



Opportunity and Challenge: Sustainability in Composite Materials and Processes

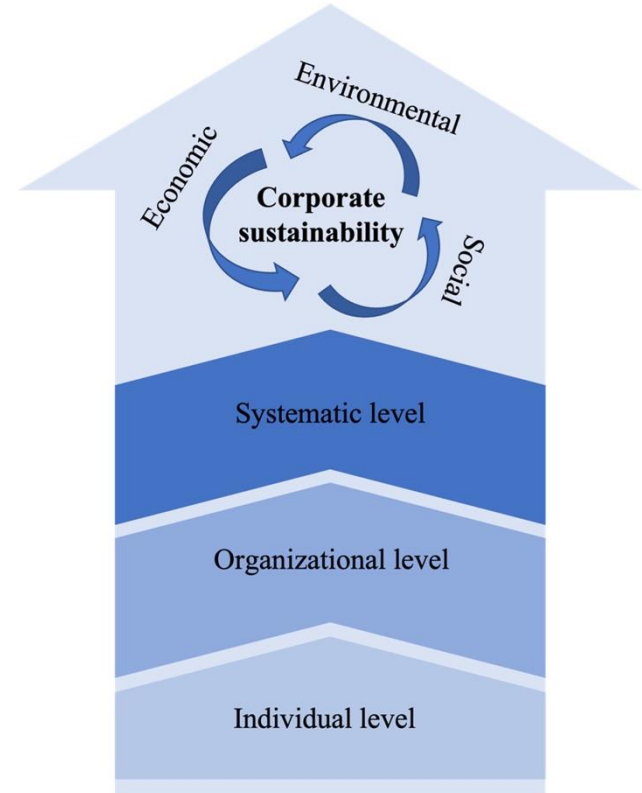
IACMI 2022 Summer Meeting
Salt Lake City, UT

Jeff Sloan
CompositesWorld
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Agenda

- **What is CompositesWorld**
- **What is sustainability, ESG, CSR, TBL, SDG**
- **How sustainability is being expressed**
- **Audience participation (!)**
- **What is driving sustainability?**
- **Sustainability in the composites industry**
- **“Do something”**
- **Q&A**



What is CompositesWorld?

- B2B trade publication that provides technical content covering the design, tooling, fabrication, and finishing of fiber-reinforced composite parts and structures
- Printed monthly magazine, CW *Today* newsletter (M/W/F), CW *EXTRA* newsletter (2x/month), [CompositesWorld.com](https://www.compositesworld.com), CW Talks podcast, CW Trending video
- Jeff Sloan, editor-in-chief; Ginger Gardiner, senior editor; Hannah Mason, associate editor; Grace Nehls, managing editor; Cara Decknadel, digital editor
- Carbon Fiber Conference: Nov. 15-17, Greenville, SC; we are soliciting abstracts — see me if interested



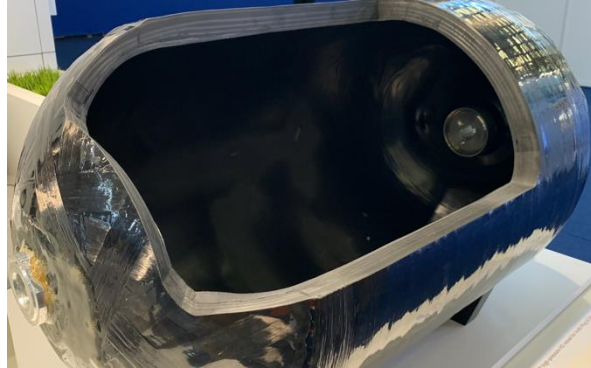
Sustainability, ESG, CSR, TBL, SDG?

- Corporate **sustainability** aims to create long-term stakeholder value through the implementation of a business strategy that focuses on the ethical, social, environmental, cultural, and economic dimensions of doing business.
- **ESG**: **E**nvironmental, **s**ocial, and corporate **g**overnance evaluates the extent to which a corporation works on behalf of social goals that go beyond the role of a corporation to maximize profits on behalf of the corporation's shareholders.
- **CSR**: **C**orporate **s**ocial **r**esponsibility is a form of international private business self-regulation that aims to contribute to societal goals of a philanthropic, activist, or charitable nature by engaging in or supporting ethically oriented practices.
- **TBL**: The **t**riple **b**ottom **l**ine is an accounting framework with three parts: social, environmental and financial.
- **SDG**: **S**ustainable **d**evelopment **g**oals represent a blueprint to achieve a better and more sustainable future for all people.



