the exploitation of garment workers on such a scale. The 2013 Rana Plaza collapse in Dhaka, Bangladesh, which killed 1100 and injured 2500, was the moment which exposed the lengths to which fast fashion had stooped to. Canadian brand Joe Fresh, a division of Loblaw's, distanced themselves from any responsibility in related law suits resulting from the Rana Plaza deaths, *as they do not operate the factories*. A \$2B law suit was dismissed by Canada's high court. Loblaw's paid relief and compensation of some \$5M to Bangladeshi workers and various social agencies following the favourable ruling. While many garment marketers conduct *social audits* where they have their brands made, the audits appear to have minimal impact on sincerely addressing the social problems.

Dhaka is the home base for 5,000 garment factories which employs 80-90% women in patriarchal operations. ~18 million workers in Dhaka are women with ~11 million working in the agriculture industry. The 2018 ILO report states that most of the women in the garment sectors are in vulnerable positions but are dependent upon earning their meagre wages.

The 2022 ILO report, *Decent Work in the Garment Sector Supply Chains in Asia*, shows the continent employs 60 million workers and accounts for 55% of clothing and garment exports. While wages have risen, most workers remain in vulnerable conditions in the low skilled "cut and trim" operations.

For decades retail fashion brands hid behind the statement "it's not my problem because I don't own the production company." This has been exposed as being exploitive and illegal to deny workers their fair pay. The US Department of Labor came down hard again in December 2022 in its press release: "U.S.

Department of Labor Wage and Hour Division investigators found Justar Fashion – a garment contractor that produces apparel for retailers such as Stitch Fix, Indigo and Evereve – failed to pay minimum wage and overtime as required by paying workers on a piece-rate basis and at straight-time rates regardless of the overtime hours they worked. The employer also failed to keep records of hours worked. Their actions violated minimum wage, overtime and recordkeeping provisions of the Fair Labor Standards Act. The Dept of Labor stated that 32 employees of Justar were owed US\$145,290 in back wages.

ESG in the fast fashion world has a long way to go. The over use of micro-fibres and chemicals contributes to carbon emissions and pollution from waste water discharge; the social issues remain largely unresolved. The marketing to the WEIRD world far exceeds the actions to address ESG issues. QIMA Senior Business Development Partner, Dory Lanenter, reported persistent non-compliance issues involving wages, lack of training related to the use of PPEs, and child labour in their traditional ethical audits of factories. For example, many Asian-based factories partner with local schools to send children to work in the factories as non-paid internships and often in sub-standard dormitories. Sadly, in a late 2022 global survey by QIMA, there was a substantial increase in child labour use in factories from 2019 levels. QIMA audits thousands of factories per year for its clients.

Trade agreements allow Export Processing Zones (EPZ) to flourish legally with sovereign space allowing duty-free imports with no quotas on raw materials or the capital equipment to produce the exports. Host countries provide the EPZs with private security, private generators, avoidance of inbound/outbound taxation, and easy access to low wage labour pools from foreign multinationals. Asian factories subcontracted production to lower cost producing countries such as Honduras and controlled by the US. That's how cheap clothing gets to the WEIRD market.

The Ellen MacArthur Foundation and the Textiles Action Network support the circular economy principles of increased selling of reused clothing with materials designed to be circular and made from circular raw materials. This is a good step but will take decades to make a difference.

The Worldwide Responsible Accredited Production (WRAP) is the largest factory-based certification program for clothing and footwear manufacturers. WRAP principles align with the ILO labour conventions and provide an auditable process for certification compliance.

A February 2023 report from the Federal Government's Canadian Ombudsman for Responsible Enterprise (CORE) found that Canadian clothing companies have limited awareness about whether child labour could be in their supply chains. The proposed legislation under Bill S-211 which is to curb child and forced labour. Bill S-211 is an Act aimed at *Fighting Against Forced Labour and Child Labour in Supply Chains Act and to amend the Customs Tariff*. The Act, if passed, goes beyond clothing to include all imported products and could envelope mining industries. CORE was formed and mandated in January 2018 to investigate human rights abuses by Canadian companies operating abroad in the oil and gas, mining and garment sectors.

Consumers are entitled to their decisions. It will take more of a collective conscience to change conditions and acknowledge that cheap clothing should not come at the expense of the worker which made them. The same theory applies to paper-based packaging in general. If consumers know there is an environmental benefit for switching to paper from glass or PVC plastic, they will buy what is most responsible. We can't afford to say we won't support it if there may be a slight premium for paper alternatives, as we can't afford not to. E-vehicles come at a premium but are sold on the basis of their long-term environmental benefits. Consumers are literally in the driver's seat on responsible choices. Intuitively, consumers want to buy responsible products but the marketing noise obfuscates decisions.

Product labels

Confirmation bias is commonly used to describe how individuals are partial to or influenced by existing

beliefs or expectations. If we read that a product is *eco-friendly*, and we are trying to be environmentally conscientious, we will tend to favour that product over one which does not provide any environmental differentiation, or states its actual chemical properties. The latter is seen as being harmful in our bias. A growing trend favours green and sustainable products.

Eco-friendly, sustainable, or organic products are ambiguous terms. These labels have become known as *greenwashing*. They sound good and resonate with customers but lack any evidence. ESG could be subject to greenwashing. Companies could state their vehicle fuel efficiency was higher than other companies, which Volkswagen was caught doing in 2015. In 2022, coffee maker Keurig paid a \$3M fine for falsely claiming their single use K pods could be recycled. Setting green targets sounds good from a CSR perspective but may not actually be achievable.

In February 2023, the Competition Bureau launched an investigation as to whether Canadian forests are being sustainably managed as claimed under the Sustainable Forestry Initiative (SFI). SFI is the largest certification system in North America and has been recognized since 1998. Several NGOs have launched the claim that SFI is being misrepresenting its methods and outcomes. It remains to be seen if this is a form of greenwashing but reiterates the importance of legitimacy in 3rd party labels and certifications.

Many consumers like to support Canadian made products. However, the labeling requirements require an understanding of the difference between a *Product of Canada* and *Made in Canada*. A Product of Canada, under the guidelines, applies to all or virtually all of the significant ingredients, components, processing and labour used in the food product must be Canadian. Food products claiming Product of Canada must contain very little or no foreign content, with the exception of minor food additives, spices, vitamins, minerals and flavouring preparations. Products labeled as Made in Canada, may be used when the food product is manufactured or processed in Canada regardless of whether the ingredients are imported or domestic or a mix of both. However, this claim must always be qualified with either Made in Canada from domestic and imported ingredients or Made in Canada from imported ingredients. To use these qualified claims, the last substantial transformation of the product must have occurred in Canada. Companies risk their consumer and ESG reputation when attempting greenwashing. In the bigger picture, false product or service claims taint all companies with an absence of trust.

Case study - Promoting a more sustainable diet

The following case citation is from the Behavioral Economics newsletter, *Information, Insights, Inspiration* | Winter 2022-23 Newsletter, by Katie De-loyde and edited by Mariliis Öeren:

One way to promote a more sustainable diet is to label food products with information about sustainability (eco-labelling), for example by providing details of water and land usage, as well as greenhouse gas emissions, using a traffic light system. Another option is the use of social nudging, such as telling consumers that a particular menu option is the most popular choice.

My co-authors and I wanted to discover if increasing the awareness of the impacts of different meals would influence consumers to choose a more sustainable option. To do this, we used an eco-label (Figure 1) and a social nudge label (Figure 2) to investigate whether adding these labels would influence food choice compared to a control group with no label. We conducted the study online with UK adults who were 18 years or older. These people were randomised to one of three different groups, each showing three burrito options with different accompanying menu information.

Burritos & Fajitas

All Burritos come in a 12" tortilla with refried beans, shredded lettuce, diced tomatoes, Mexican rice and guacamole.

Beef (494 kcal) £3.50	Medium Spicy Fair Trade 		
Chicken (451 kcal) £3.50	Medium Spicy Fair Trade 		
Vegetarian (467 kcal) £3.50	Medium Spicy Fair Trade 		

Figure 1: Eco-label.

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Figure 2: Social Nudge Label.

All menus contained a photo of each burrito as well as the calorie content, a Fairtrade logo, a spice indicator, and the price, which was the same for all options. But on one menu, each burrito was also given an eco-label, with the beef option scoring '5' in red, highlighting it is unsustainable. The chicken option had a yellow '3', indicating it was neither sustainable nor unsustainable, and the vegetarian option got a green '1' for sustainable. Another menu featured a 'social nudge' – an indicator encouraging people to act according to the most sustainable option. This resembled a gold star, including the words 'Most Popular' placed alongside the vegetarian burrito. Participants were randomly shown one of the three menus and asked to pick a burrito option, as if they were normally ordering food online. They were also asked follow-up questions designed to measure their level of motivation to act sustainably and meat consumption.

Eco-labels vs Social Nudge

We found that both the eco-label and social nudge label were effective at influencing more sustainable food choices, and although both labels produced promising results, the eco-label was the most effective.

Additionally, we found that a third of the participants who were given the ‘control’ menu – without a social nudge or eco-label – went for the beef burrito. However, this dropped to 29 per cent for those who saw the social nudge labelled menu, and to 16 per cent for those who saw the eco-labelled menu.

Considering that reducing beef intake is a specific component of many sustainability strategies, eco-labelling and/or social nudging could provide an effective method to achieve this. A mandatory eco-label could help to address some of the information gaps consumers have concerning the sustainability of the products they are buying and enable people to choose sustainably if they wish. The eco-label was particularly effective among those people who reported a high level of motivation to act sustainably. This suggests that these kinds of labels help people make dietary decisions which are in line with their personal values. However, considering we observed relatively high motivation to act sustainably among our participants, but the reported mean consumption of meat was six times per week, this suggests consumers would benefit from having information that could assist them in their goals of acting more sustainably. Currently, sustainability information about our food is not made freely available in the UK, contributing to a lack of freedom to choose for those individuals who are motivated to do so.

Furthermore, and somewhat surprisingly, participants were positive about the eco-label, with a huge 90 per cent of participants supporting the idea of an eco-label, compared to only 52 per cent of participants supporting the social nudge.

Implications

More research in real-world settings (rather than online) is essential. However initial results from our study suggests that future policy could include eco-labelling and/or a social nudge in both real-world and online settings to reduce meat consumption and help to meet global climate change targets. End of case.

Bluewashing refers to the practice of claiming social benefits without providing evidence or being verifiable. One of the reasons for bona fide 3rd party labels on products is to establish credence. The contents or labour conditions can be assessed objectively. In 2021, the Dyson group of companies was charged with alleged forced labour practices by its Asian contractor, ATA IMS Bhd. To its credit, Dyson cancelled its contract with the contractor. Dyson likely contracted with ATA as being a low-cost producer and accepted that their labour practices met international standards.

While, non-binding, the UN Global Compact to address corporate sustainability is based on 10 principles:

1. Businesses should support and respect the protection of internationally proclaimed human rights
2. Businesses should support and respect the protection of internationally proclaimed human rights
3. Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining
4. Elimination of all forms of forced and compulsory labour
5. Effective abolition of child labour
6. Elimination of discrimination in respect of employment and occupation
7. Businesses should support a precautionary approach to environmental challenges
8. Undertake initiatives to promote greater environmental responsibility
9. Encourage the development and diffusion of environmentally friendly technologies
10. Businesses should work against corruption in all its forms, including extortion and bribery

Canada participates through the *UN Global Compact Network Canada (UNGC)*. There has been criticism

of the UNGC such as lack of enforcement and independent monitoring, which opens it up to bluewashing claims.

Long-term brand damage is seldom experienced by companies which have used greenwashing or bluewashing. The above case study shows the reverse effect of bluewashing or greenwashing, where labels actually promote a healthier diet in an economic and sustainable manner.

The labeling of many products currently, is heavily weighted on its marketing and sales. Labels are a means of both informing and influencing our decisions. Costco must face a lawsuit for allegedly labeling its Kirkland branded tuna as being *dolphin safe*. While Costco sought dismissal of the case, in early 2023, a judge ruled that the labeling would infer to customers that the tuna met safe seafood fishing practices but it may not be able to be verified in practice.

Bottled water is mired in myths about it being healthier than tap water. Pepsi and Coca-Cola brands have acknowledged that their water source is municipal tap water. The Evian brand is sourced from natural spring waters. Spring waters contain nutrients and actually taste different than *purified* water. Bottled water in North America and elsewhere is primarily a convenience item. This requires a large amount of plastic containers to store, ship and dispose of adding to environmental issues. Further, bottled water containers in every size, shape and form add to the pollution problems. We could take a lesson from the city of Paris, France. Make good, clean water easily available in as many public spaces as possible.

Under USA 2022 guidelines, food products with less than 0.5 grams of trans fat, which may be stated in its ingredients as partially hydrogenated oils, can have labels which claim 0%. Canada banned the use of trans fats in 2020. According to a 2019 International Food Beverage Alliance release, international food brands will *phase out* the use of trans fat to 2 grams per 100 grams of fat or oil to comply with a World Health Organization guideline. The IFBA was founded in 2008 by Coca-Cola, Danone, Ferrero, General Mills, Grupo Bimbo, Kellogg, Mars Wrigley, McDonald's, Mondalez International (formerly Kraft), Nestlé, PepsiCo, and Unilever.

Consumers are entitled to buy whichever products are legally sold in the market and must accept that the labels are accurate as stated. Consumers are responsible for their personal decisions to make tradeoffs between cost, quality, and convenience.

ESG reporting metrics

Governance reporting frameworks use different matrix for different purposes. Originally intended for financial investors, audiences, and an accounting narrative on the materiality of outcomes. The 2019 NYU Stern Center for Sustainable Business provided a synopsis on the use matrices. Reporting should consistently follow a framework which meets the corporate governance needs. Reporting metrics include:

The 2017 **Accounting for Sustainability** (A4S) launched by the Canadian Chapter of A4S which works with the Chief Financial Officers to integrate economic, environmental and social factors into business decisions. This is aimed at implementing social and human capital accounting.

CDP focuses on key environmental data. CDP, as a not-for-profit, runs the disclosure system for investors, corporations, cities, states, and regions to manage their environmental impact.

Global Reporting Initiative (GRI) is aimed at environmental, economic, and social impacts. The International Integrated Reporting Council (IIRC) targets the ability of an organization to generate value largely for European and international stakeholders, with lesser attention on IIRC in the USA.