How sustainability is expressed

- JEC World 2022: Overwhelming theme of sustainability — strategies, initiatives, goals, materials
- Internally driven, customer-driven, market-driven, regulatory
- Stronger in EU than North America or Asia
- **Sustainability strategies revolve around *decarbonization*:**
 - Natural fibers
 - Bio-based precursors
 - Bio-based resins
 - Hydrogen economy
 - Fuel efficiency
 - Battery powered vehicles
 - Renewable energy
 - Waste reduction
 - Recycling/reuse
 - Customer mandates
 - Government mandates



What is driving sustainability?

- **Paradigm shift: Massive social, political, environmental, health events**
 - COVID
 - Climate change (wildfires/drought)
 - Racial/gender inequity
 - Authoritarianism
 - Supply chain disruptions
- **COVID effects/response**
 - COVID emerged through the interplay between drivers of change, such as ecosystem disturbance, urbanization, international travel and climate change
 - Existing social, economic inequality is exacerbated; UN/IMF: The pandemic is expected to accelerate inequality, pushing 8% population into poverty
 - Disaster response triggered from employers, governments: \$9T in public/private COVID relief (IMF)
 - Retirements, other labor shortages place a premium on employee health and retention, which leads to greater social issue awareness
 - Business sustainability depends on flexibility, agility, and a willingness to rethink strategy and market position



What is driving sustainability?

- **Climate change effects/response**
 - Climate change exacerbated/hindered global COVID response
 - Immediacy and visceral impact of climate events — wildfires, flooding, rising tides, drought, heat waves — heightens public sensitivity
 - Consumer buying decisions, habits affected
 - Poorest, most vulnerable members of society disproportionately impacted by climate events
 - Companies are compelled to consider how they engage with the communities and industries they serve
 - Shareholder activism and resolutions compel slow-moving businesses to act to reduce GHGs ([Climate Action 100+](#))
 - Businesses that fail to engage proactively risk losing customers, market share, profits, employees, and investors
 - Sustainability = profitability

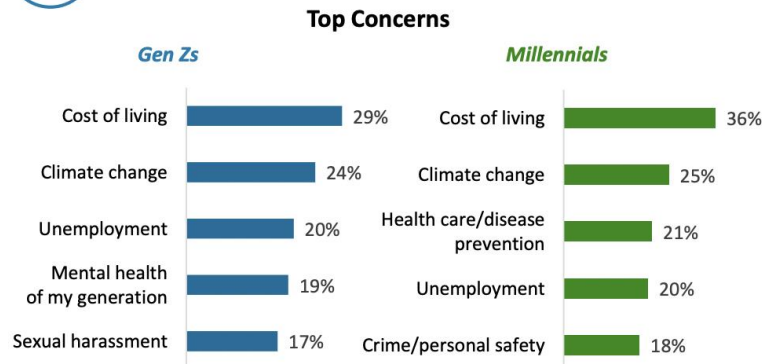


What is driving sustainability?

- **Employee attitudes about employers and work**
 - [DeLoitte Global 2022 Gen Z and Millennial Survey](#)
 - 11th year; 14,808 Gen Zs, 8,412 Millennials, 46 countries
 - Gen Z (1997-2012); Millennial (1981-1996)
 - Surveys work habits, attitudes about work, attitudes about retirement, sustainability outlook
 - Pessimistic about retirement security, climate change effects, ability to correct climate change impacts
 - Job satisfaction tied to work/life balance and sense of belonging and value in workplace
 - Highly sensitive to employer's commitment to social impact, inclusivity, sustainability



The cost of living is the top concern among Gen Zs and millennials, followed closely by climate change.