The **Sustainability Accounting Standards Board** (SASB) is based on US materiality definitions from security laws aimed at sustainability factors which could affect performance and operations.

The **Task Force on Climate-related Financial Disclosures** (TCFD) reports disclosures from governance, strategy, risk management, metrics and targets for investors.

The **UN Global Compact** (UNGC) looks for companies to make commitments to its sustainability principles related to human rights, labour, environment and anti-corruption on an annual basis.

Social Accountability International developed an international standard, **SA 8000**, which helps organizations to use socially acceptable business practices and can be applied to any company, of any size. For over 20-years, their certifications examine forced and child labour, freedom of association and collective bargaining, discrimination, workplace discipline, hours of work, pay rates, and management systems.

The **EU Taxonomy** is a European classification system which establishes a list of environmentally sustainable economic activities. The intent is to provide investors, companies, and policy makers with how to interpret sustainable economic activities. The Taxonomy Regulation has six environmental objectives:

1. Climate change mitigation
2. Climate change adaptation
3. The sustainable use and protection of water and marine objectives
4. The transition to a circular economy
5. Pollution prevention and control
6. The protection and restoration of biodiversity and ecosystems

Many companies subscribe to the **B Corp** criteria model. B Corp has thousands of small, medium businesses which voluntarily commit to meet B Corp certification. Formed in 2006, B Corp is a not-for-profit organization with a philosophy to encourage businesses to address ESG issues. B Corp has optional assessment tools, standards, and baseline requirements. The latter are defined as being for a parent company with \$5B+ in annual revenues including Patagonia. Canadian-based B Corp companies include BDC, Coast Capital Savings, Fairware, Salt Spring Coffee, and hundreds of other responsible businesses which continue to demonstrate their commitment to ESG.

The Canadian Federal government, in April 2023, mandated the reporting on emissions involving federally regulated banks and insurance companies to comply with the TCFD framework disclosure guidelines from 2022. Further will be a requirement for ESG considerations and climate-related risks for federally regulated pension plans. New legislation requires all federal contracts over \$25M can only be awarded where the companies agree to publish their annual GHG emissions and their mitigation plans. These requirements are part of the federal 2030 Emissions Reduction Plan.

KPIs for supply chain management

There is limited consensus by supply chain professionals as to which KPIs are the best to assess progress with ESG strategies. This makes sense when we think about the variety of organizational structures and corporate goals.

Supply chain KPIs should be tailored to the organizational strategies, policy statements, and be reflected in its practices. The reason for measuring and reporting is to add to the level of accountability. Take platitudes to the next level.

Some of the more common KPIs applied by supply chain managers in private and / or public sectors

include:

A. Environmental

- i. GHG emissions
- ii. Freshwater consumption
- iii. Resource circularity
- iv. Waste management
- v. Energy consumption

B. Social

- i. Supplier/employee diversity, equity and inclusivity
- ii. Supplier/employee health and safety
- iii. Employee training
- iv. Employee pay equality
- v. Employee turnover rate
- vi. Employee code of ethics
- vii Supplier code of conduct

ESG as a misguided direction

For all of the positive outcomes attributed to ESG, this VUCA period has sounded alarm bells. One of the loudest complaints comes from Elon Musk, credited with restarting the EV movement. In May 2022, after poor labour relation reports, poor handling of traffic deaths, and alleged racial misconduct, Tesla was removed from the S&Ps ESG Index. Musk retorted ESG is a scam and claimed that ratings agencies lost their integrity.

The private sector is cognizant of stakeholder capitalism; however, post pandemic pressures such as extreme inflation and across-the-board shortages are downplaying ESG as a priority. Globe and Mail writer Jeff Jones, stated in a July 2022 article that “in good times, we can afford everything; in tough times, we reset our priorities.” We are facing wars, inflation, economic uncertainty, political polarization and therefore, ESG interest abates.

Compounding the challenges to ESG from a private sector perspective, is the lack of evidence that there is a correlation between improved financial performance and ESG policies being in place. There are a few claims of shareholders having satisfactory returns where companies have adopted ESG policies but they are the few, not the many. Stated another way, investors want their corporate governance expectations to continue and environmental and social issues are a distraction.

Adding to the ESG perplexity are the reporting metrics. Self-appointed, 3rd party agencies use their own methods for calculating results. Without a recognized set of reporting outcomes or definitions, it is difficult to find credibility in reports and support increased pressure for the supply side to improve. Scope 1, 2, and 3 emissions, supplier diversity, green products, green operations, anti-corruption, or carbon offset project returns can all be part of this reporting miasma.

Professors Cornell and Damodaran, in their 2020 paper, *Valuing ESG: Doing Good or Sounding Good?*

found that Bloomberg’s ESG data covers 120 environmental, social, and governance indicators. While all the raters include the most highly publicized indicators in their ratings yet still fail to agree on how these indicators are to be measured. The professors go on to *conclude the hype regarding ESG has vastly outrun the reality of both what it is and what it can deliver.*

ESG doubters had suspicions confirmed when, after a lengthy investigation by the British Guardian, German Die Zeit and non-profit SourceMaterial, found that one of the largest voluntary carbon market (VCM) investment companies, Verra, was not meeting expectations. Verra was allegedly over-issuing carbon credits involving major companies such as BHP, Shell, and Gucci. The challenge is that Verra’s baseline calculations are flawed. As this involves billions of dollars there is definitely a shadow being cast over the use of VCM funds to offset GHGs and the credibility of the VCM companies.

In the US, it is expected that their Security Exchange Commission will require detailed disclosure in 2023 by publicly traded companies on carbon emissions and climate risk mitigation plans. The Sarbanes-Oxley Act will necessitate those Canadian branches of US-based companies to report. Politicians in several states have turned up the backlash and have stated that companies such as BlackRock will be barred from handling state pension funds if they use ESG benchmarks.

A Financial Post article, citing Assistant Professor at Carleton’s Sprott School of Business, Leanne Keddie, stated there is no evidence ESG leads to sustainability. “Until people wrap their heads around this distinction, we are going to continue to have confusion on this point. ESG ratings will continue to tell investors about the risks/opportunities they face on ESG topics but not on how a firm contributes towards a sustainable world.” Charles Cho, professor of sustainability accounting at York University’s Schulich School of Business, said a mini-industry has sprung up to measure and catalogue environmental, social and governance impacts, with a money-making motive that hurts credibility. “ESG ratings have evolved to become a product to sell,” he said, adding that they can be hard to compare, biased and misleading. “So, they don’t really mean much.”

Countering the fog of reporting is fiduciary investment leader BlackRock Inc. They are committed to full disclosure and encourage the use of the TCFD and / or the SASB frameworks. BlackRock supports industry reporting out on specific and operational standards or to state which global standards any company has found to be appropriate – but make full disclosure.

Last Mile Innovations

Trucking¹

Manitoulin Transport invests in technology where there is a measurable improvement in productivity and efficiency. According to Jeffrey Smith, off-the-shelf software lacks the technical capabilities and requires in-house software to be developed to meet customer demands. Other carriers echoed Smith’s view. Higher fulfillment rates with an ease of data flow between suppliers to address the last mile of delivery costs is one of the targets. In a 2021 Business Insider article, it argues that the last mile is the costliest in logistics at 53%. The LTL boom from ecommerce sees more smaller packages getting into the hands of the end customer.

Manitoulin rely on the PeopleNet fleet onboard truck system. This system offers end-to-end vehicle tracking with a focus on pre/post trip inspections, travel logging, navigation and routing, fleet

¹ Thanks to Eric Beckwitt, CEO, Freightera; Jeff Smith, Ex VP, Manitoulin Group; Cory Thorn, Dir of Ops, Canada Cartage; and Matt Zarycki, COO, Amplify Logistics for sharing their industry insights and experience in a series of interviews in 2021.

performance monitoring, safety, and compliance. The software was initially developed for small to medium sized businesses which own a number of trucks. It has a custom designed GPS receiver device coupled with vehicle telematics.

In Canada, 3rd party certified ELD or electronic logging devices are a mandatory requirement as of 2021 in all commercial motor vehicles, to ensure safer operating conditions. The Canadian ELD system aligns with US regulations for use in both countries. Infractions for noncompliance were deferred until June 2022.

Application Programming Interface (API) is becoming more popular with shippers who wish to provide electronic information on bills of lading (BoL). API enables automatic uploading of all BoL data without clerical intervention to manually enter the information which increases accuracy and saves time. Similarly, customer portals allow BoLs to be completed, uploaded into the shipper's system, labels printed, and shipments can be tracked throughout the route.

Faxes have been superseded by sending PDF files via email to any customer's broker for any shipment. Manitoulin as an example, uses this in a centralized manner through their Customs Help Desk. They created a database for all customs brokers which includes their own customs brokers Summit Customs Brokers and Near North Customs Brokers.

Pre-Arrival Review Systems (PARS) allow customers brokers to notify the Canada Border Services Agency (CBSA) in advance of a shipments arrival to expedite its release. The carrier will affix a PARS sticker/label to the commercial documents and forward them to the customs brokers so they may set up the shipment with the CBSA in advance. Previously when faxing the broker, the shipper must also advise CBSA what port to cross, an estimated date and time of arrival, as well as the contact information in case the customs broker need to contact the shipper. Manitoulin uses a performance metric of 99.2% for successful clearance of PARS shipments. Their 2021 actual performance was 99.7% YTD.

One target at Manitoulin is a 60% reduction in the use of paper by 2023. An observation during the pandemic was the increase in staff working from home which led to far less paper being required. New document scanning and retention tools eliminate printing with reduced non-value clerical support. Manitoulin recently eliminated paper-checking and paper manifests and now scan all shipments. Each handling unit has a specific label with a unique identifier. Shipments are scanned throughout their network with electronic signature at the point of delivery.

Canadian-based Amplify Logistics has a leadership team with a CEO in his early 20s. Technology is an important means for them to stay competitive. Amplify uses Samsara Fleet telematics to track its operations. They provide refrigerated carrier services and can activate the trailers remotely to save energy. Amplify use BorderConnect software to coordinate with their customers' brokers.

A challenge for Amplify is in partnering with smaller truckers on the use of technology. To create mutual benefits, Amplify allows smaller carriers access to Amplify's system to reduce the cost of doing business where they need to have a smaller carrier do a contracted delivery. New technology ideas often come from their drivers with suggestions on how to increase efficiencies. Amplify use bots to handle their order entry data to save manual intervention of data.

Amplify measures its performance through customer satisfaction surveys; pulse checks; and freight growth trends. When capacity becomes an issue, they reach out to 3rd parties to support service.

A BC-based lubricant company invested in the SAP Business One as their ERP system; SPS Commerce for its EDI connections; Valogix for MRP procurement functions; and Fabric as its website/ecommerce platform. Outcome? A 65% reduction in its client care team with an increase in productivity of 2.4 times. With national sales of ~\$90M per year, this lean organization budgets an average of \$250K per year for

technology solutions. 95% of their logistical requirements are outsourced.

A relatively new, US-based multi-modal company with a significant investment in a variety of logistics' technologies is Stord. They claim to partner with 15,000 carriers across the US. Stord runs a cloud-based transportation management system and embraces technology as a market differentiation strategy. They have heavily invested in a full suite of digital network services.

The phasing out of the highest polluting vehicles is being led by IKEA, Unilever, A.P. Moller-Maersk, JSW Steel Limited and the GeoPost/DPDgroup. These players have signed on to the EV100 pledge targeting medium- and heavy-duty trucks which account for 4% of all vehicles but emit 40% of road transportation emissions and 33% of all transport fuel consumption. 2040 is the goal as announced by the environmental organization Climate Group in 2022 to convert fleets to EVs under the EV100 Initiative. They also want all new trucks to be designed as zero emission vehicles in larger markets.

Technology and the circular economy are enabling more resiliency in supply chains and optimizing the economic decoupling. Real time data sharing between business partners is a must.

FedEx is converting to Bluetooth Low Energy (BLE) sensors from GPS scanning of packages which tells the driver where to store the package on-board. Tracking information is sent every two seconds to update shippers. This is FedEx's SenseAwareID™. With ever-increasing ecommerce and consumer online habits, the "peak season" for the last mile appears to be mid-August to mid-October. FedEx and Mercedes have developed an auto scan system so as a package is placed in a delivery van, it tells the driver the optimum location to place it-referred to as a "CoRos" or cargo recognition and organization system. Lights designate the on-board location in a pick-and-put protocol to efficiently load and unload packages.

Even though FedEx has been operating 24/7 for several years, it is revamping its logistics in 2023. CEO Raj Subramaniam, says it will partner with 3rd party carriers to move lower priority shipments, referred to as deferred traffic. While FedEx is handling 6+million packages per day, it wants to cut its costs by US\$4 billion by 2025. Through its DRIVE strategy to increase efficiencies, they will move to higher density routing with daily shipments having more packages per delivery vehicle. In a 2022 earnings call, FedEx stated that their operating income was down 64% year-over-year. FedEx expects downsizing of its air freight to contribute the largest savings in response to slower demand.

Large US retailers have changed their business models for the post-pandemic period which is a response to customer behaviours. Online ordering and omnichannels require a new response. Rite Aid is partnering with Uber Eats, Instcart, Shipt, and DoorDash which saw Rite Aid's revenues increase by 183%.

Home Depot and Wal-Mart (US) joined forces to deliver Home Depot products for same-day and next-day service. Customers don't care what name is on the carrier – just the goodies inside. In 2021, Wal-Mart launched *GoLocal* utilizing gig drivers from their Spark Driver program. Wal-Mart is targeting 30M household deliveries by 2023. This is part of the Wal-Mart delivery-as-a-service (DaaS) strategy.

In October 2022, Loblaws introduced a fleet of multi-temperature autonomous box trucks utilizing Gatik technology. This follows a 3-year trial with a 3rd party safety compliance audit. Loblaws can make deliveries 7-days per week to select customers using driverless vehicles over fixed, repetitive and predictable routes.

As reported in Supply Chain Dive in October 2022, Walmart acquired Alert Innovation to deploy their Alphabot system to store, retrieve, and dispense grocery orders using robots. No need for lifts or conveyors with these omnidirectional bots reducing space constraints and allowing for scalable applications. Walmart now has access to 90% of the US population within 10 miles for storage and

fulfillment.