Top reasons respondents chose to work for their current organization:



Gen Zs' satisfaction on the following efforts of their organization and its impact on their loyalty

Societal impact



Progress in creating a diverse and inclusive environment



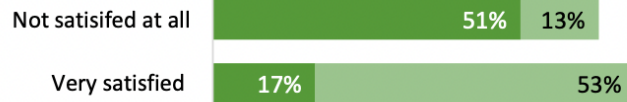
Commitment to sustainability



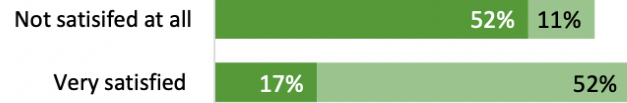
■ Leave within two years ■ Stay beyond five years

Millennials' satisfaction on the following efforts of their organization and its impact on their loyalty

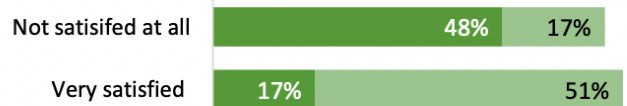
Societal impact



Progress in creating a diverse and inclusive environment



Commitment to sustainability



■ Leave within two years ■ Stay beyond five years

What is driving sustainability?

- **Gen Z buying habits (“Follow the money”)**
 - [Do Something 2020 survey](#)
 - Gen Z = 40% of global consumers; 40% of luxury purchases by 2035
 - Buying habits favor
 - Brand and product authenticity
 - Employers that protect employees (i.e., not Amazon)
 - Companies that support social, community programs
 - Brands that have a strong digital presence
 - Companies that truthfully pursue sustainability strategies

61%

of Gen Z respondents recycle regularly.

Q: When you are at home, how often do you sort glass, cans, plastic, or papers for recycling? n=1,509

61%

of respondents also want to do more to protect the environment. This desire is greatest among Authentic Activists and Stressed Strivers.

Q: How well does the following statement describe you? I would like to do more to protect the environment. n=1,509

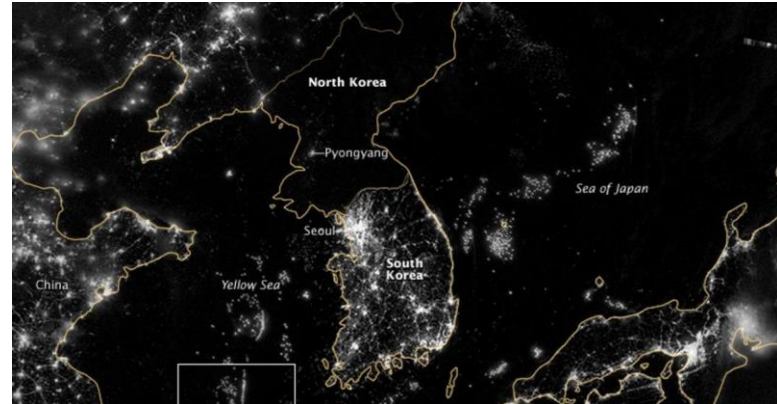
57%

of respondents think it is very or extremely important to buy from brands that protect and preserve the environment.

Q: How important do you think it is to buy from brands that show they are taking action to protect and preserve the environment? n=1,509

What is driving sustainability?

- **It's not the first time: Black Plague**
 - 1347-1351, Central Asia, China, Middle East, Europe
 - 50% of affected populations died (75 million)
 - "Eat, drink, and be merry for tomorrow you may die."
 - Economic stagnation, inflation
 - Feudalism/serfdom died as labor shortages gave power to workers
- **It's not the first time: South Korea vs. North Korea**
 - 1950-1953: Korean War
 - 38th Parallel divides North from South
 - Hereditary dictatorship vs. democracy
 - North Korea lacks basic services, suffers food shortages, decades of punishing and crippling authoritarianism
 - South Korea prosperous, democratic, inclusive, innovative, market-focused
 - *Longitudinal line is only distinction*



What is driving sustainability?

- *“Successful strategies employed during disasters boils down to a variation of a few variables, namely, crisis management, product diversification, financial flexibility, supply chain, technological innovation, and digital transformation. Business as usual shifts to an emergency model.” — Ruixin Su, et al*
- *“Social metrics have become increasingly important for hyper-growth names: companies with more social awareness than their peers have tended to outperform.” — Federated Hermes*

What is driving sustainability?

- *“In the aftermath of the pandemic, a new ecosystem will likely emerge where policymakers, public authorities, consumers, suppliers, manufacturers, and providers, including previously competing entities, all collaborate and extend their services for the greater good in coherence with the principles of corporate social responsibility.” — Ruixin Su, et al*
- *“To address the sustainability problem we face, social and economic practices must change across different levels and aspects of society: the way we live our lives and the way we eat, move and power our societies cannot remain the same.” — European Environment Agency*

Sustainability in composites

- **Historically**

- “We’re light weight, high strength, and durable — what more do you want?”
- Poor manufacturing scrap rates and reduction efforts
- Landfilling is the cost of doing business
- Feeble efforts to reduce carbon fiber manufacturing carbon footprint (non-PAN precursors)
- Reuse/recycling of carbon fiber/thermoset composites nonexistent until 10 years ago
- Natural fibers = red-headed stepchild
- No competitive advantage in supply chain for firms that develop a sustainability strategy

- **Last 4 years**

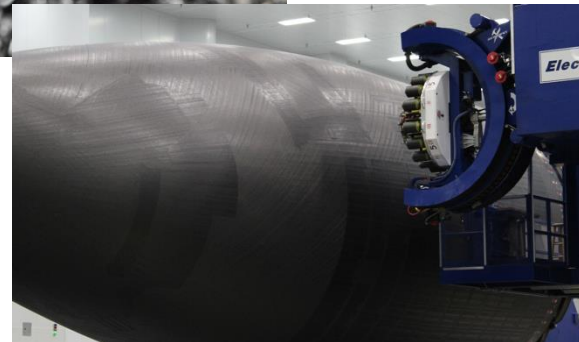
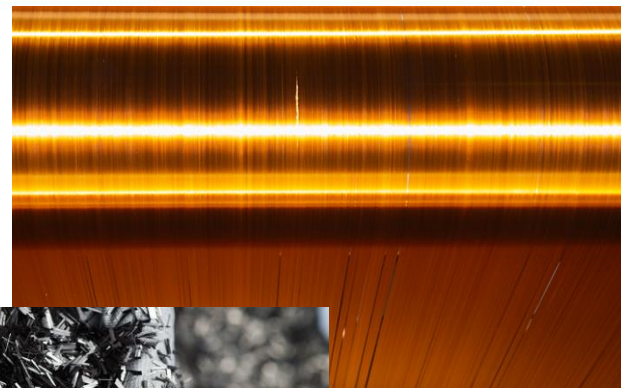
- Lightweighting is not enough — “What more can you do?”
- Bad optics poster child = end of life (EOL) wind blades being landfilled ([CW story, June issue](#))
- Landfilling of uncured CF scrap becoming prohibitively expensive
- Recycling business case stronger, maturing quickly
- 2020: French government conditioned COVID relief funding for Airbus on development of hydrogen-powered aircraft by 2035



Sustainability in composites

- **Challenges**

- Sustainability best practices are just being developed
- There is no cure-all — incremental, multi-disciplinary, business-wide effort
- Every sustainability solution — even a “green” one — has trade-offs
- High embodied energy penalty of composites; carbon fiber in particular is energy-intensive
- Immature, fast-evolving, dynamic composites recycling market
- Large-structure EOL management — wind blades, aircraft structures, boats
- Life and Death Paradox of composites: We want highly consolidated multi-material structures that are strong and durable in service, but readily separate into their constituent materials at end of their lives