NorthStar Digital Solutions was launched in 2019 and developed an integrated application called *FR8Focus* to share information on LTL shipments. “Deploying FR8Focus to a real asset-based company that moves 300,000-500,000 pieces of freight annually gave FR8Focus a real good run for the investment. Results included \$25,000 monthly revenue increase; 100% decrease in missed invoices due to lost/incomplete paperwork; 95% decrease in quality assurance audit needs; 90% straight-through automation of invoicing; 75% decrease in document handling; 50% decrease in customer disputes (with real-time invoicing); 40% acceleration of accounts receivable payment cycles (from weeks to days),” according to North Star Digital Solutions.

Last-Mile solutions are going to be rooted in technology solutions. Automated dispatching replaces manual for its efficiencies in scheduling routes, driver availability and proximity to the final address. Optimization of routing utilizes algorithms which factor traffic patterns and conditions, traffic lights, and even eliminating most left turns. The latter problem was identified a decade ago as bottlenecks in urban areas costing too much time. Through the application of electronic proof of delivery (ePOD) tracking in real time lets customers and delivery drivers avoid missed delivery times and adjust trips to inadvertent occurrences. Other options include e-bikes and scooters for smaller packages in city centres; sharing the cost of supplying Smart lockers in key locations for fewer deliveries and access by customers. In 2021, Bluemyth Technologies, installed lockers in Vancouver, BC via BlueBox Smart Lockers. This mitigates the first attempt delivery rate (FADR) costs and allows for flexible delivery times for drivers and customers.

The counterpoint to the last mile cost is the use of reverse logistics. Reverse logistics goes beyond simply returning goods which have been purchased. Reverse logistics incurs operational costs associated with reusing products and materials, recycling, reclamation of raw materials, refurbishment and reselling. While online shoppers were drawn to the buy it, try it, and return it at no charge, this practice is waning as retailers realize it is becoming financially unsustainable. More sellers are imposing restocking and handling fees. Larger retailers such as the Walmarts may be able to afford the return of goods in the short-term, but SMEs who have a limited line of goods and face heavy inventory carrying costs cannot. The National Retail Federation estimates that the cost to retailers to return goods from consumers amounts to ~21%, which is up from 18.0% in 2020. The National Retail Federation estimates that returned goods cost sellers ~16% of the sales.

Nabil Malouli, Senior VP of Global eCommerce at DHL estimates the cost of returned goods ~\$750B on 2021 data. Further Malouli says that “return abuse”, often from impulse fashion purchases, is from 1% of the online customers and accounts for 40% of the problem. Some companies like Zara, have tried to impose a modest return fee for online returns and not apply the fees to in-store returns. Amazon has refunded the purchase price and told the customer to keep the goods, as the cost of return logistics is excessive. Retailers are going to need to be more creative to resolve cost issues. Reverse logistics must be affordable to avoid unnecessary waste or write-downs of finished goods and surplus inventory problems.

UPS estimates the 2022-2023 returns from the peak season (Nov 20 – Jan 21, 2023) at 70 million packages – that’s just for UPS. This is the majority of returned gifts over the US Holiday season. The UPS VP of Retail and Business Development summarizes the trend as customers wanting to buy online and return in-store.

FedEx is beginning its Consolidated Returns program in 2023 to allow a broader segment of customers to return items without a box or shipping label to its ~2000 FedEx office locations. These small packages will be brought into LTL return shipments from multiple sellers and sent back to the shipper. Addressing the skyrocketing increases in reverse logistics’ costs becomes a much higher priority.

The practice of *recommerce* has evolved to address the reverse logistics problems. Recommerce is the reselling of returned goods with acceptable margins without destroying the merchandise. Larger brands are turning to 2nd hand outlets to resell in traditional store fronts.

In the e-commerce, ocean freight logistics world, reverse logistics is a more complex and costly undertaking. The sheer volumes of containerized goods and rerouting can cost 3-5% of the total revenues. While this is a considerable expense, the circular economy relies heavily on ensuring products at their end-of-life can be recovered for extracting critical materials, precious metals, and be repurposed wherever possible.

Although the last mile will always entail emissions, buying carbon offsets is an emerging circular economy practice to act as responsibly as possible. In 2007, Harbour Air out of Vancouver introduced carbon offsets for its passenger flights. A nominal fee which gave environmentally conscientious travelers the ability to reduce their impact. The carbon offset fees collected are aggregated and invested in global projects. These have provided efficient wood cook stoves in Uganda to protecting wildlife habitats in Zambezi. A 3rd party company, Offsetters, manages the carbon offset aggregation for Harbour Air, measured in tonnes of CO₂ (tCO₂e).

Other transportation companies are buying carbon offsets to address GHG emissions. DHL, FedEx, and as reported in Transport Dive, April 2022, JB Hunt is advising its intermodal shippers the volume of offsets required for a carbon neutral shipment. While carbon offsets are voluntary in nature, progressive companies see this as their way of participating in the circular economy and mitigating their environmental impact where their type of business operations make them unavoidable.

Digital logistics

The essence of LTL freight is finding the best rate to move goods from point A to B, based on the weight, distance, freight classification, and the commodity. Currently, this requires an inordinate amount of human intervention to search through thousands of carriers to manage these transactions. While technology to digitize transportation is unfolding, the majority of transactions are paper-based with phones and faxes.

What was needed was a means to aggregate dynamic data into a simple model for shippers to select carriers. In 2014, Vancouver-based Freightera figured this out. CEO Eric Beckwitt leveraged this gap and filled the void. Freightera connects 13,000 plus logistical companies on their hosted platform which allows shippers/carriers to select the best rate along with environmental considerations, if they choose. Their proprietary software uses a transaction fee-based service where lane options can be transacted within minutes-including the printing of labelling and waybills. Carriers have 15 minutes to respond to a query from a shipper as to their capacity to handle an order.

Freightera focuses on the small, medium business sector and is growing at a rate of 74% year-over-year, which is a sign their services are in high demand. They have taken a lot of the guesswork out of trying to find the best rate for shipping. Carriers have been pushed to the limit on rates by large shippers and try to carve out better rates from smaller shippers. Freightera serves the US, Canada, and cross border markets.

Freightera's software allows the carriers/shippers to select the best fit based on a load basis. Customers enter basic shipping information including postal codes and Freightera identifies their carrier options and decide which one best fits their needs. Invoicing is automated.

As an SaaS (Software as a service) provider, Freightera was recognized with the 2020 Deloitte Technology Fast 50™ award. In part, as a result of their 678% revenue growth from 2016-2019. The circular economy requires that we optimize the use of energy in the LWD sector to support production without adding more emissions.

Robotics

Warehouses have been transformed into fulfillment centres and involve *RaaS*-Robotics as a service. RaaS has accelerated their presence in warehousing, in part due to the demand created through the COVID pandemic. The rush by consumers to adopt online ordering and businesses increasing their ecommerce activities, required forward thinking to invest in CMRs. Order fulfillment speed and accuracy are the characteristics of CMRs. The productivity of CMRs has a definite payback to warehouse operators. Amazon currently operates more than 100,000 robots in its fulfillment centres.

One caveat to the growth of fulfillment centres by major players such as Amazon, is the reduced level of consumer buying in early 2023. Amazon is making big cuts to its operating costs said CEO Andy Jassy, in a February earnings call. The slower economy hits the distributors after retail and online sales slump. Another example of having a resilient supply chain. Being able to manage the boom and the bust cycles in the market.

It has been estimated that 70% of warehouse operating costs are attributed to labour. A case study published by 6 River Systems indicates a return on investment over 15 months with a net present value of US \$7.1M when using CMRs to replace a manual cart and RF picking method. The savings were attributed to 2.5 times increase in pick rate; reduced supervisory time; reduced training time; reduced operational supply costs; reduced licensing and hardware costs; and reduced replenishment costs.

A January 2023 report from Supply Chain Dive, order picking costs run at 55% of warehouse operating costs. Walgreen's is expanding its micro-fulfillment centres by using robots to fill pharmacy orders and address the shortage of pharmacists. The robots target repetitive tasks which can be easily replicated by robotics. Their Chief Supply Chain Officer, Roxanne Flanagan says that 60% of its 2022 prescriptions were filled through automation.

Smart sorting systems using machine vision technology are now being used where bots select the correct package size for a specific product. In part, this can increase the load capacity in a trailer with the right-sized package. Small-item sorting through bots in a distribution centre adds to the efficiency in the handling processes.

Warehouse Management Systems (WMS) enable batch order picking; pick-to-light; inventory cycle counts; and AutoCAD to optimize locations. Carousel systems are now competing against Loop sorters which can process 50,000 pieces per hour. DHL has invested US \$300M for (2) Loop sorters in one of its distribution centres with a 30% labour saving costs.

In a January 2023, 4th quarter market call with investors, food products and spice company, McCormick & Co. announced a 10% US labour force cut which will largely be addressed through automation. As a result of declining profits and labour shortages, increasing investment in automation to replace ~1400 workers, has McCormick on track to achieve the labour savings and its long-term operating cost structure. If labour shortages continue, we can expect more and more automation wherever possible across most sectors.

Order management systems (OMS) complement the WMS. OMS use visibility throughout an ordering process as the key value. Tracking in real time from the sales order through to fulfillment can be done from any location by the parties involved, depending upon security requirements for access. Checking on an order status, packing, processing, shipping, return goods, inventory levels, product details, and supplier contact information, all easily accessible, when required.

Pet food online retailer, Chewy, reports that its automated fulfillment centres handled 30% of the sales orders in Q3 2022, up from 10% in 2021. Shipping distances were reduced by 25% with 18-20% lower

processing costs than Chewy's previous distribution system. Based on their success, they plan on two more automated fulfillment centres over the next 2 years. Concurrently, Chewy is planning two import routing facilities, expected to handle 90% by early 2023.

Walmart's US president and CEO Doug McMillon, is on the record to reduce store-level wage investments through increased automation of picking orders. This will entail retrofitting existing facilities and upgrading with multiple technologies to automate storage and retrieval systems. The retrofit will reduce the need to build new facilities. Walmart's new Chicago high-tech fulfillment centre does not require a "lot of human engagement." Micro fulfillment centres (MFC) will complement existing operations and address grocery order picking. McMillon's vision is to be an omni-channel organization.

The warehouse connectivity systems such as the Mobility Edge™ from Honeywell utilize voice automation with voice and visual picking; voice and autonomous mobile robots (AMR); voice guided work solutions; voice enabled workflows; voice activated maintenance; with real time locations.

Simbe Robotics has a grocery store robot named *Tally*. Tally travels throughout a store scanning digital tag and QR codes for JIT replenishment. Saves labour and a claimed 30% reduction in stockouts.

In California, Fulfil Solutions has partnered with the Save Mart companies to fully automate the picking and packing of all types of grocery product categories. Within minutes of receiving an order, robots fill the order and have it ready for delivery. Fulfil's proprietary system uses computer-vision and a series of algorithms to sequence the picking efficiencies and updates the inventory on demand. Their database monitors locations, origin and expiry dates in real time to build order accuracy and is meeting customer service requests. Save Mart operates 200 stores and is currently one of the few successful, fully automated grocery services.

Emerging robotics companies which bear following are: 6 River Systems (Shopify); Fetch Robotics; Geek+; Locus Robotics; RightHand Robotics; and Fabric. Harnessing technology is a key part of the circular economy being efficient with energy consumption and waste reduction.

RFID

RFID means radio frequency identification wireless technology. While CMRs are taking on larger roles, RFID still has its place in the market. The key feature is the ability to track and identify items in real time and is used commonly for inventory control. RFID tags or chips transmit data to a central database to affect inventory levels and locations. Each tag represents a SKU in the system. RFID have replaced barcodes due to the line-of-sight limitations which barcodes require. An RFID negates the need to manually inspect each shipment and enables items to be scanned and catalogued even if it hidden by other goods. The RF signal is the key. RFID tags or RFID transponders include passive, semi-passive and active forms.

Passive, which are the most common, have no power source and only interact with the RFID reader or scanner. *Semi-passive*, have battery power but rely on the RFID reader to transmit data to the reader. *Active*, have battery power which enables the tag to transmit signals to the reader up to ~30 metres.

RFID smart labels use an embedded technology in an adhesive label. These are often used where there is a need for a person to read the tag to know what the product is and to have it readable by a scanner. Retailers often have the smart label for customers ease of viewing on the contents. Smart tags differ from smart labels. The advanced smart tags are usually appropriate where a level of security is necessary. The advanced smart tags have built in processors and can therefore be quite costly.

In a February 2023 earnings call, UPS said it will invest US\$140M to implement its smart package initiative in ~900 US sites. UPS trialed the RFID tag program in ~100 of its facilities where employees wear scanning devices to accelerate parcel handling and reduce misloads. CEO Carol Tomé says this will

eliminate 20 million manual scans across the UPS system.

RFID benefits include accuracy, response time improvement, and efficiency. In a Canadian health care operation, they went from an ~80% accuracy and fill rate to 99% accuracy and fill rates. When RFID was combined with a horizontal carousel system, there was also a 50% reduction in staffing for similar work volumes. The payback on the RFID and carousel system was 1.5 years on a \$400K investment, at the time.

QR codes

A quick response (QR) code is a two-dimensional barcode. The QR function is to inform the reader about the item. They can contain data for location, identification or links to a website or application. During the pandemic, restaurants provided menus in QR format for diners. Post-COVID, the QR codes seem to be staying as customers can use their smart phones easily to access menus and order. QR codes are replacing the UPC barcodes commonly used in the grocery industry.

QR codes are becoming more common to provide information on the *provenance of products* across a supply chain. They can inform as to where the product was grown, harvested, manufactured, processed, repaired, and a host of other data for customers, consumers, and inspection services. QR codes serve as business cards, discount coupons, provide video content and many other marketing and service functions without the use of a print format.

Blockchain

Blockchain technology is changing supply chain practices with the ability to share data, its security, and the smart capabilities. The provenance of materials and labour will enable a transparency which can prevent fraud, eliminate intermediaries, and automate processing. Authors Köhler and Pizzol, in their 2020 publication, *Technology Assessment of Blockchain-Based Technologies in the Food Supply Chain*, summarized the elimination of staff intervention in perfunctory clerical roles to try and address these issues. People can't adequately cope with the volume of information on the traceability of labour and materials and hope to stop illegal practices, spoiled good in-transit, or lost shipments. Blockchain is meeting the challenge where consumers and customers expect accelerated delivery times with reduced handling costs.

In 2018, Maersk and IBM partnered to apply blockchain solutions for international supply chains sharing data among their decentralized trading partners with digitized record keeping. It was felt that the blockchain platform, TradeLens, would become the standard for tracing and accessing product-related information, including labour. In late 2022, Maersk and IBM shut down their joint blockchain venture as it failed to reach commercial viability. They don't see this as a blockchain problem but one of a lack of mass adoption across the shipping ecosystem system.

Walmart had deployed blockchain as a solution to the last mile traffic jams. It's patented *Smart Package* utilizes a blockchain-formulated application to scan environmental conditions, locations, and private key addresses of shippers, carriers, and customers.

Proof of delivery (PoD) has been a pervasive problem for all companies shipping products for many years. The hours of time spent to confirm deliveries or locate missing packages is overwhelming from a staffing perspective, for just the PoD portion of a shipment. Ensuring refrigerated goods are kept at the correct temperature is difficult to communicate expeditiously in a paper-based world. Again, blockchain can ensure real time data is transferred to the parties involved to meet shipping specifications, facilitate transactions, and complete the record keeping within a secure, distributed ledger, efficiently.

The Achilles' heel for technology is cybersecurity. The preponderance of invasive malware remains a real threat to all parties and can easily be transferred between supply chain partners. Meat producer JBS

USA paid US\$11M for a 2021 ransomware attack. In early 2023, Dole plc, which is one of the largest fruit and vegetable producers, briefly shut down its production and distribution operations when hit with ransomware. US Technology provider, MKS Instruments, stated that February 2023 ransomware attack led to a \$200M loss. While MKS had \$3.0+ B in revenues, the attack required MKS to cease production for customers and has resumed operations. Several Canadian hospitals and health service providers have been hit with ransomware, accessing personal patient records. Surreptitious blockchain technologies may be able to address the cybersecurity dilemmas.

Cryptocurrency

Built off blockchain technology, cryptocurrencies are both a speculative commodity and a means of making payments between supply chain partners. Walmart and DLT Labs in Canada have been using the distributed ledger technology to track, trace, and process payments and reconciliations since early 2020. This involves 60 of Walmart's carriers, 500,000 shipments per year, and its 400 Canadian retail outlets, leading to substantially reduced massive numbers of transactions requiring clerical staff to try and manage. One carrier reported a 97% reduction in invoicing discrepancies. One of the root causes of the previous system was the fact that Walmart had to deal with multiple information systems. Blockchain brings them all onto one platform.

Walmart's Global Chief Technology Officer, Suresh Kumar, says that "Crypto will become an important part of how customers transact." Large retailers and trucking companies will likely follow suit and adopt similar blockchain with cryptocurrency options now that Walmart has proven its viability.

The infamous, if not criminally connected collapse of FTX in November 2022, after only 3-years in operation, will add to the perceived levels of risk with cryptocurrencies as a secure form of payment and investment.

Drones

Drones are being used to reduce warehouse staffing. Drones can perform inspection services for construction, petrochemical, oil and gas, and power generation industries. Drones can inspect roofing, racks, pallet locations, and physical structures. Drones can also deliver materials from inventory to staging or internal work process stations, which is referred to as intra-logistics. For inventory management activities drones can increase the inventory count accuracy, decrease labour costs, and provide a safer workplace.

Erez Agmoni, VP with Maersk, confirmed in January 2023, that they are deploying Verity drones to collect 3-dimensional data inventory data via high-res cameras. The e-drones run off a battery charging pad and usually operate at nights or on weekends without overhead lighting required. The drone data is reconciled with the WMS data from the pallets to identify SKU or location errors.

Emerging technologies for indoor use of drones is being developed concurrently with several companies using a variety of systems. Warehouses which can benefit from drones typically are >50,000 ²ft; > 5 metre shelving; >50 metre corridors; and single depth pallet racking.

Drone technologies in use or being piloted are SLAM – simultaneous localization and mapping algorithm; LiDAR – light detection and ranging; UWB – Ultrawide Band. The use of drone technology is expanding exponentially year-over-year.

In 2022, Walmart completed 6000+ drone deliveries out of 36 stores through drone delivery hubs. These hubs are operated by DroneUp, Flytrex and Zipline in seven states. This promising service is targeting a goal of 1M packages per year, per Vik Gopalakrishnan, Walmart US VP of Innovation and Automation.

Water freight

Real time transportation visibility (RTTV) is the focus of many ocean shippers and carriers to improve efficiencies. In a 2021 survey, sponsored by software company Fourkites, they report that 50% of international shipments are conducted on a manual system with paper-documents being faxed and emailed around the globe. The desire for greater visibility requires technology investments. Where are the paybacks? Significant operational savings and improved customer services such as on time, in full (OTIF) and less dwell time. Dwell time is the # of days containers sit at a terminal after being unloaded. Dwell is a KPI for terminal operational efficiency. Delays can be attributed to many different factors beyond the control of the terminal but can also provide a sense of their capabilities and resilience.

A single RTTV platform connects freight forwarders shippers and carriers with less staff intervention to trace and expedite orders. In March 2021, the container ship Ever Given blocked the Suez Canal, with months of delays as a ripple effect. Those shippers which had a RTTV platform were able to reroute much faster than those that depended on individual staff to intervene during the crisis.

Large terminal operators are investing in dock scheduling systems to increase their supply chain visibility. Cross docking operations are very complex and scheduling systems are aimed at driving efficiencies to coordinate multiple products, from multiple carriers going to multiple destinations out of a warehouse or terminal.

Norway launched the first all-electric ferry with rechargeable battery system, in 2019, claiming 90% reductions in emissions and 80% reductions in cost. Electric ferries run much quieter when compared with the traditional diesel engine powered designs. Two electric propulsion ferries were ordered for operating in Ontario in 2021. In 2021, New York ordered its first, 150 passenger electric ferry for commuters. It would seem that all-electric ferries could replace many of the diesel-powered fleets as a scalable solution.

While the e-ferry systems will continue to grow, there is still going to be a need for renewable fuels to displace the bunker fuel for large container and cruise ships. Methanol engines are now in use. E-Methanol can be made from CO₂ derived from biomass and green hydrogen. This requires a scalable carbon capture process for industrial sources of biogenic CO₂. The Methanol Institute reports that AP Moller-Maersk has ordered dual-fueled ships to address the decarbonization of international shipping. The supply of e-Methanol at major shipping ports would be required to support the fuel distribution system. Methanol is used in household products, automotive components, and in the production of chemicals.

Air Freight

This sector handles less volumes than the other modes of transport and is usually the fastest means of moving goods with a higher cost. Air freight is catching up with digitalization of its services. One of the leaders in air freight is FedEx. Their fully integrated logistics systems arguably set the bar. FedEx is one of the largest air freight airlines in the world. FedEx operates 281 aircraft to reportedly handle the shipment of 13M packages per day. Amazon, for comparison operates 73 aircraft and ships 3M packages per day. One could make the case that without the technical tools of the buyers, sellers, and logistical connections, these volumes would not have been possible. The relative ease of ordering through to the fulfilment processes is only feasible because of the technologies being deployed in mature markets. Emerging economies are much more labour intensive and have fundamental problems where the demand side and the supply side are not as connected, which adds costs but does not increase the value.

With the loss of passenger flights through the pandemic, the cost and capacity of air freight was a challenge for passenger airlines which focus on people rather than packages. The biggest customers of airlines are freight forwarders. The integration of freight forwarding services into larger logistics network companies may reduce the need for independent freight forwarders. Forwarders advise on costs, documentation, insurance, customs clearance, labelling, scheduling and arrange intermodal services. Forwarders don't own transportation assets. They historically rely on their expertise. Digital integration tools may negate some of the forwarder's niche in the market where the soft skills compete with technology.

Rail

Rail services do utilize many of the aforementioned technologies for safety, scheduling, track inspections and are also looking at the redesigning of rail cars. Hazmat materials are a common commodity on a rail line. Compartmentalizing flammable liquids as an example where a single puncture does not affect the entire contents. Drones inspect track and rail bridges routinely. Crew scheduling is provided through SaaS as a mobile solution to employee assignments, seniority rights, allows manual adding of trains, and hours of service data. An innovator of SaaS for rail is PS Technology.

Idling reduction technologies are a part of the SmartWay verified services for locomotives. These include: Automatic Engine Shut-Down/Start-Up Systems (AESS); Auxiliary Power Units and Generator Sets (APU/GS); Fuel Operated Heaters aka Direct Fired Heaters (FOHakaDFH); Shore Connection Systems (SCS).

SmartWay offers a Green Freight Assessment to Canadian companies to apply for funding to hire a 3rd party to conduct a fleet energy assessment. The review would provide a carrier with recommendations on how a company could improve fuel efficiencies through retrofits and using different fuel types.

One of the more interesting technical disruptors in rail transit is the use of hydrail-hydrogen energy for power. Mass transit is trialing various vehicle designs to look for scalable outcomes for the types of vehicles best suited for hydrogen-based fuels. Most Canadian railways use diesel and diesel-electric propulsion systems. Biofuels have not been welcomed due to potential problems in the diesel engines. LNG has been used but is not seen as a large-scale alternative fuel.

Zero-emission passenger trains are operating in Germany using 100% hydrogen. The French engineering firm Alstom designed the trains which only emit steam and condensed water. The engines are refueled daily from an industrial gas company Linde hydrogen generation depot with an 1800 Kg storage capacity. The operator, LNVG, will replace its fleet of (15) diesel-powered units. The trains will attain a speed of 140 Kms with a range of 1000 Kms. It's estimated that 1 Kg of hydrogen will replace 4.5L of diesel.

Canadian Pacific is heavily investing in hydrogen-fueled freight locomotives with Provincial government funding. Ballard Power Systems will develop the hydrogen-electric powertrains to convert the diesel-electric powertrains which most rail lines have used for decades in North America. Retro-fitting existing locomotives is part of the circular economy strategy of decarbonization. CP is trialing their hydrogen-fueled trains in early 2023 through the Rocky Mountain pass which will be a critical test area with the variations in grade and temperatures.

Mass transit has used magnetic levitation (Maglev) technology successfully in China and Japan. While Maglev enables high speeds it has limited scalability. There are US projects which are assessing the use of Maglev but have not moved forward. The French TGV, electric-powered trains have been in service for 30 years and the TGV technology has been used on other European countries, which is a scalable

solution.

Electrification of transportation

In 2018 Rolls Royce and FinFerries² launched the first fully autonomous car ferry. The cost advantages of using autonomous trucks in B2C (business to customer) last mile delivery is substantial, with potential of reducing delivery costs by 10% comparing to traditional delivery method (McKinsey,2018). The design of the fastest route reduced the pollutants created by shipping vehicles, especially for overseas shipping, while autonomous delivery acts as a solution to effective, low manual input delivery, allowing more funds and human resources to be devoted to more productive usage.

Stellantis, which is the 2021 company formed with the merger of Fiat and Peugeot, is preparing EV sales for mass production. As the 4th largest automobile manufacturer, they see EV vehicles as the immediate future. Stellantis has created its Circular Economy Business Unit which is aggressively targeting €2B in revenues by 2030 and to be carbon net zero by 2038. They see remanufacturing, repair, reuse, and recycle as the core means for their success.

The Canadian government has recently invested \$13 B to support the conversion from internal combustion engines to plug-in vehicles by funding Stellantis, Ford, GM, Honda and Toyota facilities. Investments include producing and processing critical materials to make batteries and related research. To bolster the strategy, the Federal government announced that it will ban the sale of new internal combustion engines in passenger vehicles by 2035.

The country of Norway has been the leader in the number of EVs per capita, with new fully electric cars at 79% of sales in 2022. This has been encouraged by having no taxes on new or imported battery EVs until the end of 2022. In 2023 Norway will begin taxing EVs. The estimated loss of sales taxes through the exemption is ~39.4 billion kr or US\$4B.

In December 2022, the first all-electric delivery trucks rolled out of the GM Cami plant in Ingersoll, Ontario. After closing the former Chevy Equinox plant in April, the plant was retrofitted to a full-scale electric vehicle plant. Orders for the BrightDrop vehicles have been placed by DHL, Walmart and FedEx. The Cami plant is designed to produce 50,000 vehicles by 2025.

Quebec-based Lion Electric is producing electric school buses. Their purpose-built e-buses are zero emission vehicles. Lion design and manufacture e-trucks, mini-buses, refuse and utility trucks. Lion has taken the design of its products as the first step in reducing emissions.

Vancouver-based RiiSE EV company is rethinking the electrification of many types of vehicles, including the everyday school bus. RiiSE EV has opted to go where few others have gone. Retrofitting and converting gas and diesel buses and shuttles to electric power. They also apply their know-how to sports and classic cars, fleet and utility vehicles.

Electrification of school buses has a tremendous impact to address GHG reduction targets. When we consider the millions of buses and trucks currently reliant on fossil fuels, the conversion should be cause to reflect and rethink how we move people and products.

The RiiSE EV strategy aligns with the circular economy value which states that everything begins with the design. Taking existing resources and repurposing them for other uses, substantially reduces the consumption of new raw materials and enables a sustainable economic model with a lower

² <https://www.finferries.fi/en/>

environmental impact over the life of the vehicles.

We can take the next step of designing all new e-everything; or, we have the potential to convert tonnes of resources, such as school buses and other utility and service vehicles, which we currently own and operate to avoid or defer further financial risks and perpetuate material shortages.

In January 2023, Toyota's CEO Akio Toyoda, said that while Toyota has been very successful in hybrid technology which powers their Prius model, as a plug-in hybrid (PHEV), battery electric vehicles are getting more attention. BEVs comprise ~20% of the auto market. A Schmidt Automotive analyst references rising material costs such as lithium pushing BEVs higher in price and PHEVs offer a good option. Retrofitting older Toyota vehicles is an option being put forth from Toyota. This supports the circular economy principle of reducing the demand for raw materials-converting existing resources to extend their life and reduce energy.