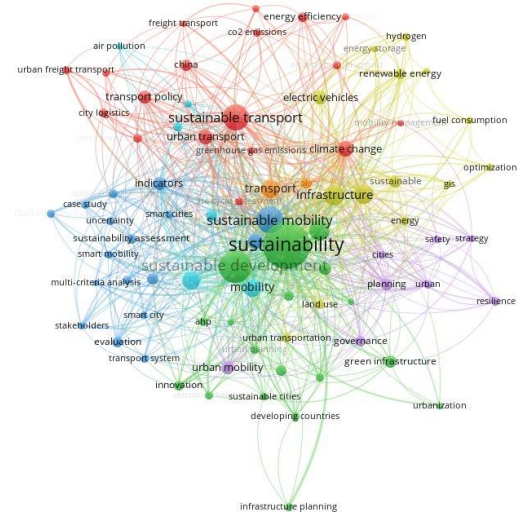


Sustainability in composites

- **Options***
 - Set goals — “Do something, start somewhere”
 - Be willing to miss goals — learn by failing, set new goals, new targets
 - Network, use resources — IACMI, ACMA, SAMPE — that provide lessons learned, guidance
 - Don’t re-invent the wheel — many composites industry players publish sustainability strategies/reports
 - [Teijin](#)
 - [Hexcel](#)
 - [Arkema](#)
 - [Spirit AeroSystems](#)
 - [Magna International](#)
- Seek out and evaluate tools, software, services that can help you measure and assess your sustainability strategy

10 Principles of Sustainable Value Analysis

- | | | | |
|--|--|--|--|
| | Consider all Economic, Social and Environmental Outcomes | | Communicate all Results Clearly and Effectively |
| | Express as Many Outcomes as Possible in Monetary Terms | | Involve Stakeholders and Subject Matter Experts |
| | Evaluate dynamic feedback of investments | | Use Sustainability (or Measurement) Frameworks Tailored to Clients Needs |
| | Assess impact on wellness, if applicable | | Consider the Distribution of Benefits and Costs |
| | Account for Risks and Uncertainty | | Conduct Transparency Analysis |



*Thanks to Andrew Maxey (Vartega) for his input here

UN 2030 Agenda for Sustainable Development

- [17 Goals broad goals, 169 targets](#)
- People, planet, prosperity, peace, partnership
- Most directly business/manufacturing-relevant goals
 - 8 – Decent work and economic growth
 - 9 – Industry, innovation and infrastructure
 - 12 – Responsible consumption and production
 - 17 – Partnerships for the goals
- Sustained, inclusive, and sustainable economic growth, full and productive employment
- Upgrade infrastructure with increased resource-use efficiency and environmentally sound technologies
- Waste reduction, recycling, reuse; integrate sustainability information into corporate reporting cycle
- Accelerate development of poor-country economies, promote development and transfer of environmentally sound technologies, promote exports of developing countries via rules-based trade agreements sanctioned by WTO



Sustainability in composites

- **What to expect**
 - Customers will increasingly demand an ESG strategy from their supply chains that aligns with their own ESG requirements — the cost of doing business
 - Trade studies, and the software used to conduct them, will be expanded to calculate decarbonization to guide materials and process decision-making
 - Life cycle analyses (LCA) will become integral to an ESG strategy as a way to measure carbon footprint of finished products
 - Recycling/reuse will become the norm, as it is with legacy materials (steel, aluminum)
 - Increasing regulatory and government guidance and oversight



Sustainability in composites

- **Regulatory oversight, US:**
 - SEC in 2010 established ESG disclosure framework for publicly traded companies
 - Framework [being updated in 2022](#) to cover corporate board diversity, climate change, human capital management, and cybersecurity risk governance
 - Quantitative and qualitative disclosures regarding a company's climate-related risks and opportunities
 - Possibly different disclosure metrics based on industry
 - Requirements for forward-looking climate commitments
 - Requirements for analyses of how businesses would adapt in light of environmental, market and economic changes
 - Impact: Publicly traded companies likely will pass disclosure requirements down through supply chains



Sustainability in composites

- **Regulatory oversight, EU:**
 - [Corporate Sustainability Reporting Directive](#) (CSRD) supports the [European Green Deal](#), a set of policies intended to combat the climate change crisis
 - Applies to all companies listed on EU regulated markets, except micro companies; or large companies that meet two of the following three criteria: a net turnover of more than €40 million; balance sheet assets greater than €20 million; more than 250 employees
 - Approximately 50,000 companies affected in total
 - Disclose more sustainability-related information about business models, strategy and supply chains
 - Provide sustainability strategy information that allows investors to perform apples-to-apples comparisons of companies
 - Change how businesses approach sustainability decision-making and share their stories with stakeholders





Questions?

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