In early 2023, the first battery-powered public transit bus line was initiated in Vancouver with four Canadian-made Nova LFS+ brand vehicles and two charging stations. The announcement from the operator, TransLink, stated the buses cost \$1.1M each and are expected to save \$40K each per year when compared to diesel units. There was no indication as to the cost of the charging stations. An additional 11 BEV buses are on order with another 385 to be delivered by 2030. The four older diesel vehicles they replaced emit 280 tonnes more than the BEVs. If we use \$50 per tonne as the cost of GHGs that's a further savings of \$14k per year. It's a payback of ~25 years even with reduced GHGs. Therein lies the rub with affordable and clean energy. Currently it is difficult to get one without the other.

The *Catch 22* for EVs in Canada, is the lack of adequate infrastructures to support charging. In 2022, with EVs now only representing a small % of the market share, the charging networks cannot meet demands. If our wishes come true and we can all buy affordable EVs, the investment in open standards to charge any vehicle anywhere, on interoperable systems, will require strategic energy management programs that are currently unattainable.

The Canadian government wants ~65,000 charging stations across Canada by 2027 while the industry argues there should be hundreds of 1000's more to meet the demand. Canada has mandated that 20% of passenger vehicles be electric by 2026 and that 50% of new cars be emission free by 2030. In Europe the target is one public charger for every 10 EVs. This extrapolates to Canada requiring ~4 M public chargers by 2050. EV infrastructure needs to stay in sync to encourage conversion of the sector.

The US Postal Service has ordered 66,000 battery EVs for service by 2028. This type of demand will assist manufacturers to achieve economies of scale. The supply side can invest in the latest battery technologies and vehicle designs. The Postal Service will buy a further 106,000 new vehicles to replace its existing fleet. The investment by the Postal Service is based primarily on the US Government's passage of the Inflation Reduction Act which secured funding aimed at reducing GHGs and environmental impact. The strategy is to completely move to an electric fleet as announced by the US Postmaster General Louis DeJoy in December 2022.

Electric construction equipment

Most major construction equipment manufacturers have rolled out new product lines which are fully electric. These models eliminate the need for diesel fuels, have equivalent payload capacities, operate quieter, and need less maintenance. Volvo reported a savings of \$2400 when operating an electric machine for 400 hours as compared to a diesel machine. Volvo ceased the manufacturing of compact wheel loaders and compactors in 2019 as it launched its electric versions.

In a city such as Toronto, as an example, noise from conventional construction equipment requires that

it shut down between 7pm and 7am. Quieter electric equipment could extend the work day in these situations, increasing productivity.

Swiss-based Kuhn-Gruppe converted a 40-tonne Komatsu HB 605-7 rock truck into an eDumper. It's capable of carrying 59 tonnes of material without stopping. In a mining application the eDumper uses a regenerative braking system which recharges its 600 kw per hour batteries when going downhill. The battery pack weighs 4082Kgs. The conversion capability supports the circular economy principles of refurbishing existing equipment and rethinking how we use manufactured products.

Caterpillar has done test trials to prove the viability of its 793 all electric mine haul truck. Fully loaded, it can reach a speed of 60 kmh. It too recaptures the energy on a down slope to recharge the battery. Caterpillar also has an autonomous, 100-Ton 777 off-highway truck.

Electric first responder vehicles

The cities of Vancouver, Los Angeles, and Brampton have ordered electric fire service trucks from Austrian-based manufacturer, Rosenbauer Group. These trucks have the benefits seen in other EVs such as less maintenance requirements and lower fuel costs. The chassis design allows a lower profile for fire fighters to access equipment and board the vehicle. The height can also be raised to travel over debris. The Rosenbauer design uses a BMW diesel engine for pumping operations and charging when required. The fire trucks will be built in the US by Rosenbauer supplying training and spare parts.

BC Emergency Health Services (BCEHS) will use the Ford Mach E for paramedics to respond to calls. Quebec-based Demers Ambulances and Lion Electric have developed a fully electric eFX ambulance. The all-electric ambulance will have a range of up to 200 Kms on a single charge. The design allows for a much lower chassis height making patient care easier.

The first fully electric RCMP cruiser was put into service in February 2023 in Langford, BC. This is part of a national trial to test the functionality, capabilities, and limitations with EVs for the RCMP across Canada. The Tesla Y model is suitable for milder climates while it may not be viable for northern communities. Other EVs such as the Ford Mach-E SUV and Ford F-150 are on order.

Airlines

Vancouver-based Harbour Air converted a 1955 aircraft to run on an H55 battery and will have a magniX electric propulsion unit (EPU). Under a proof of concept, Harbour Air is targeting a 2023 inaugural flight.

Seattle-based Eviation, is producing its version of an electric commuter aircraft. In 2022, Eviation received an order for 75 of these 9-passenger, zero emission craft. Eviation uses similar technology to Harbour Air in its e-plane. The planes have the capability of flying for ~1-hour after 30 minutes of charging. United Airlines has ordered 100, 19-seater Swedish-manufactured electric planes from Heart Aerospace.

United is researching the use electric vertical takeoff and landing (eVTOL) aircraft to move passengers who now drive ~250 miles or less to fly instead, according to its VP of Corporate Development Mike Leskinen. In an *ESG Impact* report in October 2022, by rethinking short flight demands, eVTOL could fill a gap in the market that is currently taken by automobiles.

Airlines are trialing sustainable aviation fuels (SAF). SAF emit much lower CO₂ levels but not zero. Airlines speculate that electric planes could serve small markets; hydrogen-fueled planes for medium-sized markets; and SAF-powered jet engines required for major cities. The International Air Transport Association (IATA) reports that in 2022, the production of SAF was forecast to reach 300M litres. However, IATA estimates that a production of 450B litres will be required annually to achieve Net Zero

targets for 2050. Airlines have increased their commitments to SAF by entering into *offtake* agreements with SAF producers. This will support the financial commitments from the supply side for the demand side.

Consumer versions of 2–4-person electric aircraft are on the market in the form of eVTOL models. Aircraft contribute ~3% of the global CO₂ emissions.

Rolls Royce has converted a conventional fossil-fuel aircraft engine into a green-hydrogen fueled engine for European short-haul air carrier EasyJet. Rolls Royce has been electrifying its products and is on a path to decarbonize on its path towards zero carbon. This prototype engine increases the possibilities for expanded hydrogen fuel options.

Weather events as impetus

The recent perplexities in global weather patterns give rise to new levels of uncertainty. Record rainfalls in some areas with debilitating droughts in other areas is creating unprecedented risks for food supplies and fresh water. Increasing temperatures threatening glacial ice packs and growing seasons for crops are definitely going to impact business operations and societies at large. Insurance companies are bracing for massive financial exposures which will need to be factored into the cost of most goods. Inflation will be incurred across the board as weather events are equally disruptive to all organizations. The circular economy will require a rethink of energy and land use. How food, water, and people will be sustained for a healthy lifestyle has still not been answered.

The 2011 tsunami in Japan disrupted Honda's production capacity for months. With ~20,000 parts in a vehicle, the odds of a few parts not being available was considerable. Japanese parts manufacturers which went down due to the tsunami, also affected other vehicle manufacturers which sourced similar parts. In 2011, floods in Thailand caused Ford to shut down production in this profitable market, which in turn, caused chip maker Intel, to reduce its revenue projections. Ford's supply chain reportedly involves 35 billion parts!

Within a couple years, Ford analyzed the potential impact on its production by categorizing the risks of parts availability. Ford identified about 10% of their North American sites were vulnerable to disruption. Long story short, they looked at multiple sources and redesigning parts to avoid the risks of disruption. They bet on resiliency for availability of parts rather than the lowest price.

Rainfall in most urban areas is seen as a problem. The excess water is collected in storm drains and diverted back to the ocean, streams, or lakes as quickly as possible. This flushes a lot of surface contaminants into the water supply. Rethinking the rainfall problem could lead to diverting and temporary storage for drier periods or finding other uses for the non-potable water.

A 2020 survey from the Institute of Supply Management reported that 95% of businesses had experienced operational disruptions due to their supply chain problems impacted by COVID. Other factors in addition to weather-related events which can create havoc, are geo/political events, international trade conflicts and changing consumer preferences.

Consolidation of suppliers to attain more competitive pricing can be undone by one supplier's inability to deliver on time. Having a contingency plan for business disruption will encourage near shoring of suppliers with technology being a key enabler. The United Nations uses the acronym, *ALAN*. As local as possible, as international as necessary.

Critical metals

A common denominator in every sector is the severe shortages of critical metals to meet the demand in chips for electronics. The circular economy can provide part of the solution. Canadian-based Li-Cycle Holdings Corp has innovative technology to extract metals from e-waste. Traditionally e-waste has been burned which emits noxious fluorine chemicals and is every inefficient. Li-Cycle shreds tonnes of e-waste in a water-solution which eliminates emissions and recovers 95% of the critical materials vs ~50% through the burning method.

Recovering critical metals is much cheaper than mining raw materials. Li-Cycle estimate that 75% of EV batteries could be provided by recycling old end-of-life batteries. With global shortages of nickel, lithium, and cobalt across the globe, the circular economy is rethinking how we get the materials we need.

Li-Cycle, while not fully operational, will create jobs to produce the *black mass* used as the main component in electric vehicle batteries. Other companies which are mining e-waste are Redwood Materials, BASF (Germany) and Electra Battery Materials Corp. This will divert millions of tonnes of e-waste from going to landfills and be a source of production materials³. Potentially providing ~15% of the requisite battery materials by 2025, per investment analysts.

The recycling and recovery of critical metals will require a substantial, networked collection system using a hub and spoke model, as per Li-Cycle's co-founder Tim Johnston. The circular economy effectively reduces consumption and supports conservation practices. Robotics will play a large role in the recovery of critical metals and other materials as outlined in the section on Digitalization and the Circular Economy which follows.

In 2023, Ascend Elements out of Massachusetts, entered into an agreement with US Honda Motor Co, Ltd. to process recovered lithium-ion battery materials for new EV batteries. Ascend refer to this as a *closed-loop* process which will include other critical materials such as cobalt and nickel.

Canada is the only country in the Western Hemisphere with all of the minerals and metals required to product EV batteries. Canada is in a good trade position for socio and geopolitical interests. The investment opportunities to develop this market will attract leading mining and manufacturing companies. The precarious relationships with Russia and China, which both have considerable critical and rare mineral resources, and other democracies, will require diplomacy to ensure global supplies. Canada ordered (3) Chinese mining companies operating in Canada, to divest of their investments in critical materials, citing national security, in late 2022.

This is in contrast to the Canada allowing Chinese state-owned Zijin Mining Group to acquire Canadian lithium mining company Neo Lithium Corp in early 2022 for \$960M. At present Canada has minimal refining processes for critical battery minerals and the environmental approval process for a new mine can take 5-10 years. The James Bay Lithium Mine project was approved in early 2023, with 270+ conditions, after a 5-year environmental impact study and is expected to open in 2025. The only active lithium mine in Canada as of February 2023 is the Chinese owned Sinomine Resource Group in Northern Manitoba and the lithium ore is refined in China.

It would not be out of the question to see cartels for rare and critical minerals being formed as OPEC leveraged its fortuitous role in the oil market. The transition away from fossil fuels to other energy options needs economic strategies and policies to make it sustainable.

The US government stepped up to the plate with its October 2022 announcement of US \$2.8 B in grants

³ Li-Cycle leapfrogs miners in green transition. Gabriel Friedman. Financial Post. April 30, 2022

to expand its domestic production of EV batteries. Concurrently, announcing the American Battery Materials Initiative to secure reliable supplies of critical materials and not be dependent upon imports. China has been a major supplier of EV batteries and critical materials which were supplied under “unfair subsidies and trade practices” according to US government sources.

Digitalization and the Circular Economy⁴

Knowing about digital technology and the need to transform business is no longer good enough. As companies across all industries embrace the changes of our increasingly digital work, we are seeing leaders at the helm of these companies dive deeper into how technology is being implemented.

For the organization to succeed as a Digital Enterprise it has to transform itself to meet the challenges of our post-industrial Digital Age, by embracing an adaptive culture, employing technology at its core, and creating new business models.

Employing technology at the core of the business is called Tech@Core. Determining whether the organization is Tech@Core requires an assessment and positive yes on the following aspects:

- Leaders understand the critical nature of tech to their business and are increasingly technology savvy
- Leaders depend on technology to create innovative customer journeys
- Customer value replaces cost as primary performance measure
- Speed and ability replace cost and efficiency as technology drivers
- Technology knowledge and experience are continuously evolving
- Leaders promote fast, frequent experimentation and learning, while maintaining the discipline to select and evaluate the right experiments
- Reducing cycle time maximizes the value from learning

To strengthen the organization’s technology capabilities, the following steps could be taken:

- Shift the technology fitness function to speed and adaptability
- Accelerate technology edge over competitors
- Maintain awareness and take advantage of technology shifts and trends
- Develop and maintain a digital technology platform strategy
- Reduce technical debt to increase speed and adaptability
- Get key technology staff involved and constantly improve their capability

Organizations with successful digital transformation will likely use more sophisticated technologies such as artificial intelligence, the Internet of Things, and advanced neural machine-learning techniques.

For organizations to generate a technology shift and follow or lead trends, information and intelligence regarding the following six guiding principles must be gathered, analyzed, and formulated:

1. Signals: What are you seeing that is indicative of this shift?
2. Business input: How might this shift impact your business?
3. Horizon: What is the time horizon for the trends within the shift?
4. Urgency: How urgently do you need to react to the trend?

⁴ A special thanks to **Andries Jacobs** Ph.D, [M.Com](#), CMC Controls Assurance and Systems Transformation. PDO Solutions Ltd. for the digitalization notes

5. Technical impact: What capabilities will you need to implement your strategies?
6. Actionable advice: What advice will you offer your organization on how to approach and use the shifts and trends?

The organization's capability to adapt to value driven digital transformation practices, based on an understanding of the six guiding principles, will be critical to success.

What is digital transformation?

Rather than thinking about digital transformation as a trend with a clearly defined beginning and end, think of it instead as a series of waves in the ocean, each of which makes an impact before giving way to the next one. But, as is always the case, as one wave crests others form behind it. And even though many of us are still adjusting to the changes brought by its predecessor, the next wave of digital transformation is already upon us.

To ride the individual waves and take advantage of the extraordinary productivity growth each wave brings, and understanding of the technology makeup of the wave.

- First wave – Digitalization: Arise from adoption of personal computers, use of mainframe and mini-computers, desktop publishing, communication applications, and computer-aided design.
- Second Wave - The internet: Arise from US military network (ARPANET), National Science Foundation Network as internet backbone (NSFNET) linking of emerging internet services (ISP), Hypertext transfer protocol (HTTP), world-wide web (WWW), and Internet (commercialization of NSFNET).
- Third Wave – Digital transformation: Known as the Fourth Industrial Revolution, or the Second Machine Age. Arise from the intersection of cloud computing, big data, Internet of Things, Artificial Intelligence, across the market.

To date, the current wave, also known as the third wave, is profoundly more disruptive than what happened in waves one and two. The third Wave or Digital transformation wave comprises the following technologies:

- Cloud computing: As a model of accessing shared pools of configurable hardware and software resources, that can be rapidly positioned with minimal management effort via the internet.
- Big data: Big data is critical important for training Artificial Intelligence (AI) algorithms. Digital transformation initiatives require the capability to manage data at petabyte scale.
- Internet of Things (IoT): Connecting any device equipped with adequate processing and communication capabilities to the internet for sending and receiving data.
- Artificial Intelligence: The science and engineering of making intelligent machines and computer programs capable of learning and problem solving in way that normally require human intelligence. With machine learning as a subset of AI learning from example and experience, rather than depending on pre-coded or pre-defined rules that characterize traditional algorithms.

As digital transformation is a disruptive force, it has rapidly become a household name and the focus of the corporate world. Business leaders who focus on digital transformation understand that to survive, their organization will have to go through fundamental change.

AI as universal engine of execution

Within the Third Wave AI is the most advanced and disruptive. As digital technology increasingly shapes "what we do" and enables a rapidly growing number of tasks and processes. AI is becoming the new

operational foundation of the business, the core of the company's operating model, defining how the company drives the execution of tasks. AI is not only displacing human activity; it is changing the very concept of the organization.

We have to be clear in understanding AI is not a standalone technology, rather the *science of making inanimate objects smart*. AI helps to solve problems through performing tasks which involve skills such as pattern recognition, prediction, optimization, and recommendation generation, based on data from videos, images, audio, numerics, text and more.

The value of an organization is shaped by its business and operating models. The business model encompasses the strategy of the organization: how it seeks to differentiate itself from competitors by providing and monetizing its unique set of goods and services. The operating model encompasses the systems, processes, and capabilities that enable the delivery of goods and services to the organization's customers.

The operating model delivers the value promised to customers. Whereas the business model creates a goal for value creation and capture, the operating model is the plan to fulfill the goal. As such the operating model is critical in shaping the actual value of the organization. Ultimately the goal of the operating model is to deliver value of scale, to achieve sufficient scope, and to respond to change by engaging in sufficient learning.

Managing scale is about designing an operating model to deliver as much value to as many customers as possible at the lowest cost. Improving scale involves efficiently increasing the production volume or the number of customers served.

The organization's scope is defined as the range of activities it performs. Economics of scope is an important enabler to establish multiple lines of business, manage multiple business units and create true conglomerates. AI could be used as an enabler to increase or optimize the variety of products and services the organization offers to its customers. AI driven assets and capabilities can help the organization reach economics across diverse business.

The learning function of an AI driven operating model is driving the continuous improvement, increasing operating performance over time, and developing new products and services.

AI and the circular economy

The circular economy refers to all the efforts in seeking a systematic and scientific method to transform the traditional "take-make-waste" one way flow of resources to a circular based approach. It is not simply about recycling, but also rebuilding the environment that we have disrupted, as well as trying to design a new system such that the externalities we exert on the environment as we produce and consume are mitigated.

Let's have a look how organizations are using AI achieving their Circular Economy targets.

ZenRobotics⁵, founded in 2007 was the first company to leverage AI and robotics in a demanding waste processing environment. The company used AI and robotics to recover recyclables from waste. Robotics adopt as a technology allows greater flexibility in waste sorting, enabling operators to react quickly to changes in a waste stream and increasing the rate of recovery and purity of secondary materials. Using AI, the waste is monitored by cameras and sensors. The robots make autonomous decisions on which objects to pick, separating the waste fractions quickly with high precision.

⁵ <https://zenrobotics.com/>

Tomra⁶ is renowned for developing the world's first high-capacity near infrared (NIR) sensor for waste sorting applications. The organization creates solutions for optimal resource productivity. They designed an algorithm that can analyze images to identify non-uniform produce that does not sell in grocery. It can arrange goods into grades so it can be put to best use, thus reducing waste.

NotCo⁷ developed a robust process by using AI algorithms to originate plant-based foods that replace meat, fish, dairy and egg-based products. A similar approach is being taken by New Age Meats⁸, which uses AI to model and optimize the conditions for producing lab-grown meat. The machine learning algorithm identifies new plant-based foods and compiles food formulas by detecting patterns at a molecular level and analyzing flavour molecules.

Conclusion of digitalization and the circular economy

With the advancement of AI and the real possibilities it can offer us, there is no doubt that it will be a very great asset for helping us to achieve a truly circular economy. The endless data solutions that are relevant across all industries can enable us to see the fruition of our circular economy ideals become a reality in a much faster period of time.

As more industries realize the importance of changing from a linear economy to a circular one, it is hoped that further development in this field will persuade these industries that not only does it make moral sense but also an economic revenue growing sense, to embrace the change. Here is to hoping that AI will be the solution to building a cleaner, less wasteful and successful new world.

⁶ <https://www.tomra.com/en/about-us>

⁷ <https://notco.com/us/products/notmilk>

⁸ <https://newagemeats.com/>

Actions to advance the ESG agenda

Advocating actions are best and easier where there are formal policies in place. However, many organizations do not have corporate policies and are still able to affect changes which consider ESG values. Exercising one's professional fortitude is always an expected form of behaviour and we don't need a policy to state that-it's implicit. Realizing value for money is implicit. Doing good is implicit.

Actions speak louder than words. Actions motivate others to take up like challenges. It's a great idea if there is not a lot of experience to start with small steps-but start! Going out and making a difference builds self-esteem, confidence, and is fulfilling from a personal and professional perspective.

Regardless, we can always do more within our respective spheres of influence. If you haven't yet, consider:

1. Advocate to senior management on raising the ESG profile
2. Talk with key suppliers as to their transition plans for ESG success
3. Keep key stakeholders informed
4. Support buying local for economic development and increased social opportunities
5. Work with social enterprises in terms of hiring individuals and buying goods
6. Engage with not-for-profit organizations to increase their capacity and your awareness
7. Volunteer your managerial expertise or time
8. Encourage volunteerism by staff
9. Allocate a % of your requirements to ensure local assurance of supplies
10. Buy Fair Trade certified products to complement sourcing requirements
11. Review your product commodities and identify where resource conservation could apply
12. Ensure responsible recycling of used goods
13. Get involved at the design stage of products to identify responsible options
14. Consider living wage programs
15. For larger organizations and public sector groups, look at unbundling large contracts to increase opportunities for SMEs and SEs
16. Measure your Scope 1 and 2 emissions and look for reductions
17. Work with suppliers to reduce Scope 3 emissions
18. Ensure your supply chain has conflict free materials
19. Revise job descriptions to include ESG responsibility
20. Assess how to deconstruct vs demolition of buildings and structures for replacement or removal
21. Encourage staff to display international flags which represent their diversity
22. Host local food days to showcase suppliers
23. Organize clothing donations and cover shipping costs
24. Host events which showcase ethnicity and diversity of cultures
25. Share information across multiple networks
26. Eliminate waste through design and practices
27. Weight the total cost of ownership when decision-making
28. Ensure policies reflect stakeholder interests and practices follow accordingly
29. Adopt a supplier code of conduct
30. Ensure business ethics are meeting or exceeding expectations
31. Develop KPIs and report out
32. Support community gardens
33. Install a vermiculture container for waste foods
34. Hire co-op students

35. Consider gift matching by company with employee causes
36. Reimburse staff for taking public transit
37. Denounce discrimination and harassment
38. Support products which align with the circular economy principles
39. Use P-cards to support local businesses
40. Think beyond the lowest cost
41. Affect and accept professional responsibility
42. Challenge the status quo in practices
43. Offset GHGs from corporate travel
44. Support local artisans when buying corporate schwag
45. Share best practices with suppliers
46. Implement a decarbonization strategy
47. Take actions within your sphere of influence
48. Be a discerning consumer
49. Be a responsible customer
50. Build a leading ESG organization
51. Hire Larry!

Coda comments

Rationale

Environmental, social and governance practices are a means to demonstrate a commitment to do good for all stakeholders, which includes the natural ecosystem. We will continue to extract resources to sustain our lives but we know we can do so in a more responsible manner. Business operations can be sustainable and profitable without doing harm. To continue supply chain operations which knowingly are not aligned with internationally recognized standards is willful blindness. Willful blindness is a conscious decision to avoid acting responsibly as it conflicts with one's self-interests where the end cannot be justified by the means.

The need for due diligence in business investments will continue to challenge business and government leaders. Infrastructure improvements in all transportation modes is a basic requirement to sustain competitiveness as a country. Technology will play a larger role in business solutions aimed at efficiency gains. There is as much risk with inaction as there is in a risk of a poor investment.

Sustaining success in business has moved beyond simply making profits. Stakeholder capitalism wants to know how those profits are being achieved. A combination of environmental, economic and social values is required to provide a balanced solution. The ratio between these three elements will change as conditions and practices are revised through technical advances and as stakeholder expectations are raised.

Circular economy

Repurposing resources through design innovations allows us to save existing resources and materials and support continued economic activities. This foray into the circular economy encourages and requires many sectors to rethink how they are going to function in the years ahead. Appropriate compromises need to be made as society cannot continue to absorb tonnes of waste materials, which are increasing year-over-year.

The fate of paper bottles may land in the reluctance of consumers to change their buying habits from what they know. Until there are E-vehicles which are more affordable, due to technical advancements, subsidies may continue for the foreseeable future. The ban on the manufacture and import of many plastic products required legislation as the industry stuck with the status quo due to the fear of increased costs. More investments in circular economy designs of products may require some type of legislation to make them viable where there is a good scientific case for long-term economic, social and environmental benefits. Legal challenges to legislated requirements, such as the ban on plastics, should be expected in a democracy. Moral responsibility requires legitimacy to be enforceable.

The data from various studies showing a net increase in employment may help to alleviate the fear of large job losses in the transition to the circular economy. There will be asymmetrical shifts based on market sectors, technology, and how each are affected by the circular economy. Supply chains will need to prepare and adapt in order to remain economically viable and socially responsible.

The positivity related to the outcomes by leading companies which have adopted the circular economy principles and practices, should encourage and embolden other organizations to do so. When we can realize savings in energy, resources, labour, and offset the impact to climate change, we are on the right track.

Energy

Energy and fuel alternatives must continue to be developed in scalable formats to make meaningful reductions in GHGs. Scientists reiterate the criticality of the 2030 reduction target of 1.5° C to achieve

the mean global average temperature of 13.6° C. This will approximate the period of 1850-1890, being the preindustrial period benchmark, as agreed in the 2015 Paris Climate Agreement. Different geographical locations will need to find which type of energy is affordable for their needs as compared to other countries.

Electricity will compete with hydrogen fuels in some sectors. Renewable energies will be multifaceted. It will take decades, and is highly improbable that a single renewable energy source will dominate all sectors. Much as today where fossil fuels dominate the commercial, industrial and transportation sectors alongside other forms of energy.

Environment

The environment is quite literally a global problem and will require collaboration between international players on where priorities should be focused. One of the root causes to environmental problems is the design of products. We will transition to a circular economy which will have at its centre, a reduction in consumption of materials and resource conservation.

The environment has been on our radar for 50-years and we have only recently realized how ineffective our tactics have been to mitigate our collective impact. The clock is ticking and more urgency is necessary to address our common problems.

Technology

Continuing to allow people to starve is not acceptable nor a choice. Digitalization enables the transformation from an economy based on massive consumption to one based on strategic conservation of resources. Supply chain resilience will embrace technical advancements to solve logistical problems. Electrification and decarbonization will require massive investments for scalable solutions. As the example of Maersk and IBM's partnership with TradeLens failed due to a lack of uptake in the shipping sector, this reiterates the need that any solutions must meet the interests of at least a mass of customers which makes commercialization viable.

Disruptive technologies will continue changing how we do business and how we move goods for resilient sourcing in an economy framed around circularity. As new pharmaceutical products may be discovered in our oceans, it will create debates as to who benefits from these breakthroughs. Sharing of land resources has largely been determined by the companies that buy the rights to control. Agreements, such as the UN Convention on the Law of the Sea, are causing a pause and reflection as to how to manage the wealth of the oceans, where there are few sovereign rights. Developing countries will want an equitable share or access to these relatively new resources.

Role of government

Governments come in three forms: Federal, Provincial, and Municipal. Other governmental entities are Crown corporations, Universities, Schools, and Hospitals. In a democracy we are open to new politicians every few years to try and get the correct monetary and fiscal policies in place. The elected official uncertainty contributes to a reluctance on the part of private sector businesses to respond to the various edicts and legislation, as their shelf life is often tied to a political ideology. Each variation of a government entity will have its own procurement policy and practice. While ideas may be shared, they often are buying the same goods and services, from the same suppliers, under separate contracts. In the smaller communities and towns, government spending has minimal oversight and is influenced directly by its local elected officials.

Carbon taxes or some form of internalizing the cost of decarbonization will require fiscal policies by many governments to address inequities in geopolitical locales. If country A offers a lower taxation rate than country B, it will attract some producers who intentionally avoid the carbon taxes. Transparency of operations and the provenance of goods will require a robust monitoring and auditing process.

Transparency is a critical component of the governance commitments. Carbon tax revenues must be used by governments to address climate problems and not be used for other purposes or risk the charge of a lack of credibility.

It would appear that legislation, based on scientific research, is the best means to affect the requisite change. Industry is not capable of voluntarily reducing emissions and consumptions without governmental intervention. Consumers are at the receiving end of the problem and it is at the source which needs to be corrected for designs, materials, production, health, and economic sustainability. Government intervention was required to shift to LED bulbs from incandescent. E-vehicles require substantial tax breaks to encourage more people to buy them and build an affordable market.

The social procurement strategies deployed by governmental agencies at all levels must continue and be amplified. It is working to create meaningful employment for people facing systemic barriers to employment. This group of people represent the disenfranchised in our communities. When they are engaged in work the studies show that there is a drop in crime, improved physical and mental health, less dependency on social programs, improved self-esteem, increased local spending, and reduced shelter costs. Social procurement does NOT cost government agencies more to train and hire these individuals. It's a win-win for all parties.

Role of consumers

Consumers are customers, stakeholders, taxpayers, voters, and represent a significant portion of the demand side. Changing behaviours and habits will take science, education, and tradeoffs with health, convenience, and costs. Inflation costs will dictate priorities for family choices. Buying an EV may be put off for an ICE due to cost. Fast foods may address the convenience factor but not the long-term health issues. Vinyl siding on a house rather than wood may be faster for the builder and reduce construction costs to the owner but eventually the vinyl will fail. Buying plastic products is largely driven by an implication that disposable products can be fully recycled, which we now know is not entirely true. The unseen microplastics have contaminated every region on the planet. The collective conscience of consumer choices chafes against the collective self-interests of many sellers. The circular economy will assist through the initial design of items but may take further legislation for force change and alter consumptive habits.

The marketing strategies of all goods including foods to consumers must reset the balance between the need for sales, health, and consumption of resources. The production and distribution contribute to environmental problems while the actual health or safety of the consumer is sometimes an afterthought. Our look at packaging is the tip of the iceberg. We have to have continuous governmental interventions to assure the wellness of the consumers, fish, animals, poultry, and plants are respected.

Consumers are facing increasing affordability barriers in Canada. With increases in carbon and property taxes, rising governmental service costs, recycling fees, energy and fuel taxes, along with inflation due to shortages of supplies, it is becoming more difficult to support long-term ESG decisions. While many favour the promising ESG solutions to address global warming and related issues, in the short-term, all programs are paid for by the same consumer through consumption taxes in some form. Affordability limitations are a real concern as to how far and how fast ESG practices can be rolled out.

Role of private sector

Innovation on all fronts leads to the advancement of ESG goals. It will be an asymmetrical transition as some sectors will be able to adapt to new technologies while others will be on an exit trajectory. The EV boom aligns with circular economy goals but requires substantial investment in infrastructure to make these vehicles a viable option. Charging stations in cities and rural areas must prepare for the pending demand or it will constrain the growth.

Concurrent is the transition from the fossil fuel based economic development and dependency to a decarbonized transportation structure. The use of zero emission (ZE) vehicles in all sectors are going to be advanced by continued investment in proven technologies. While vehicles currently are reliant on fossil-fuels, ZE vehicles will be successful with significant reduction in battery weight and costs; operational constraints must overcome the recharging times and limited travel distance; and infrastructure availability for the various green fuels and adequate and charging and refueling grid. All of these combined need to address commercial and economic viability.

The transition to electric cars for commuters faces similar challenges to get the masses out of traditional ICE vehicles and address the affordability gap. Increased government legislation and use of taxes as an incentive will support the transition.

The lack of governance as to the claims of misuse of carbon offsets to reduce GHGs and improve the air quality is a concern. This does not mean that VCM programs are all part of a scam but it does rightfully challenge any statements being made as to their credibility and value to address global warming. The cloud of doubt will hang over the billion-dollar VCM market for some time.

Food security and fresh water should remain a top priority to protect. Without these we will not have a sustainable anything. The circular economy is addressing these issues but will require a rethinking of our food production processes throughout the supply chain.

Supply chain responsibilities

The anchoring effect of the status quo is difficult to overcome. New ideas invite risk. New ideas threaten existing products and services. New ideas imply that what we are doing may be wrong. Disruptive technologies can turn a business or sector on its head. But supply chain professionals need to be vigilant and be able to see around the corner at the next best thing. Keeping on top of the best and leading practices is a serious issue to remain competitive or relevant.

Policies are the starting point for adopting ESG practices. The governance which follows requires developing KPIs to be measured and monitored. Without good data analysis you are simply guessing or maintaining the status quo of “we’ve always done it this way.” Don’t be afraid to be humbled when inviting external advisors with expertise to complement internal resources. KPIs are primarily for the organizations’ external stakeholder’s information and internally to assess managerial progress and competencies. If it can be measured, it can be managed better.

While the cost of goods sold has been weighted on the lowest cost, having a resilient supply chain needs to have a balance between price, delivery, quality and service. Customer retention can be affected by availability of goods and the ease of ordering. Packaging is an important part of the customer interaction and we know it has an environmental impact. The last mile of distribution will likely remain the highest cost but will also be reduced from today’s cost factor of delivery as improvements in systems and materials are adopted.

When we consider the loss of small, medium businesses and social enterprises to large big-box operations, there could be a case made to strategize for localized commitments. Larger organizations could scan for locally based companies to draw goods and services from, especially around discretionary spending practices. Corporate swag, artwork, cultural events, catering, subtrades, hiring people with employment barriers, or the inclusion of endemic materials in designs. Participation in recycling programs and being part of the reverse logistics cycles demonstrates that ESG can take many types of benefits, without adding significant costs.

Supply chains are immersed in every organization’s environmental and social footprint. Yet, a 2023 study by Efficio, a global supply chain consultancy, recaps that 93% of C-suites target revenues and profit maximization. This compares to 66% on net-zero plans and 71% on social impact. For supply chain

professionals, 2/3 continue to assess financial strength and service capacity of their suppliers, with less than 1/3 looking at ethics and governance issues. About ½ of the supply chain decision-makers say that incentives do not include climate-related priorities. These self-limiting governance gaps impede the ESG agenda.

Outsourcing to 3PLs is a viable option for many companies which try to stay vertically integrated but cannot maintain the investment in all of their existing business operations. Finding the right 3PL partner allows companies to focus on their core business services.

Public sector procurement organizations act as the conduit between government policies and the market and bear the responsibility to operationalize legislation. Their main tools are the competitive bidding and tendering documents which state the criteria and weighting. These documents must clearly send the message that ESG is the means to affect change in value.

Cryptocurrencies may be embraced in supply chains as more organizations and Canadian banking institutions gain comfort with their credibility. The increased efficiencies and transparency with reduced transactional costs are too big to ignore. The business ethics and trust with cryptocurrencies now needs more attention than the technology behind it.

Leadership

Business ethics and conduct needs a rethink. Every industry has had its bad actors. Tolerance of tactless personal behaviours such as misogyny, LGBTQ+ discrimination, racial bias, workplace harassment, intimidation, and bullying are being recognized as qualities which deter from real leadership. Effective business leaders ensure the well-being of others and the importance of governance to drive results. Implementing DEI strategies into an organization and within its supplier base curbs this atrocious behaviour. ESG strategies are part of good corporate values contributing to healthy communities. Issues such as greenwashing and bluewashing are a detriment to advancing the gravitas of ESG.

Leaders are in a tough position as we transition out of a carbon-based economy into a circular economy. There are going to be winners and losers. The investment opportunities invite risks with high rewards but also threaten the very existence of long-time companies in many industries. Leaders are going to face tougher questions from their Boards, Councils, and international partners as to how they will sustain their position or exit with dignity.

Paulus Polman stated in a 2022 Fortune article, following the COP27 climate talks, *there's no need to feel hopeless—but we must recognize that our politics is failing to deliver vital climate action. We must find other ways to close the ambition gap, get the money moving, get business driving urgent coalitions, and make sure young people are firmly in the driving seat. Then, it will be up to politics to catch up.*

Charles C. Mann, in his book *The Wizard and the Prophet*, captures the debates between technology and science as being the problem for the planet or the savior. Production and profitability are compatible with sustainable growth through the options presented in the circular economy. It takes awareness, which leads to advocacy, and most of all, actions.

My motivation for this publication was to encourage supply chain professionals and other leaders to exercise their professional fortitude. Take the risks as necessary. Break some rules. Colour outside the lines. As my colleague Maureen Sullivan says, *choose courage over comfort*. Perfection is not the goal and learning from failure is healthy for all.

Do what you can, within your sphere of influence, to make the most responsible decisions.

About the Author

Larry Berglund's supply chain experience includes leadership positions in the forest industry, public health care, municipal government, university operations, academia, and consulting services. As a consultant he drafts procurement policies, templates, develops strategies, conducts audits and implements best and leading practices.

He facilitates online and classroom workshops on buying, business ethics, circular economy, competitive bidding, contract management, inventory management, leadership, risk management, social procurement, operations management, supplier performance evaluations, performance metrics, and supply chain policies and strategies. He provides on-site supply chain operational reviews.

Larry is an academic coach for supply chain courses in the Athabasca University Leadership & Management Development program, including environmental responsibility. He was the procurement advisor to the Auditor General for Local Government (BC). In 2017, 2018 and 2019 Larry presented on advanced supply chain strategies to the United Nations staff in Brindisi, Italy. He was a founding member and the procurement advisor to the BC Social Procurement Initiative. Larry also facilitates supply chain training workshops for The Procurement School. In 2020, he presented to the World Bank in Washington, DC on social procurement strategies and contributed to a World Bank research paper in 2021. He has developed supply chain and ESG courses for the University of Alberta.

He is a contributing writer to Supply Professional magazine. Larry has written several books on supply chain management:

- Food, Finance, and Philosophy;
- Good Planets Are Hard to Buy;
- Plan It for Our Planet; and
- It's the People, Not the Paper.

Larry holds an MBA, an SCMP and is a Fellow of Supply Chain Canada. He is an inductee to the Athabasca University, Faculty of Business, MBA Hall of Fame. In 2021 he received an Honourary Life Membership from the Supply Chain Canada, BC Institute.

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Abbreviations and Acronyms

7R Model	7 Principles of the Circular Economy
A4S	Accounting for Sustainability
AESS	Automatic Engine Shut-Down/Start-Up Systems
AI	Artificial intelligence
ALAN	As local as possible, as international as necessary
AMR	Autonomous mobile robots
API	Application Programming Interface
APU/GS	Auxiliary Power Units and Generator Sets
ASC	Aquaculture Seafood Council
BEV	Battery electric vehicle
BLE	Bluetooth Low Energy
BOL	Bills of lading
BOMA	Building Owners and Managers Association
Bots	Software that operates and performs repetitive tasks
CAFO	Confined Animal Feeding Operation
CAMSC	Canadian Aboriginal and Minority Supply Council
CCAB	Canadian Council for Aboriginal Business
CCC	Community Contribution Company
CCUS	Carbon capture, utilization and storage technology
CDC	Center for Disease Control
CEPA	Canadian Environmental Protection Act
CFC	Chlorofluorocarbon
CGBC	Canada Green Building Council
CHBA	Canadian Home Builders Association
CME	Canadian Manufacturers and Exporters
CNG	Compressed natural gas
CORE	Canadian Ombudsman for Responsible Enterprise
CoRo	Cargo recognition
CWC	Canadian Wood Council
DaaS	Delivery-as-a-service
DACS	Direct air capture and storage
DEI	Diversity, Equity, Inclusivity
DRC	Democratic Republic of the Congo
DRI/EAF	Direct reduced iron/electric arc furnace
ELD	Electronic logging devices
EPU	Electric propulsion unit
EPZ	Export Processing Zones
EV	Electric vehicle
eVTOL	Electric vertical takeoff and landing
FADR	First attempt delivery rate
FMEA	Failure Mode Effect Analysis
FOHakaDFH	Fuel Operated Heaters aka Direct Fired Heaters
GFANZ	Glasgow Financial Alliance for Net Zero

GHG	Greenhouse gas
GLEC	Global Logistics Emissions Council
GRI	Global Reporting Initiative
HFC	Hydrofluorocarbon
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
ICE	Internal combustion engine
IFBA	International Food Brands Alliance
ILO	International Labour Organization
IoT	Internet of Things
IRENA	International Renewable Energy Agency
ISO	International Standards Organization
JIT	Just in time
KPI	Key Performance Indicator
LDES	Long-duration energy storage
LEED	Leadership in Energy and Environmental Design
LNG	Liquid natural gas
LIDAR	Light detection and ranging
LTL	Less than truck load
LWD	Logistics, warehousing, and distribution
Maglev	Magnetic levitation
MFC	Micro fulfillment centres
MNC	Multi-national corporation
NGO	Non-Governmental Organization
OECD	Organization for Economic Co-Operation and Development
OMS	Order Management System
OTIF	On time, in full
PARS	Pre-Arrival Review Systems
PEF	Polyethylene furanoate
PERC	Perchloroethylene
PESTEL	Political, economic, social, technical, environmental, legal
PFAS	Perfluoroalkyl substances
PHEV	Plug-in hybrid electric vehicle
PLA	Polylactic acid
PoD	Proof of delivery
PSI	Principles for Sustainable Insurance
PVC	Polyvinyl chloride
QR	Quick Response
RaaS	Robotics as a service
RFID	Radio frequency identification
RNG	Renewable natural gas
RTTV	Real time transportation visibility
SaaS	Software-as-a-service
SAF	Sustainable aviation fuel
SASB	Sustainability Accounting Standards Board
SBTi	Science Based Targets initiative

Scope 1 emissions	Directly from organization-owned resources
Scope 2 emissions	Caused by producing energy for an organization
Scope 3 emissions	Indirectly produced by supplier operations
SCS	Shore connection system
SDG	Sustainable development goals
SE	Social enterprise
SFI	Sustainable Forestry Initiative
SKU	Stock keeping unit
SLAM	Simultaneous localization and mapping algorithm
SME	Small, medium enterprise
SMR	Small modular reactor
SRHBA	Saskatoon & Region Home Builders' Association
SROI	Social Return on Investment
STEM	Science, Technology, Engineering, Mathematics
tCO ₂ e	Tonnes of CO ₂ emissions
TCFD	Task Force on Climate-related Financial Disclosures
TES	Thermal Energy Storage
UNDRIP	UN Declaration on the Rights of Indigenous Peoples
UNGC	UN Global Compact Network Canada
UWB	Ultrawide band
VABE	Values, Assumptions, Beliefs, Expectations
VCM	Voluntary Carbon Market
VUCA	Volatile, Uncertain, Complex, Ambiguous
WEIRD	Western, Educated, Industrialized, Rich, and Democratic
WMS	Warehouse Management System
WRAP	Worldwide Responsible Accredited Production
WTFC	Women's Trucking Federation of Canada
ZE	Zero emission

SENIOR MANAGEMENT REFLECTION ON ESG STATUS

Date _____

The set of questions below, are intended to create an in-house dialogue on what your organization is doing to demonstrate its commitments to ESG values in practice. This includes a scan of its upstream and downstream supply chain partners; the awareness of senior management on the importance of ESG to be part of the organizational commitments to the communities, customers, and clients it serves; the organization's ability to stay current with emerging ESG issues, which can affect its business, either directly or indirectly; a risk management assessment for potential liabilities for actions or inactions on ESG; the resources required to be successful in the deployment of ESG strategies; and how the organization can demonstrate leadership in the delivery of products and services in a competitive market. The questions are to prompt ideas and encourage an open debate on ESG. There isn't one model to consider, although the fundamental values are similar for all organizations to consider, prior to or having implemented ESG.

There are no right or wrong answers. The takeaways from this exercise are to provide senior management with the opportunity to bring increased value to all stakeholders and reinforce its brand, community esteem, and social impact. For public sector entities, the questions can be revised but essentially the same level of probity into ESG practices is required.

Those in attendance at this review should involve representatives from operations, finance, supply chain, sales/marketing, communications, quality management, and logistics. Bringing in external advisors or academics to share their views and provide unfiltered tenets to the discussions is healthy and necessary. Organizations which are trying to understand ESG want to get up to speed quickly and learn from the experience of other organizations.

The kickoff to this session should be provided by a senior C-Suite executive with their ideas and opinions on why or how ESG needs to be a business imperative. By having a senior executive start the session, this gives it the gravitas needed, which infers the criticality to get ESG right. This type of annual review will encourage continuous commitments to elevating ESG across the organization and to its stakeholders.

Various business analytical tools should be considered to support this objective review. Interviews with key stakeholders and interest groups should be factored into the led up to the kickoff. This would include quantitative and qualitative data to be presented or developed as an outcome.

There can be several levels of ESG experience within organizations. Some may have been involved for several years while others are still exploring ESG and wondering how to bring it inside their organization. The questions can be revised based on the maturity of the ESG strategy.

The outcomes to the questions will likely lead to other discussion threads and follow up detailed reports to validate or clarify the status of various issues. From this exercise, the senior team will need to look at priorities and timelines to develop an appropriate responsive strategy. This will undoubtedly trigger some compromises between stakeholder and organizational capacities and interests-similar to other strategic challenges.

The data gathered can be used to build a baseline to compare progress through annualized reviews. It should be expected that there will be some uncomfortable conversations and discussions. It's best to have these sensitive or open sessions within your own walls rather than reading about them in the

media.

The long-term is to ensure that the credibility and social license of the organization is deemed to be respectful and responsible. Perfection is not required nor expected. But an evidenced based approach should be conducted annually to be sure the ESG goals are actioned and on target. Supply chains are an effective means of sending signals to the market. And the market is always listening!

Questions to be discussed through the lens of ESG:

1. What market intelligence or insights have we gathered on ESG issues for our market?
2. How do our major stakeholders view ESG in the current market conditions?
3. How effective are we at adopting international 3rd party standards?
4. How do our strategies and practices align with the principles of the circular economy?
5. How do our strategies and practices align with the UN SDG goals?
6. Are our supply chain policies current with leading practices?
7. How do we monitor our suppliers for their ESG commitments?
8. How do our recruitment and retention strategies support DEI?
9. What types of ESG practices, from other leading organizations, could we apply to our practices?
10. Which natural resources are we consuming that could be conserved through changes in our design or processes or operations?
11. How do our customers deal with non-value-added costs associated with our products?
12. Which types of information, about our organization, might we be concerned with being exposed?
13. Which social enterprises are we engaged with in our supply chain operations?
14. Which community programs are we supporting?
15. How do we support small businesses in the communities we serve?
16. Where might liabilities be incurred within the next 3-5 years for our actions or inactions?
17. Which resources such as subject matter, operational, or financial investment might we need?
18. What is driving change in our industry?
19. Where can we demonstrate leadership or differentiate from others in our markets?
20. What types of reporting are we providing internally and externally?
21. What are we doing over the next year to advance our ESG commitments?
22. What if we do nothing?

Follow up actions:

UNITED NATIONS SDG SELF-ASSESSMENT

DATE _____

RATING SCALE: 1 Low...10 High

Referring to the 17 UN SD Goals, how does your organization address, include, practice, demonstrate a concern, operationalize, strategize, quantify, or report out on these factors.

These actions may be done directly or indirectly through products or services which are provided to customers; through community programs which are supported; through policies; and some may not be applicable. A consensus-based rating involving senior management and key operational and finance staff mitigates bias. If some goals are not applicable, revise the rating accordingly.

Some goals may be pending or being planned for which they can also be rated.

	GOAL	RATING	COMMENT
1	No poverty		
2	Zero hunger		
3	Good health and well-being		
4	Quality education		
5	Gender equality		
6	Clean water and sanitation		
7	Affordable and clean energy		
8	Decent work and economic growth		
9	Industry, innovation and infrastructure		
10	Reduced inequalities		
11	Sustainable cities and communities		
12	Responsible consumption and production		
13	Climate action		
14	Life below water		
15	Life on land		
16	Peace, justice and strong institutions		
17	Partnerships for the Goals		
	MAXIMUM SCORE	170	

Follow up actions for improvement:

CIRCULAR ECONOMY PRINCIPLES SELF-ASSESSMENT

In your organization, rate the ability of the materials used in the production, application, or usage of the final product, including packaging, shipping, and waste to align with the circular economy principles. If a principle is not applicable, adjust the rating accordingly.

We are using the 7R model for the purpose of relating to the principles of the circular economy to the critical design phase.

A consensus-based rating involving senior management and key operational and finance staff mitigates bias.

DATE _____

RATING SCALE: 1 Low...10 High

	PRINCIPLE	RATING	COMMENT
1	Recyclable content		
2	Repairable after use		
3	Reusable for service		
4	Repurposable for service		
5	Refurbishable after use		
6	Reduces consumption of materials, energy		
7	Rethink if it can be better		
8	Responsible with leading practices		
	MAXIMUM SCORE	80	

Follow up actions for improvement:

Total Cost of Ownership Worksheet

Calculating or estimating the TCO is not easy. While many aspects are intuitive, as we have more familiarity or history with various cost drivers and ESG factors, there are assumptions which may not be valid or hard to validate.

The cost drivers are intended as a prompt to develop a more comprehensive perspective of the TCO.

The list is not exhaustive. Using the TCO worksheet as a guide, with a cross-section of staff and other stakeholders, try to determine the as-is costs associated for the sections which apply to your needs. The sections based on type of costs are:

- A. Acquisition
- B. Installation
- C. Operational
- D. Warehousing/Inventory
- E. End of life
- F. Risks
- G. Social procurement
- H. IT specific
- I. Productivity benefits
- J. Environmental benefits
- K. Business case synopsis

At best, you will have a more accurate projected TCO. As actual experience is gained, the variables associated with each of the types of costs can be validated and used as a baseline to compare incremental changes when materials, methods, technology, policies, practices, and other business influence impact the bottom-line.

Section I refers to looking at potential productivity benefits over the useful life of the equipment, project or process being considered. This is an important part of a business plan and estimating of TCO when looking at options on technology or design over the long-term.

Cost driver	Cost Cdn \$	Notes
SECTION A		
Acquisition cost		
Contract price (rent/lease/services)		Applicable standards, 3 rd party certifications, specifications, fair trade, LEED, capital, NPV
Customs clearance		Name of agency
Insurance		In transit, liability, political risk, export credit, self-insure, FMEA
Currency rates		Hedge fees, inflation risks, futures contracts
Air freight/ocean/rail		Lead times
Courier/trucking		Intermodal, load limits
Startup costs		One-time charges, testing, acceptance

Packaging/shoring		removal
Fuel storage and delivery		Cost to install and handling equip
Amortization/depreciation rate		# of years or within its useful life
Rental purchase option		Buy-out, first right of refusal options
Testing, inspection		3 rd party, in-house
Vendor experience		Probability of success; expected monetary value
Intellectual property rights		Legal fees; registration; escrow
Training		Include for probable upgrades x the # of affected staff; operational and maintenance; remote vs on site
Opportunity costs		NPV; ROI; payback hurdle; IRR
Restrictive covenants		Non-compete period of key personnel, relocation, mutually exclusive contracts
Cost to change supplier		One-time, standardization, training, support
INCO terms		Country of origin; certificate of origin; FOB;
Economic multiplier effect		Assess local social and economic development costs; local vs MNC

SECTION B		
Installation		
Labour		In-house cost with benefits, contractor, standards, permits, inspection
Materials		Direct and indirect
Equipment rental		Daily, weekly, monthly
Transportation		Permits, inspection, demurrage
Renovations		Permits, inspections, licensing, certification, Hazmat
Hours of access		Local by-laws
Pilot vehicles		Minimum # of hours
Time frame		Late penalties; early incentives
Temporary loss of production		Rate per hour, per shift, effect on ROI

SECTION C		
Operational costs		
Energy rate of consumption by source		Gas, diesel, propane, CNG, LNG, geothermal, solar, biomass
Emissions per tonne by source		Current and projected
Consumable materials		Renewable, recyclable
Maintenance – labour, parts, materials		SLA, in-house, training, OEM, after market, tooling

Water consumption rate		Incremental change
IT support		Software maintenance, labour, in-house, contract, license costs per # of licenses
IT energy		Incremental change
Warranties		Period of coverage; rates for exceeding; covenants
Fixed costs		Investment less residual
Variable costs		Cost per unit of production

SECTION D		
Warehouse/Inventory costs		
Security		Physical, electronic
Financial carrying costs		Weighted average cost of capital
Labour		Union, non-union
Materials		Packaging, pallets, film, plastics, degradable
Equipment		Mobile, compactors, scanners
Space at current market rate per ² ft		Fixed term
Property tax		Current and projected
Insurance		Liability, fire, theft, earthquake, and restrictive covenants
3PL		Warehousing, distribution, customs
Technologies		Warehousing, logistics, last mile, drones, software apps

SECTION E		
End of life		
Disposal of parts/inventory		Write down costs based on book value
(trade-in value)		Residual value
Removal - labour		In situ
Removal - materials		In situ
Contract termination – lease/rental		Balance owing or buy out costs
Recyclable content		Segregation, sorting
Packaging		Collection, compacting
Landfill fees		Municipal, regional
Soil remediation		Cost per tonne, trucking, equipment
Decommissioning		Title transfer, liability insurance, waivers
Waste		By products for sale, salvage, asset recovery, waste

		audit
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SECTION F		
Risks		
Country of origin		Transparency International Index, political stability, provenance of labour, materials
Prototype		Certificate of destruction, learning curve
Network capability		Integrity of security
Emergency		Spare parts, service, availability, technical changes, contingency plans
Image, brand		Customer perception of value
Cost of non-performance/compliance		Correct defects, loss of market, customer defection
Technology		Competition; disruptive technology;
Contingency costs		Risk management assessment and mitigation plan
Legal counsel		Internal, 3 rd party, compliance with trade agreements, laws, and regulations
Failure Mode Effects Analysis (FMEA)		Assess level of risk impacts, costs, and early detection methods, Probability Index rating

SECTION G		
Social procurement		
Employment		Local employment, diversity of work force, # of FTE positions, temporary foreign labour, people facing barriers, social return on investment
Training		Skills upgrading, qualifications, certification, train-the-trainer programs, apprenticeships, course materials
Use of endemic materials		Replacement of imports, use of local foods, local material content, landscaping supplies
Telework		% of time, technical requirements, security, policy, practices, space reduction
Staff retention		Turnover rate
Teleconferencing		% of time, travel cost reduction, equipment, 3 rd party service provider, IT security
Wages		Incremental costs of living wage, fair wage, minimum wage, incentive programs, piece work
Change management		Time frame, training, culture
Health and safety		Base line measurement
Philanthropical issues		Sponsorships, grants, donations, gifts-in-kind, executive coaching, mentoring
Suppliers		# of SMEs, % of business with SMEs, # of social enterprises, % of business with SEs, key value indicators, Indigenous peoples, fair trade certified, target groups, ESG policy, local vs MNC, economic multiplier effect

SECTION H		
IT specific		
Hardware		Version; refresh dates;
Software		Applications and services
Licensing		Cost per license
Software code in escrow		3 rd party
Workstations		# of stations
Migration costs		# of months; penalties/bonuses
Version upgrades		# expected over contract period;
Installation		Shared responsibility; turnkey operation; NDA; go-live date
Network compatibility		Photocopier security integrity
Training		Train-the-trainer; off site or in-house
Energy		consumption
Server capacity		Data centres, location of server re: US Patriot Act
Testing		Responsibility; completion dates
Security		Ensure full levels of security
Intellectual property		NDA; patents; escrow; trademarks; copyrights
Legal advice		In-house; external
Maintenance		Turnkey; shared services;
Insurance		Performance agreement; bondable
Redundant systems		Back up; emergency
FTEs		Staffing level requirements
Interfaces		Existing; potential; costs
Performance guarantee		Uptime or minimum down time;
Service		3 rd party costs; response time; SLA
Telework		Security; accessibility
Digitalization		Opportunities

SECTION I		
Productivity benefits		Lower unit costs; increased output; improved quality; less waste; market share; reduced COGS
Expected useful life		Length of project; # of years, life of asset

SECTION J		
Environmental benefits		
Energy savings		Compared to baseline or current sources
Emission reductions		Compared to baseline or current sources
Emission offsets		Carbon tax, bona fide certification
Reduction in toxic materials		Tonnes, types, material substitution
Reduction in packaging		Tonnes, types
Reduction in waste generated		Tonnes, waste disposal bins
Reduction in travel costs		# of miles
Reduction in consumables		Incremental volume or costs
Renewable sourcing		Type of materials, content
Organic content		Certification
Cost to audit or monitor		Contracted service fees
Cost of reporting		Departmental, annual reports, personnel

SECTION K		
Business case synopsis		
Applicable taxes		
Exemptions from governmental agencies		Qualify for funding
Inflation rate		Over life of the Project or its useful life
Total cost of ownership		# of years, cost per year, cost of goods sold, cost per unit of production, cost per operational hours of service

Key Assumptions:

SWOT highlights:

PESTEL review

(Risk) FMEA Probability Index

Recommendations:
