

# There is No Chain Without Supply: Strategic Supply Chain Resilience Through Infrastructure Initiatives and Global SDGs

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## ABSTRACT

We explore the research on supply chain resilience in severe multi-dimensional crises, focusing on geopolitical institutions, infrastructure initiatives, and strategic approaches to analysis and planning. A recent response to global supply chain shocks resulting from crises, including the worldwide pandemic and Russia-Ukraine conflict, has accelerated the growth of global and regional alliances, specifically targeting infrastructure, transparency, connectivity, trade, and transportation resilience building. This research provides a comprehensive summary of this new institutional dynamic in the context of strategic analysis and planning for supply chain resilience. As global crises expand in scope, multinational enterprises (MNEs) should increasingly rely on geopolitical institution support, especially downstream supply chain sources. Without such support, access to critical resources, infrastructure, transportation, and connectivity is at a high risk of being cut off. Since 2021, there has been a rapid expansion of geopolitical infrastructure initiatives, United Nations Trade and Development (UNCTAD) reporting and support services, and global adoption of UN Sustainable Development Goals (SDGs) into corporate strategic planning, all tied to building more crisis-resilient global supply chains.

**Keywords:** *belt and road initiative (BRI), eurasian economic union (EAEU), pacific quality initiative (PQI), supply chain resilience, united nations sustainable development goals (SDG), united nations trade and development (UNCTAD)*

## 1. INTRODUCTION

Many macro and micro-perspectives exist in the evolution of global supply chain resilience research. While critical for special interests, disparate perspectives of a highly interdependent and complex system do not inform strategic decision-making in extreme crises; thus, a new

study is required. In the wake of the COVID-19 global pandemic, according to Sodhi and Tang (2021, p.7), “it is appropriate to rethink supply chain management for research and practice to cope with extreme conditions, now and in the future, whether due to pandemics, war, climate change, or biodiversity collapse.” Although supply chain scholars have acknowledged the fundamental disruptive changes experienced by today’s supply chains and the ensuing novelty of the research problems worthy of investigation, research has primarily relied on a limited number of theories and a limited scope of analysis (e.g., resource-based view, transaction cost economics, game theory) as a basis for broad prescriptive solutions to vastly complex crises (Stank *et al.*, 2017; Gligor *et al.*, 2018).

The initial response to Russia’s invasion of Ukraine was the initiation of a series of unprecedented sanctions on Russia, a combination of legal trade restrictions with penalty enforcement consequences, public relations messaging of corporation’s social responsibilities (CSR) to suspend or close their operations in Russia, and overwhelming public opinion in support of Ukraine-led firms to reconsider their supply chain linkages with Russia, and surrounding conflict zone. The response resulted in a global reconfiguration of global supply chain designs, with thousands of firms suspending or permanently deactivating their supply chain assets from the larger war zone in a response known as “unhooking,” or “the process by which firms suspend or permanently deactivate their supply chain assets from a geographical territory” (Srai *et al.*, 2023).

MNEs have always dealt with complex environments, geopolitical tensions, and conflict zones (e.g., Dai *et al.*, 2017). In this new era, catastrophic supply chain disruptions have forced MNEs to reconsider their relationships within



Trade Blocs, unilateral and multilateral agreements, national political priorities, and strategic supply chain loyalties. The scale and speed of international response to the demand for supply sourcing since 2022 has been unprecedented. In this paper, we highlight such cases of supply chain unhooking to illustrate how large-scale multi-dimensional crises create and sustain catastrophic impacts on supply-side (resources, infrastructure, communication) global supply chains, rendering them in the moment and, in many cases, for months, inoperable.

## 2. LITERATURE REVIEW

### 2.1 *The Role of UNCTAD in Global Supply Chain Governance*

The United Nations Conference on Trade and Development (UNCTAD) is a specialized intergovernmental body within the United Nations system, established in 1964 to promote the integration of developing countries into the global economy. UNCTAD is not a “specialized agency” like the World Health Organization (WHO) or the International Monetary Fund (IMF). Instead, it is considered a permanent intergovernmental body under the UN General Assembly. UNCTAD focuses on trade, investment, and development issues, offering policy analysis, a forum for debate, and technical assistance for developing countries to integrate more effectively into the global economy.

UNCTAD’s mandate covers a wide range of topics related to trade and development, including trade policy (helping countries, especially developing nations, to improve their trade performance), investment (promoting investment and supporting sustainable development), technology (facilitating the transfer of technology and encouraging innovation), finance (addressing financial challenges facing developing nations) and sustainable development goals (SDGs) (assisting countries in achieving the SDGs, with a focus on economic sustainability, inclusive growth, and poverty reduction).

UNCTAD does not directly fund or manage large infrastructure initiatives. However, it plays a supporting role by providing data and analysis. UNCTAD conducts research and provides statistical data to help countries and organizations understand global trade trends, investment flows, and development challenges. This data could indirectly support initiatives like China’s BRI, the G7 B3W, or the EU’s Global Gateway. UNCTAD facilitated dialogue by providing a platform for countries to discuss trade and development policies. It promotes South-South cooperation and has occasionally held discussions about the BRI, emphasizing the importance of inclusive and sustainable infrastructure development. UNCTAD makes policy recommendations and advises governments on aligning their policies with international trade and development goals, which could include supporting sustainable infrastructure development that aligns with the interests of global or regional initiatives. Finally, UNCTAD provides technical assistance and support to developing nations, helping them integrate into global trade systems and improve their investment environments. This assistance could complement initiatives that focus on infrastructure, trade, and connectivity.

### 2.2 *Acceleration of Geopolitical Governance in Global Supply Chains: 2020-2022*

#### 2.2.1 *The 2020 – 2022: World Investment Report (WIR) and the Ukraine Crisis Implications*

The UN Conference on Trade and Development (UNCTAD) World Investment Report (WIR), now in its thirtieth year, supports policymakers by monitoring global and regional foreign direct investment (FDI) trends and documenting national and international investment policy developments (UNCTAD, 2024c). The 2020 WIR report, for example, integrated the latest data on the COVID-19 crisis and updated its annual Sustainable Development Goals (WIR 2020). According to the WIR, supply chain resilience and more autonomy in productive capacity remain of primary importance. In addition, the new fourth industrial revolution, national policy shifts towards economic nationalism, and sustainability trends are predicted to accelerate a global reconfiguration of international production over the next decade. Trends in international output include shorter value chains, higher concentrations of value-added activities, and declining international investment in physical productive assets. The rapid and far-reaching transformation of international production, according to the WIR in 2020, requires resilience-seeking investment, building regional value chains, and entering new markets through digital platforms. According to the WIR 2020 report, industry international production configurations will tend to favor one of four trajectories:

- (1) Reshoring will lead to shorter, less fragmented value chains and a higher geographical concentration. Technology will motivate firms to resume more localized manufacturing of formerly outsourced production when efficiency is possible. More technologically developed economies will re-industrialize, leaving their former developing country partners behind.
- (2) Diversification will lead to a broader distribution of economic activities. It will primarily affect services and high-value manufacturing industries. Digitalization of the supply chain will present opportunities for smaller entrepreneurial firms. Corporate governance models may favor private, nimble, high-value, asset-focused firms.
- (3) Regionalization will reduce the physical length, increase geographical distribution, and fragment supply chains. The geographical distribution of value-added activities will increase. Regional value chains will require changes to industrial policy and investment promotion.
- (4) Replication will lead to shorter value chains and reconfiguration of stages in production activities by building in redundancies. These reconfigurations imply a shift from investment in large-scale industrial activity to distributed manufacturing, which relies on lean physical and quality digital infrastructures. A local manufacturing base and producer services will be essential to attracting the final stages of the value chain.

Zahn *et al.* (2021) provided five policy prescriptions derived from the UNCTAD WIR report (2020) that we used to test Ukraine crisis case studies. We illustrate how crisis

events unfolded in 2022 and how weaknesses in the global supply chain ecosystems allowed a complete collapse in some cases. These and other Ukraine crisis cases represented substantial evidence that the existing world system required rapid reform. Below are the five policy prescriptions presented by Zahn *et al.* (2021). Following each policy prescription, we present the corresponding example from the Ukraine crisis. Each case illustrated how weaknesses in current systems could be remedied by targeted policy change across industries to validate and extend Zahn's (2021) findings.

### 2.2.2 Economic Governance Realignment

*WIR 2020 Report.* International economic policymaking, especially trade and investment policies, is shifting from multilateral cooperation towards regional and bilateral solutions. This is compounded by a general shift in national economic policymaking through new industrial policies, including protectionism in numerous countries (Zhan, 2021).

*Case Example: Russia's invasion of Ukraine and China's Belt and Road.* Since it was announced by President Xi Jinping in 2013, China's Belt and Road Initiative (BRI) has been marked by both optimism and anxiety. The overland "Belt" links China to Central Asia, South Asia, and Europe. The maritime "Road" links China to Southeast Asia, the Gulf countries, East and North Africa, and Europe. Investment has been estimated at up to \$8 trillion in key transportation, finance, energy, and telecommunications areas. This initiative aims to establish six economic corridors with the participation of some 70 countries. The China-Central-Asia-West-Asia Corridor, starting from Xinjiang, crosses the five Central Asian countries, Iran, the Persian Gulf, and the Arabian Peninsula, to reach Turkey. Turkey represents the land and sea gateways to Russia. Trains to Russia and Turkey will facilitate international trade between China, Central Asia, the Middle East, Europe, and Africa. The Black Sea corridor from Turkey through Ukraine to Russia, as of February 2022, represented the "last segment" of the Belt and Road initiative. Russia's invasion of Ukraine has been widely speculated to be motivated in large part by Russia's goal to achieve political sovereignty of the region's supply chain, infrastructure, transportation, and natural resources (Chenoy, 2022; Mims, 2022; Jamal, 2022; World Bank Group, 2019).

### 2.2.3 New Industrial Revolution

*WIR 2020 Report.* The application of new technologies in the international production of global multinationals, including robotics-enabled automation, artificial intelligence (AI)-enhanced systems, supply chain digitalization, blockchain, additive manufacturing, and mass customization, create new realities requiring supply chain configuration adjustments (in length, geography, and distribution) and a rethinking of their governance. Depending on industry-specific deployment, each technology will flatten, squeeze, or bend the "smile curve" of global value chains (GVCs) in its way (UNCTAD, 2020). All this will reshape the international trade and investment landscape and exert long-term social and economic impact in different parts of the world.

*Case Example A – Russia's Invasion of Ukraine and the Splinternet.* Russia's war in Ukraine is hastening the arrival of the "splinternet," a forced division of cyberspace under the control of competing political blocs, according to Henri Verdier, France's Digital Affairs Envoy (Manson, 2022, p. 1). As the crisis unfolded, Russia accelerated global and domestic online censorship, legal actions against news and entertainment media firms, and disturbing actions directed toward consolidating an independent Russian internet. According to Verdier (Manson, 2022, p.1), "If we have two or three or four internets, the temptation to disconnect the other will be very high," adding that authoritarian countries could try to take democratic countries offline if such mutual dependence were lost. There is growing concern that Russia could realize its suspected intention to establish a more "sovereign" internet. Since Moscow invaded Ukraine, Russia has sped up its internet isolation, increasing domestic online censorship by blocking Meta Inc.'s Facebook and Instagram and limiting Twitter access. As a part of the great Russia Sanction Exodus, Apple, Microsoft, and Netflix have limited their presence. In contrast, foreign internet service providers, including Cogent and Lumen, have limited their activity. As a result of the crisis in Ukraine, US tech giants are under pressure from both Russia and the West to respond to the conflict, escalating the potential "splintering" of the internet, positioning both Russia and China against the rest of the world (Mickle *et al.*, 2022).

*Case Example B - Yandex Sanctions.* Yandex, known as "Russia's Google," is the country's largest search engine. The company includes taxi services, e-commerce, fast food delivery, online education, and other technology-powered businesses (Cordell, 2022). The head of Russia's top technology firm resigned immediately after being slapped with European Union (EU) sanctions in response to Moscow's invasion of Ukraine. Brussels sanctioned Yandex executive director and deputy CEO Tigran Khudaverdyan with an asset freeze and travel ban, citing the firm's role in "hiding information" from the Russian public by manipulating search results on its platform. "Yandex's former head of news accused the company of being a 'key element in hiding information' from Russians about the war in Ukraine," the EU stated in its official journal, *EUR-lex*, outlining the sanctions against Mr. Khudaverdyan and a host of other Russian business figures. After the Russian government threatened Russian media over what they publish, the company warned Russian users seeking news about Ukraine on its search engine of unreliable information on the internet (Cordell, 2022, p. 2). The Kremlin has launched a harsh crackdown on independent news sources since it invaded Ukraine, including a new law that could punish journalists with 15 years in prison for publishing articles about Russia's military campaign that used information not provided by the Russian government. Yandex has been accused of suppressing independent news sources in search results and promoting only state media in its online news portal, accessed by tens of millions of Russians daily.

### 2.2.4 Sustainability Endeavor

*WIR 2020 Report.* Shifting global consumer demand to values-based, purpose-driven living is changing products

and processes along the value chains toward sustainability (Euromonitor, 2023). Global sustainability-dedicated investment funds are now at \$1.2-\$1.3 trillion (UNCTAD, 2020). The global effort to mobilize and channel investment to realize the Sustainable Development Goals (SDGs) will change the future pattern of foreign direct investment (FDI), including the sources of financing, sectoral distribution, and geographical location (UNCTAD, 2020).

*Case Example - Western Sanctions of Russian Companies.* Economic measures to cut Russia from sources of global finance are the most potent non-military tools Western alliance countries implemented in response to the invasion of Ukraine. No major economy in the modern world has ever been hit so hard by such weapons (Economist, 2022). After debating whether to make it harder for Russian banks to process international payments by shutting them out of the SWIFT (www.swift.com) platform, some European countries feared it would hurt their banks. Western allies finally agreed to target seven Russian banks but allowed Sberbank to remain in operation because of its key role in processing energy payments. The United States (US) went further, cutting off Sberbank and VTB, Russia's second-largest lender, from its financial systems (Economist, 2022). Export controls limited the components Russia needed for its military and high-tech sectors, denying it goods ranging from cutting-edge machinery to microchips. The measures applied to goods made in America and those containing American technology made in and shipped from third countries, like China.

### 2.2.5 Corporate Accountability

*WIR 2020 Report.* International cooperation to fight corruption, illicit payments, tax evasion, and anti-competitive practices have important implications for the modes of operation of global multinationals. The environmental, social, and governance (ESG) standards and disclosure requirements add to trade and investment policy pressures from host and home states.

*Case Example - Western Company Exodus of Russia.* Soon after the crisis in Ukraine began, many companies said that in response, they would pause their operations in Russia. President Vladimir Putin endorsed a plan to nationalize foreign assets to prevent job losses and maintain Russia's ability to produce domestic goods. More than 600 foreign companies have since paused, reduced, or closed operations, some leaving the country for good. The Yale School of Management immediately began tracking corporate behavior on its website. Nationalization or other such attempts at seizing or expropriating assets would impact sectors and companies differently; for some service sector firms (retail, professional services, media, etc.), losing leases on stores or offices might pose a relatively minor financial burden. However, the impact could be substantial for companies with expensive manufacturing equipment or logistics assets, including warehouses and fleets of trucks (Gershkovich *et al.*, 2022). Despite the cost of abandoning significant investments and losing business, there was a strong reputational incentive to withdraw. Companies that failed to withdraw faced a wave of US public resentment, potentially far more significant than they faced on climate change, voting rights, gun safety,

immigration reform, or border security (Sonnenfeld, 2022). In recent decades, global business leaders could get away with nominal support or promotion of corporate social responsibility in markets where it was a top investor concern. However, their exposure to political risk was primarily localized. For many decades, large-scale violence had been geographically restricted to regional civil wars, drug cartels, or terrorist activity. The Russia-Ukraine war has ushered a return to conventional global warfare and, with it, much greater geographic risk to inaction by companies espousing CSR values for their investors, customers, and communities (Sonnenfeld, 2022).

### 2.2.6 Resilience-Oriented Restructuring

*WIR 2020 Report.* The global crises and growing geopolitical conflicts will drive MNEs to make their global value chains (GVCs) more resistant to new shocks and cause governments to reduce reliance on foreign sources for critical supplies. Admittedly, it will not be easy for many MNEs to restructure their GVCs (Miroudot, 2020), and the reshoring and nearshoring have not been significant enough for some countries during the pandemic (Evenett, 2020). Nevertheless, the trend is emerging and likely to continue beyond the pandemic. MNEs will adopt new modes of business operations to enhance agility and flexibility and to cope with the increasing volatility, uncertainty, complexity, and ambiguity of the global business environment. This restructuring will significantly impact the future pattern of international investment flows, including diversification, redundancy, and, to a certain extent, reshoring and nearshoring (Corbeau, 2022).

*Case Example - New Solutions to Liquid Natural Gas Shortages.* Europe relies on Russia for 34 % of its natural gas. Due to the crisis in Ukraine, the demand for European Liquid Natural Gas (LNG) will increase competition with LNG-dependent countries in Asia, the Middle East, and Latin America. As LNG prices rise, countries naturally try to reduce consumption or switch to other alternative fuels when possible (EQT, 2022). Even before the invasion of Ukraine, gas markets were in a long period of price increases due to:

- a rapid post-pandemic economic rebound that supported a substantial increase in energy demand,
- lower power generation from wind and hydropower plants, calling for more gas-fired generation,
- longer and colder heating seasons in Asia and Europe and hotter summers, driving heating and power demand to higher levels,
- record high coal and carbon prices pushing up the gas switching price—the price level at which coal-fired generation becomes more economical than gas to run and can replace it,
- much lower availability of LNG supplies, and
- lower gas deliveries from Russia to Europe due to a combination of a colder winter in 2020/21 in Russia that required higher injections in Russian gas storage (Corbeau, 2022).

Traditionally, energy supply disruption scenarios have not been designed to integrate back-to-back crisis events, including the global pandemic and the Russia-Ukraine war. There was little preparation for a situation where global energy systems were threatened with major gas disruptions

due to lockdowns, travel bans, and a complete collapse of energy demand, followed by geopolitical disruption from a major energy supplier like Russia. Russian sanctions seeking to ban imports of Russian oil and refined products impacted global LNG contracts, which, in 2020, were estimated at 56% of total global LNG trade. Additionally, Russia supplies 46% of European coal imports. Thus, Russian sanctions designed to remove Russian coal exports from the worldwide market will exacerbate the energy crisis. The Standard & Poors Energy Report (Zigliani *et al.*, 2022) details transportation, processing, and primary market facilities along the natural gas and oil value chains. The report illustrates that a complete cutoff of Russian gas supplies through these transit routes would decrease supply by 30% to Europe.

Geopolitical concerns regarding an over-reliance on Russian gas prompted Poland, Lithuania, Estonia, and Finland to pursue supply diversification for many years. LNG regasification terminals have been built, allowing gas imports from new markets. European countries less concerned about importing Russian gas urgently sought new remedies for their supply shortages. Germany imports approximately 45% of its total gas supply from Russia. The Ukraine crisis severely impacted it, following on the heels of the suspension of the Nord Stream 2 pipelines. Germany planned to accelerate the construction of LNG regasification terminals to secure alternative supplies for the longer term. A major complicating factor was that the infrastructure investment is primarily based on joint ventures with Russian companies, most notably Gazprom (Zigliani *et al.*, 2022).

The impact of the pandemic in Ukraine and ongoing geopolitical and climate-related disruptions acted as accelerants for more comprehensive analysis, planning, and prescription to the global investment and business community of stakeholders. In less than two years, the United Nations, an institution not known for hurrying, expanded its global investment oversight role via its UN Sustainable Development Goals (SDGs). As we will illustrate below, in 2024, the UN SDG framework is now at the center of global strategic analysis, planning, and reporting for creating resilient supply chains built to withstand ongoing global crises.

### 3. METHODOLOGY

This study adopts a qualitative, case-based research approach to explore the dynamics of supply chain resilience during global crises. The methodology is grounded in a strategic analysis framework incorporating geopolitical events insights, the United Nations Conference on Trade and Development (UNCTAD) reports, and Sustainable Development Goals (SDGs). Our primary focus is to examine how global crises, such as the COVID-19 pandemic and the Russia-Ukraine conflict, disrupt supply chains and to evaluate the effectiveness of policy-driven strategies for resilience. Data was collected and synthesized from primary and secondary sources, including UNCTAD's World Investment Reports, Infrastructure Initiatives, governmental trade associations, academic literature, and case studies on corporate responses to recent crises.

The research leverages a multi-phase approach to analyze both macro and micro-level disruptions. First, the

literature review provides historical context to current trends in global supply chain disruptions as documented in academic research, business media reporting, and global policy reports. This phase identified key themes: geopolitical risk, labor shortages, and technological innovations. Second, we chronicle the evolution of UNCTAD WIR 2020 and 2024 policy prescriptions against real-world responses from multinational enterprises (MNEs) to the Russia-Ukraine conflict and geopolitical conflicts more broadly. These policy prescriptions provided a structured framework to evaluate and categorize firms' resilience strategies. Third, case studies were selected based on their relevance to critical supply chain challenges, such as reshoring, nearshoring, and diversification of supply sources. These cases were analyzed to uncover patterns and draw actionable insights for practitioners and policymakers.

The methodology also incorporates the development of a summary table, **Table 3**, which provides readers with a clear, actionable framework. This table consolidates the five policy prescriptions outlined in the UNCTAD 2024 policy prescriptions related to the UN SDG 2024 framework and aligns them with observed corporate strategies during crises. Integrating policy insights with empirical data ensures that the study contributes to academic discourse and offers practical guidance for building supply chain resilience in the face of multifaceted global crises.

## 4. ANALYSIS

### 4.1 Emergence of Abnormal Supply Chains and Strategic Global Supply Challenges

For decades, companies of all sizes have managed supply chain risk as an essential element of daily operations. Increasingly, natural disasters, geopolitical conflict, and humanitarian crises have amplified uncertainty among many companies previously sheltered from impact by local alliances, trade agreements, government policies, and risk insurance schemes. In their research, Sodhi and Tang (2021), Yu *et al.* (2021), and Roscoe *et al.* (2022) outlined how extreme conditions simultaneously disrupted supply chains along multiple dimensions simultaneously. These seven dimensions represent a fundamental decision-making framework of any supply chain management (SCM) system and are presented below.

#### 4.1.1 Global Crises Test Assumptions of Functioning Supply Chain

*Demand Certainty.* Supply chains can be efficient or effective when demand is stable and predictable. Historically, major global supply chain disruptions have been researched, and remedies have been proposed. Climate disasters, including earthquakes, tsunamis, major flooding events, and hurricanes, have all produced severe regional and global disruption to business stability and certainty (Takeda *et al.*, 2018).

*Supply Certainty.* Supply chain management models and methods have been built on the assumption that a reliable and predictable resource acquisition and allocation system exists. This assumption must be fundamentally challenged as events from the past three decades, including natural and man-made disasters, military crises, geopolitical trade wars, and pandemics, have dramatically increased

uncertainty in even the most local daily business practices. Decades of allegiance to Just-in-Time and Lean Manufacturing approaches exposed manufacturers, logistics and transportation companies, consumers, and communities to increased risk of shortages during a crisis (Legget, 2022).

*Channel Stability.* Supply chain channels are assumed to be stable and reliable. However, this assumption demands calm externalities in political, economic, social, technological, environmental, and legal macro-environments. A distribution channel represents the critical networks connecting manufacturers directly to their end consumers. These direct or indirect channels facilitate the seamless flow of goods, ensuring products are more efficient from production to the retail outlets and the final consumer. Recent research in last-mile delivery network analysis highlights the increasingly complex challenges facing this aspect of supply chain channels (Arevalo-Ascanio *et al.*, 2024).

*Availability of Labor.* Labor capacity is assumed to be another constant, and the low elasticity of labor supply is not or has not been a significant concern in most industries. In a recent comprehensive review of supply chain risk modeling research, the word “labor” was used only once (Morteza Beigi *et al.*, 2024).

*Supply Chain Visibility.* Suppliers are visible, accountable, and responsive in standard supply chain management (SCM). Technology is essential for supply chain resilience and efficiency in the continually changing global commerce scene. Advanced technologies enable real-time visibility, predictive analytics, and streamlined processes, helping firms foresee interruptions, respond quickly, and preserve continuity (Karanam *et al.*, 2024).

*Geopolitical Stability.* Geopolitical stability potentially holds the most significant impact on preserving healthy global supply chains. Geopolitical risk relates to supply chains and has received steadily increasing attention even before the global pandemic and crisis in Ukraine. In their comprehensive review of the literature to date, Bednarski *et al.* (2024) applied “a systematic literature review of 50 papers from the Association of Business Schools’ (ABS) ranked academic journals in the fields of operations, production, and supply chain management published between 1995 and 2022” (Bednarski, 2024). Their findings created a new subfield of research based exclusively on open geopolitical disruptions and the resulting impact on supply chains.

*Reliability of Financial Flows.* The normal functioning of supply chains relies on stable financial flows. In their systematic literature review, Adhim and Mulyono (2023) illustrated how Supply Chain Finance (SCF) research and practice has risen worldwide. Due to the inefficiencies and structural incapacity of traditional global financial systems, SCF bespoke solutions were explicitly created to support and improve business efficiency and effectiveness of suppliers, distributors, buyers, and financial institutions.

Lessons from the past few years are supported by The World Economic Forum (WEF) Centre for Regions, Trade and Geopolitics working groups that overwhelmingly take a strategic view of supply chain resilience, emphasizing the long-term ability of organizations and economies to create the capabilities needed to deal with disruptions, withstand

shocks, and continuously adapt as disruptions and crises arise over time (WEF 2022, 2024).

The new SCM normal is Strategic Supply Chain Resilience (SSCR). For this research, we define SSCR as the ability of a supply chain to anticipate, prepare for, adapt to, and recover from unexpected disruptions while maintaining or quickly resuming its essential functions. SSCR goes beyond simply managing risks, and it incorporates strategic foresight, flexibility, and adaptability into the supply chain’s design and operation to ensure continuity and competitiveness in the face of global challenges.

#### 4.1.2 Developing Countries: The Supply Side Imperative for Global SC Resilience

According to reporting by Um and Han (2021), before the Covid-19 global pandemic, the majority of supply chain risk management studies focused on conceptual approaches (Manuj and Mentzer 2008a, 2008b; Olson & Wu, 2010; Tang & Musa, 2011; Giannakis & Papadopoulos, 2016) or on particular focus areas including flexibility (Sreedevi & Saranga, 2017), integration (Wiengaten *et al.*, 2016; Brusset & Teller, 2017), outsourcing (Olson & Wu, 2011), supplier dependence (Hendricks & Singhal, 2005), global sourcing (Tang, 2006) and coordination with partners (Ojala & Hallikas, 2006). In their comprehensive review of supply chain risk and resilience research, Um and Han (2021) discovered that little research had been conducted to identify broader structural mechanisms to mitigate diverse risks, let alone major global crises.

Post-pandemic research has paid more attention to diverse risks (Sodhi & Tang, 2021; Zavorska, 2022) and survivalist responses. Companies responding to extreme conditions that disrupted their supply chains at all levels tested the assumptions necessary for normal operations to continue. Significant supply chain bottlenecks, surges in demand for certain products, labor shortages, materials, resources, transportation, and even necessities highlighted weaknesses in current and longstanding supply chain assumptions, theories, policies, and prescriptions.

As companies struggled throughout the pandemic to identify which aspects of their supply chains were under intense short-term risk, they also considered longer-term implications for supply chain redesign to incorporate reliance contingencies that were not readily available. Within the first four months of Russia’s assault on Ukraine’s infrastructure, key strategic resources for energy, semiconductors, food, transportation, and other global strategic industries were severely damaged or destroyed. The Russian sanctions regime forced a mass exodus of MNE affiliates from their base of operations in Russia. MNE affiliates in Ukraine were cut off entirely, and the geopolitical region surrounding the military conflict entered a high-risk crisis stage. In the summer of 2022, global MNEs had already begun to consider regional sourcing (“reshoring”) as a possible alternative to global sourcing to strengthen their supply chain resilience (Jovanović *et al.*, 2021; van Hoek & Dobrzykowski, 2021).

Between October 2022 and September 2024, the Russia-Ukraine conflict caused significant adverse business outcomes across various sectors, especially regarding supply chains, global trade, and energy markets. While

SMEs were equally, if not more, impacted by significant disruptions in global supply chains, it is not in the scope of this paper to address SMEs specifically. However, Senin *et al.* (2024) provide a comprehensive review of research within this period and summarize similar adverse outcomes for SMEs globally. According to reporting from several consulting and business sources (including Deloitte Global, KPMG, MIT Sloan, Asian Business & Management, and S&P Global Ratings), the global business community experienced the following five impacts and disruptions:

*Supply Chain Disruptions.* The conflict severely disrupted global supply chains, particularly affecting the flow of wheat, oil, natural gas, and critical industrial materials, including nickel and palladium. Ukraine and Russia are key exporters of these resources, and their restricted availability led to soaring prices and supply shortages. Sectors including automotive, electronics, and food industries were particularly hard hit, leading to higher raw materials and transportation costs. Shipping through the Black Sea was heavily impacted, stranding hundreds of cargo ships and further aggravating food shortages in regions dependent on grain exports, including Africa and the Middle East (Wiseman & Anderson, 2024).

*Increased Costs for Energy and Commodities.* The war caused a global energy shock as Western countries imposed sanctions on Russian oil and natural gas. The sanctions led to soaring prices and inflation, especially in Europe, where countries depended highly on Russian energy supplies. The spike in energy prices affected businesses and consumers, increasing production costs and eroding profit margins in multiple industries. Precious metal markets saw volatility, particularly in materials critical to high-tech manufacturing, further increasing costs for companies reliant on these inputs (World Bank, 2024).

*Withdrawal of Multinational Corporations.* Numerous multinational companies withdrew or scaled back operations in Russia due to sanctions and reputational risks, including primary automotive, food, and consumer goods players (McDonald's, PepsiCo, and Volkswagen), causing financial losses and operational disruptions. Some companies faced threats of nationalization by the Russian government, which sought to seize assets abandoned by these firms (UNCTAD, 2024c).

*Geopolitical Shifts and De-Globalization Trends.* The geopolitical tensions accelerated deglobalization trends, with companies reevaluating longstanding supply chain strategies and shifting toward localized production and sourcing. Industries previously relying on just-in-time supply chains sought more resilient alternatives (UNCTAD, 2024c).

*Long-Term Financial and Credit Impact.* The war contributed to prolonged high inflation and interest rates, tightening credit conditions for businesses globally. Already burdened by high debt, companies in emerging markets faced more significant difficulties accessing financing. Western sanctions on Russia further disrupted capital flows, especially in energy and manufacturing (WIR, 2024).

In each of these scenarios, the resulting hard lessons by global MNEs were that withdrawal from markets, regionalizing and localizing sourcing, adjusting financial investment away from global sources, and other uncoupling

tactics only work if one has access to “supplies” available closer to home.

#### *4.1.3 MNE Global Supply Chain Reshoring Failures in Response To Global Crises*

During the global pandemic and exacerbated by the Russia-Ukraine conflict, heightened media and public attention on perceived supply chain failures exerted increasing pressure on governments to intervene in firm-level operations to calm fears of significant shortages and ensure the steady supply of essential and strategic goods. According to Thakur-Weigold *et al.* (2024), the prevailing academic and public discourse was based upon supply chain myths that lean management had gone too far and exacerbated disruptions in global supply chains and that efficient supply chains and international sourcing made supply chains less resilient.

In recent months, government interventions for MNE support to abandon strategic supply chain partners to reduce risk and control resources have proved these myths to be just that. Creating or resourcing upstream supply involves many complicated actions that increase failure risk. Below, we highlight two recent case studies to illustrate how deglobalizing supply chains, reshoring, and decoupling from foreign trade alliances do not improve supply chain resilience. In both cases, the incentives, infrastructure, and ongoing strategic support provided by the US government via the Inflation Reduction Act, a foreign investment law within the framework of the UNCTAD Sustainable Development Goals that has resuscitated both semiconductor and automobile manufacturing industries globally.

## **4.2 Case Studies: Strategic Resource Focus of Supply Chain Management**

### *4.2.1 Case Study 1: Intel and Taiwan Semiconductor Alliance US (Arizona)*

The Intel-TSMC alliance in Arizona has faced several challenges, particularly concerning constructing semiconductor fabrication facilities known as “fabs.” Key challenges were overcome through increased investment from beyond Taiwan and the US via UNCTAD investment mechanisms. Initially, Intel and TSMC encountered delays in building their Arizona facilities due to rising construction costs, labor shortages, and delays securing CHIPS Act subsidies. Chemical and material providers scaled back or postponed their construction plans. Some suppliers, including LCY Chemical and Solvay, delayed their investments, opting to import from Asia. In 2024, the Intel-TSMC alliance challenges have proven a valuable lesson in the risks of reshoring (Intel), as evidenced by a new venture between Intel and Samsung in which the companies could collaborate on various fronts, including process technology exchanges, shared production equipment, and joint research and development efforts (Shilov, 2023a).

### *4.2.2 Case Study 2: Volkswagen Reshoring Reaction*

In 2023, Volkswagen was forced to lower its delivery target from 9.5 million vehicles to between 9 million and 9.5 million due to these continuing supply chain problems and transportation and logistics delays. Although Volkswagen has tried to mitigate these issues by relocating

some production, they have significantly impacted production capacity and revenue. In 2024, after revising its outlook downward due to macroeconomic challenges, further supply chain difficulties, and reduced demand in key markets, Volkswagen avoided unprecedented layoffs in Germany by expanding its global reach beyond Europe into EVs via a joint venture with the EV manufacturer, Rivian (Hawkins, 2024).

Volkswagen has faced significant supply chain issues, particularly related to the ongoing semiconductor shortage, which has affected its production and delivery targets. These supply chain disruptions are expected to last until 2025, with Volkswagen executives pointing to structural problems in the semiconductor supply market and the ongoing effects of the war in Ukraine, which disrupted the supply of key components, including cable harnesses from Ukrainian suppliers.

### 4.3 The New Global Trade and Supply Chain Analysis Paradigm: WIR, SDG, Infrastructure Initiatives

Shrivastava *et al.* (2022), in their analysis of UN Sustainable Development Goals (SDGs), argue that “examining and establishing a relationship between the United Nations Sustainable Development Goals (SDGs) and sustainable managerial practice is crucial” (p.17). Their research traces the process of converting raw materials into a final product. Extracting ores for raw materials is the first step in a supply chain, so extractive industries are categorized as “strategic.” Many developing countries are heavily involved in extractive industries, including mining, oil, and gas. Approximately 30 to 50% of mining activities globally are concentrated in developing countries, particularly those rich in natural resources such as minerals, oil, and gas. This percentage is even higher in low-income countries, with many nations relying on extractive industries for export revenue. For example, mining and related industries contribute more than 60% of their export revenue in Sub-Saharan Africa, Latin America, and South Asia. Dependency on mining in developing nations highlights these countries’ critical role in supplying the

global market with essential minerals, significantly as demand rises for materials vital to renewable energy technologies like lithium, cobalt, and copper. The dependency further underscores the vulnerability of the upstream dependencies in strategic industries, as they are often subject to challenges directly related to global multi-dimensional crises. The UN Trade and Development World Investment Report (WIR, 2024) revised its most recent report, highlighting the ongoing impact of global crises on strategic supply chain challenges.

According to the World Bank, approximately 3.5 billion people live in countries rich in these natural resources, and many of these countries rely on extractive industries. However, these industries face challenges in managing resource wealth responsibly and sustainably, which often requires improved governance and transparency (World Bank, 2024). The World Bank RISE Partnership is a global initiative that provides knowledge, technical assistance, and finance facilitation to create an enabling business climate generating new opportunities for developing inclusive supply chains of clean energy products in targeted low- and middle-income countries, bringing value addition and benefits of diversified economies; and support global decarbonization efforts through more diversified and inclusive supply chains of clean energy products for the worldwide economy (World Bank Group, 2024).

#### 4.3.1 WIR 2024: Top 10 Global Trends in Investment

According to the WIR 2024 report update, international production continues to expand, but investment patterns and global venture capitalist firms, or GVCs, are shifting under the influence of economic fracturing trends. MNEs are beginning to alter their international footprint, bringing strategic activities closer to home and considering options to de-risk supply chains. As shown in **Table 1**, this includes increasing access to critical minerals via significant cross-border investment and expansion of regional headquarters to increase regional autonomy and mitigate risks (UNCTAD, 2023b).

**Table 1** WIR Global Trends in Foreign Direct Investment (FDI)

Global Trend	Global Trend Description
1. Long-term FDI stagnation	The long-term trend in cross-border investment shows that a global FDI slowdown started in 2010. FDI no longer keeps pace with global trade and GDP. Trade within global value chains (GVCs) also slowed, confirming the close link between FDI and GVCs.
2. The increasing weight of services	The overall stagnation in FDI conceals sectoral differences. Cross-border investment in services flourishes while manufacturing lags, reflecting a global shift towards more services-centric and asset-light investment.
3. The deglobalization of manufacturing (FDI perspective)	Manufacturing FDI, stagnant for two decades, showed negative growth after the COVID-19 pandemic. Although global manufacturing activity and investment remain robust, the international component is shrinking, suggesting a trend toward deglobalization.
4. The growing ends of the smile curve	The transition from manufacturing to services is part of a broader change in the role of FDI in global value creation. Cross-border investment is moving from the center to the two ends of the “smile” curve, most notably towards services in business, information, and communication technology upstream and in marketing downstream.
5. Convergence of sectoral patterns across regions	All regions feel the transition’s effects towards services-oriented, asset-light FDI. Consequently, traditional differences in sectoral patterns between developed and developing regions are increasingly blurring.
6. The diminishing role of FDI in China	The declining share of China has significantly influenced the regional rebalancing of global FDI as a recipient country. Despite waning interest from multinational corporations in initiating investment projects in China, the country continues to maintain a dominant position in global manufacturing and trade, signifying a transformation in its global production model.

**Table 1** WIR Global Trends in Foreign Direct Investment (FDI) (Con’t)

Global Trend	Global Trend Description
7. Unstable investment relationships	Heightened geopolitical tensions are exacerbating the volatility of investment sources and destinations and the susceptibility of traditional investment links to disruptions. Instability in investment relationships limits the capacity of developing countries to strategically capitalize diversification opportunities arising from shifts in investment patterns.
8. Fracturing along geopolitical lines	Geopolitical differences are causing a fracturing trend in global FDI, with the reduction in investment between geopolitically distant countries highlighting the significant influence of such differences on investors’ location choices, overshadowing traditional determinants of FDI.
9. The sustainability imperative driving new FDI sectors	FDI in environmental technologies is the main pocket of growth outside services. Since 2010, while manufacturing investment stagnated across all industries, the number of greenfield projects along the entire value chain of environmental technologies sectors has increased steadily.
10. The increasing concentration of FDI and marginalization of developing countries	Amid historical shifts and economic fracturing, the share of greenfield projects in smaller developing countries and least-developed countries is diminishing. This trend exacerbates the marginalization and vulnerability of those countries as FDI becomes increasingly concentrated in developed and emerging economies.

In their 2024 Global Update, WIR reported trends over the past two years resulting from critical infrastructure disruptions due to military conflicts and climate change impacts. Strategic extractive resources sourced mainly in developing countries have become a central focus of new geopolitical infrastructure initiatives. As a group, foreign direct investment (FDI) flows to the Least Developed Countries (LDCs) increased only slightly over the last decade. However, the impact of multi-dimensional crises is evident across all types of investment flows: international project finance (IPF) decreased by 42% compared to 2019, and greenfield project announcements fell by 55%. Both investment types are crucial for building productive capacity and essential infrastructure and for sustainable development prospects for LDCs (WIR, 2024).

Extractive industries remain among the top recipient sectors for international project finance deals. Investment activity in LDCs in sectors relevant to attaining the SDGs – infrastructure, renewables, water and sanitation, food security, health, and education – suffered a significant blow in 2021-2022, primarily due to global retrenchment and restructuring of supply chains. Upstream extractive industries are a central concern in strategic supply chain resilience planning, but transportation is equally important. In their January 2024 briefing, UNCTAD warned that global trade disruptions were and will continue to escalate due to ongoing geopolitical tensions at the Suez Canal, the Black Sea, and the Panama Canal. Since then, hostilities in the Sea of Azov (Ukraine) and the Eastern Mediterranean (Israel/Lebanon) have put key trade routes at risk. These ongoing conflicts represent “a considerable threat due to maritime transport’s critical role in international trade (as) maritime transport is responsible for about 80% of the global movement of goods” (UNCTAD, 2024a, p3).

**4.3.2 Infrastructure Initiatives: Supply Chain-Driven Geostrategic Competition**

The global supply chain shocks resulting from the global pandemic, the Russia-Ukraine conflict, climate change disasters, and humanitarian migration upheavals proved that neither the global development bank system nor regional trade alliances were designed nor structured to respond to multi-dimensional crisis shocks. In the rush to deglobalize supply chains, MNE efforts were partly unsuccessful because efforts were based on false beliefs in supply chain myths and false narratives (Thakur-Weigold,

2024). With infrastructure-supported new supply sources at the solution's core, a significant shift toward multilateral infrastructure investment initiatives began in earnest.

Until 2021, there was no viable equivalent to China’s Belt and Road Initiative (BRI), the only genuinely global infrastructure investment system serving over 100 countries and strategic industries dependent on access to critical resources. Since 2022, there have been six newly formed or recently updated initiatives actively pursuing their missions: to focus on necessary investment, development, and monitoring of regional and global infrastructure, transportation, and connectivity of supply chains. Below is a comparative description of all global infrastructure investment initiatives, with BRI described first and the “alternatives to BRI” at the end of 2024.

**4.3.3 China Belt and Road Initiative (BRI)**

China’s Belt and Road Initiative (BRI) is a global development strategy that differs from traditional multilateral institutions like the World Bank, UNCTAD, or regional development banks. Rather than being a formal organization, the BRI is an infrastructure and investment project spearheaded by China to enhance trade, connectivity, and economic cooperation between Asia, Africa, Europe, and beyond.

- *Strategic Focus Infrastructure and Connectivity:* The primary focus of the BRI is infrastructure development, such as building roads, railways, ports, and energy pipelines to enhance trade routes and connectivity across countries, especially between China and its neighboring regions.
- *Investment and Trade:* The BRI deepens trade ties and economic integration. It often involves significant Chinese investment and loans for partner countries.
- *Scope and Structure:* Bilateral Agreements: Unlike multilateral institutions (like the World Bank or Asian Development Bank) that involve collective governance, bilateral agreements between China and individual countries drive the BRI. China negotiates directly with participating nations and financial institutions, including the China Development Bank and the Export-Import Bank of China, which essentially fund projects.
- *Funding Model:* The BRI is funded mainly through loans from Chinese banks, with infrastructure projects typically executed by Chinese companies.

- *Political Influence:* The BRI has been viewed as a tool for expanding China's global political influence. Some critics argue that BRI financing, which often creates debt for developing countries, may lead to "debt-trap diplomacy"—a situation where countries become heavily indebted to China.

*Belt and Road as a Global Initiative:* The BRI is unlike other organizations because it lacks a permanent institutional structure or headquarters. Instead, it functions as a series of cooperative agreements underpinned by financing from China. Its projects are typically large-scale infrastructure investments to improve connectivity across continents, focusing on creating new trade routes and economic corridors, especially between China and other regions (McBride *et al.*, 2023).

#### 4.3.4 BRI Alternative Infrastructure Initiatives

While no country is directly equivalent to China's BRI in scale and ambition, several countries and regions have launched initiatives to enhance infrastructure development, trade connectivity, and economic influence across borders. Notable initiatives and strategies that resemble aspects of the BRI include:

##### *The European Union: Global Gateway*

- *Description:* Launched in 2021, Global Gateway is the European Union's strategy to boost global infrastructure development, focusing on sustainability and transparency. It aims to mobilize up to €300 billion by 2027 for investments in digital, energy, transport infrastructure, healthcare, and education, especially in developing regions.
- *Purpose:* The initiative is seen as a response to China's BRI, offering an alternative model for global development that prioritizes democratic values, environmental sustainability, and responsible financing.
- *Regions Targeted:* The Global Gateway targets Africa, Asia, Latin America, and the EU's neighboring countries.
- *Comparison to BRI:* Unlike the BRI, primarily funded by China and its state-owned banks, the Global Gateway emphasizes partnerships with other countries, private investments, and multilateral development banks like the European Investment Bank (EIB). It also aims to promote green and digital transitions in partner countries (Global Gateway, 2024)

##### *G7 Nations: Build Back Better World (B3W) Initiative*

- *Description:* The Build Back Better World (B3W) initiative, announced in 2021 at the G7 meeting, is designed to counter the BRI by providing a transparent and sustainable alternative for infrastructure financing, focusing on climate, health, digital technology, and gender equity.
- *Purpose:* B3W aims to narrow the infrastructure gap in developing countries, helping nations address critical infrastructure needs while promoting democratic governance, anti-corruption measures, and environmental standards.

- *Regions Targeted:* Low- and middle-income countries, particularly Africa, Asia, and Latin America.
- *Comparison to BRI:* B3W is more focused on values-driven infrastructure, addressing climate change, and ensuring debt sustainability, whereas BRI has faced criticism for sometimes leading to "debt-trap diplomacy." B3W is still in its early stages, so its full impact is yet to be seen (The White House, 2021).

##### *Japan: Partnership for Quality Infrastructure*

- *Description:* Japan launched its Partnership for Quality Infrastructure (PQI) in 2015 to promote high-quality infrastructure development in Asia and beyond. The initiative emphasizes sustainable growth, environmental considerations, and transparency.
- *Purpose:* PQI aims to promote infrastructure projects that ensure high efficiency, longevity, and minimal environmental impact, countering some of the criticism that the BRI faces around quality and sustainability.
- *Regions Targeted:* Asia-Pacific region, extending to Africa and other areas.
- *Comparison to BRI:* Japan's PQI focuses more on "quality" infrastructure over sheer volume. Unlike the BRI, which often prioritizes rapid construction and large-scale investments, Japan aims for sustainability, long-term performance, and partnerships with local entities and international financial institutions such as the Asian Development Bank (ADB) (Osaki, 2019).

##### *India: Infrastructure for Resilient Island States (IRIS)*

- *Description:* In partnership with the Coalition for Disaster Resilient Infrastructure (CDRI), India launched the Infrastructure for Resilient Island States (IRIS) initiative in 2021. It aims to build climate-resilient infrastructure in small island developing states (SIDS).
- *Purpose:* IRIS focuses on helping island nations in the Caribbean, Pacific, and Indian Oceans build resilient infrastructure to withstand climate change effects like rising sea levels, hurricanes, and other natural disasters.
- *Regions Targeted:* Small Island Developing States (SIDS), particularly in the Caribbean and the Pacific.
- *Comparison to BRI:* Although smaller in scale and more focused on climate resilience, IRIS shares BRI's focus on infrastructure. However, IRIS specializes in helping vulnerable nations prepare for climate-related disasters rather than broad trade and connectivity goals (Coalition for Disaster Resilient Infrastructure 2024).

##### *Russia: Eurasian Economic Union (EAEU)*

- *Description:* The Eurasian Economic Union (EAEU), established in 2015, aims to create a single market between Russia and several neighboring countries, including Belarus, Kazakhstan, Kyrgyzstan, and Armenia. It focuses on economic integration and connectivity, with a special emphasis on transportation and energy.

- *Purpose:* The EAEU seeks to foster regional cooperation, trade, and infrastructure development across the Eurasian region.
- *Regions Targeted:* Eurasia, particularly the former Soviet states.
- *Comparison to BRI:* While not on the same scale as the BRI, the EAEU shares some similarities in its focus on connectivity and trade within a regional context. In many cases, it also complements the BRI, with several member countries actively participating in both initiatives (EAEU Official Website 2024).

#### *African Union (AU): Programme for Infrastructure Development in Africa (PIDA)*

- *Description:* The Programme for Infrastructure Development in Africa (PIDA) initiative launched by the African Union (AU) to promote large-scale infrastructure projects across the continent, focusing on energy, transport, and telecommunications.
- *Purpose:* PIDA aims to integrate African economies and foster trade through improved regional infrastructure.
- *Regions Targeted:* African continent.
- *Comparison to BRI:* PIDA is an African-led initiative focused on intra-continental infrastructure development, but it shares similar goals with the BRI regarding improving connectivity and trade. China's BRI has also collaborated with African nations to complement PIDA's infrastructure projects. (AU-PIDA 2024).

## **4.4. Infrastructure Initiative Case Studies**

### *4.4.1 Case Examples: B3W, Global Gateway, and PQI*

The following three cases highlight recent developments in global Infrastructure Initiative activity to demonstrate the rapid acceleration of geopolitical interest and influence in controlling global supply chains.

#### *Case: G7 Build Back Better Initiative (B3W)*

In 2021, the G7 countries launched the “Build Back Better World” (B3W) infrastructure initiative strategically targeting low and middle-income countries, including those in Africa (Mwadi Makengo *et al.*, 2022). Holland & Faulconbridge (2021) argued that B3W was created most significantly because of BRI projects' non-transparent procurement systems, failure to respect socio-environmental rights, uncertainty surrounding implementation plans, and required non-disclosure loan agreements, and disputes regarding infrastructure ownership in the case of failure. The diverse practices and standards for project selection, construction, and operations stem from different financing approaches and procurement practices. Projects can differ in their openness to competition, opportunities for participation among local firms, and demands to transfer technology and expertise.

#### *Case: European Union (EU) Global Gateway*

On 1 December 2021, the EU presented its proposed global infrastructure investment scheme, the “Global Gateway” (European Commission, 2021). The Global Gateway is intended to further the EU's ambition to become a global power by harnessing its economic size and

political attractiveness. The initiative seeks to incentivize European efforts visibly and effectively in infrastructure investment. On a geostrategic level, the Gateway should provide countries with an alternative partnership to China's Belt and Road Initiative.

This considerable increase in investment, much of which is to be delivered in risky environments, should be achieved through a combination of EU development aid, loan guarantees, and public investment capital raised by European investment banks and private finance. The scheme focuses on building “connectivity” via physical and digital communications infrastructure projects, renewable energy, trade, and capacity-building. The Global Gateway should strengthen connections between Europe and the world, thus improving value chains and promoting global interdependence and peaceful cooperation.

The European Commission has outlined several motivating factors behind the initiative, including challenges posed by the Covid-19 pandemic to crucial global supply chains; Europe's interest in ensuring that global connections and networks develop in line with democratic values and high-quality standards; the need to bridge a global infrastructure investment deficit of €13 trillion by 2040; continuing support to Europe's partner countries to achieve the infrastructure-related Sustainable Development Goals (Furness & Keijzer, 2022).

According to reports from the EU Global Gateway news service, the Global Gateway aims to mobilize public and private sector infrastructure investments of up to €300 billion by 2027. The mobilization will include up to €135 billion in investments from the European Fund for Sustainable Development Plus (EFSD+) to support projects designed to meet UNCTAD Sustainable Development Goals (SDGs) 2030 targets. The Global Gateway will focus on five sectors: digital (secure and open internet), climate and clean energy, transport; health (including vaccines and supply chains); and education and research. The proposal announced plans to create a European Export Credit Facility to complement existing member state arrangements and safeguards to strengthen the competitiveness of EU businesses in developing countries (European Commission, 2021).

#### *Case: Partnership for Quality Infrastructure (PQI)*

Japan's major infrastructure initiative is the Partnership for Quality Infrastructure (PQI), designed to mobilize financial resources and know-how to promote infrastructure investment in quantity and quality. The focus on “quality” is quite particular to Japan in part due to its multi-decade-long investment in the Asian region tied to its Quality Management manufacturing approach but also because it signals “quality” as a central proposition to establish multilateral standard-setting in a competitive global infrastructure investment context (Pascha, 2020).

The PQI investment initiative language emphasizes economic efficiency over the long life cycle of infrastructure investments in safety, resilience against natural disasters, environmental and social impact consideration, and contributions to the local society and economy (Ministry of Finance of Japan, 2022, April 22). In its institutional set-up, PQI stresses the role of four pillars, namely assistance through Japan's primary provider of

technical cooperation, the Japan International Cooperation Agency (JICA), collaboration with ADB, funding with consideration of the high-risk profiles of infrastructure investments through the Japan Bank for International Cooperation (JBIC) and a newly founded Japan Overseas Infrastructure Investment Corporation (JOIN), and the promotion of the quality aspect through relevant international standard-setting.

## 5. DISCUSSION

### 5.1. Sustainable Development Goals: A Framework to Unite Investment

Global supply chain crises highlighted the limitations of traditional trade and development institutions such as the

OECD, World Bank, WTO, and IMF in responding to large-scale shocks. Each of these geopolitical institutions analyzes and responds to crises based on their distinct legal mandates, which adds complexity to formulating a coordinated global response. Research by Orhan (2022) illustrated the diminishing role of global development banks and regional trade blocs in mitigating crises. As shown in **Table 2**, institutions like the Asian Development Bank (ADB), African Development Bank (AfDB), and BRICS Development Bank (NDB) have struggled to address multifaceted crises like the COVID-19 pandemic and the Russia-Ukraine conflict. Their broad mandate and long-term financing approach can act as a buffer for more infrastructure-focused initiatives.

**Table 2** Global Development Banks

Bank Name	Website	Region	Purpose
Asian Development Bank (ADB)	adb.org	Asia-Pacific	Promotes social and economic development in Asia by providing loans, grants, and expertise.
Inter-American Development Bank (IDB)	iadb.org	Latin America and the Caribbean	Supports Latin American and Caribbean economic development, social development, and regional integration.
African Development Bank (AfDB)	afdb.org	Africa	Fosters sustainable economic development and social progress in African countries, focusing on poverty reduction.
European Investment Bank (EIB)	eib.org	European Union	Provides finance and expertise for sound and sustainable investment projects that contribute to the European Union's policy goals.
Eurasian Development Bank (EDB)	eabr.org	Eurasian Economic Union (EAEU) and Central Asia	Promotes economic growth and integration in its member countries by financing investment projects in infrastructure, energy, and transport sectors.
BRICS Development Bank (New Development Bank - NDB)	ndb.int	BRICS (Brazil, Russia, India, China, South Africa)	Supports infrastructure and sustainable development projects in BRICS and other emerging economies.

Infrastructure initiatives, such as the EU's Global Gateway, the G7's Build Back Better World (B3W), and Japan's Partnership for Quality Infrastructure (PQI) reflect strategic missions focused on mitigating current and preventing future supply chain disruptions by investing in sustainable, high-quality infrastructure aligned with the United Nations Sustainable Development Goals (SDGs). This shift underscores the increasing importance of a central unifying framework, SDGs, to focus infrastructure development and trade connectivity in securing global supply chains and ensuring long-term economic stability, particularly amid geopolitical and environmental crises.

### 5.2 SDG Report 2024: A Call to Global Action

The Sustainable Development Goals Report 2024 makes for sobering reading. Few SDG targets are on track, and the majority show minimal or no progress. The report, however, highlights that despite profoundly worrying trends, progress is being made and will require the global business community to continue:

“Reform of the outdated, dysfunctional, and unfair international financial architecture to facilitate far greater investment in the SDGs. And massive investment and more effective partnerships to drive critical transitions across food, energy, and digital connectivity to unlock progress right across the Goals” (UN DESA 2024).

Progress assessment in 2024 reveals that the world is “severely off track to realize the 2030 Agenda. Of the 169 targets, 34 lack sufficient trend data or additional analysis,

and only 17% sufficiently display progress for achievement by 2030. Nearly half exhibit moderate to severe deviations from the desired trajectory, with 30% showing marginal progress and 18% showing moderate progress. Alarming, 18% indicate stagnation and 17% regression below the 2015 baseline levels. This comprehensive assessment underscores the urgent need for intensified efforts to put the SDGs on course (UN DESA 2024).

This lack of measurable progress toward achieving 2030 SDG goals comes even though one-third of indicators had good data coverage in 2016 when the global indicator framework for SDGs and associated targets were initially adopted. By 2020, all 231 indicators had established and internationally agreed methodologies. However, in 2024, there remains a persistent lack of trend data from 49% of the indicators in more than half of all participating countries (UN DESA 2024).

Recently, Hosseini, Ivanov, and Dolgui (2019) proposed quantitative methods for supply chain resilience analysis based on three lines of defense: (1) absorptive capacity that acts before a disruption occurs; (2) adaptive capacity or the capability of the supply chain to overcome disruptions; and (3) restorative capacity, reflecting the ability of a system to be restored quickly and efficiently when other lines of defense fail. Based on these three lines of defense, the authors proposed a new definition of supply chain resilience as follows: the “capability to utilize the absorptive capacity of supply chain entities to repulse and withstand the impacts of perturbations, to minimize the

consequences of disruptions and their propagation by utilizing adaptive capacity and to recover performance level to normal operations in a cost-efficient manner using restorative capacity when absorptive and adaptive capacities are not sufficient.” (Hosseini *et al.*, 2019). Six lessons learned from firms, investors, governments, and academics regarding the complex reality of supply chain resilience in the face of global crises:

*Decentralized Decision-Making in Supply Chains.* No firm or point controls modern supply chains; they consist of distributed networks with multiple decision-makers (Graves, 2021). This reflects the de-verticalization trend, where firms increasingly rely on third-party suppliers and global networks, making resilience a collective responsibility rather than one firm’s domain.

*Economic Performance of Networks vs. Deglobalization.* The literature highlights that supply chains function as networks of interdependent firms (Chopra & Meindl, 2016). These networks generate economic performance through collaboration, even across borders, suggesting that deglobalization, or moving away from international partners, might not inherently improve resilience. Networks that spread risks across multiple regions are more resilient than purely localized or nationalized operations (Tang, 2006).

*The Myth of Excessively Lean Supply Chains.* The popular narrative that lean supply chains (e.g., Just-in-Time inventory systems) were overly vulnerable to crises is debunked. Lean practices, especially when done correctly (as in the case of Toyota), can still be resilient when combined with strategic stockpiling or buffer capacities (Choi *et al.*, 2023). The key to resilience is not simply abandoning lean systems but balancing efficiency with strategic redundancy.

*The Role of Redundancy and Flexibility.* There is a growing understanding that resilience is not just about stockpiling inventory but also about creating flexibility in the supply chain (Sheffi, 2020). Resilience includes having backup suppliers, shared capacities, and even alliances with competitors, as highlighted by Sodhi and Tang (2021).

*International Networks and Real Options Theory.* Firms operating in global supply chains benefit from having multiple production sites across different countries, allowing them to shift operations in response to crises. The practice further aligns with the real options theory, which suggests that global networks allow for greater flexibility and opportunity during times of crisis (Čirjevskis, 2024).

*Resilience through Collaboration and Public-Private Partnerships.* Firms and governments can create “industry commons,” a concept where companies collaborate (sometimes even with competitors) and coordinate on building shared capacities for emergencies. This approach emphasizes that public-private partnerships, rather than isolated firm-level interventions, may be the future of crisis response in global supply chains (Sodhi & Tang, 2021).

In summary, supply chains today are decentralized and network-based, where firms must collaborate for resilience. Globalization is not necessarily a vulnerability. Diversified global networks allow firms to shift operations and continue functioning during regional or global crises. The lean vs. redundancy debate is nuanced: firms

need strategic buffers, but lean principles, when properly applied, can still support resilience. Collaboration and shared resources through public-private partnerships and industry alliances are critical to future resilience efforts. Firms maintaining a singular focus on SDG9 (Industry, Innovation, and Infrastructure) and building supply chain resilience capacity will see results that benefit supply chain resilience and have more sustained impacts on SDG goals beyond goal 9.

### 5.3 Strategic Supply Chain Resilience: A Framework for Analysis and Planning

To make industries resilient in global crises like pandemics or geopolitical conflicts, businesses and industry stakeholders must implement strategies to increase flexibility, diversity, and adaptability in their supply chains and operations. These measures are rooted in risk management, technology adoption, and collaboration across industries and governments. Our research shows that the geopolitical infrastructure investment environment provides robust opportunities for firms of any size to identify sources of technical, educational, financial, and legal support critical to their efforts to maintain and grow their supply chains.

Our SSCR Framework, as shown in **Table 3**, presents a process that firms should consider including in their strategic analysis efforts to capitalize on globally available opportunities.

### 5.4 SSCR Analysis and Planning Objectives

Through a step-by-step process directed at investigating and curating opportunities for support and collaboration, MNEs and their supply chain partners can create new avenues for building supply chain resilience. The long-term mission is to build resilience by focusing on eight strategic outcomes:

1. *Diversification of Supply Chains through Multiple Suppliers.* Companies must avoid reliance on a single supplier or region, which is especially important when disruptions hit specific geographies. Businesses can better manage risks by sourcing materials and components from multiple countries or regions. For instance, during the COVID-19 pandemic, industries that relied heavily on Chinese manufacturing suffered more severe disruptions. In contrast, those with diversified supply chains could adapt more quickly.
2. *Supply Chain Visibility and Transparency via Real-time Monitoring.* Companies can improve the visibility of their supply chains by using technologies including the Internet of Things (IoT), artificial intelligence (AI), and blockchain. Such visibility allows companies to monitor where delays or disruptions might occur and respond more quickly.
3. *Regionalization and Nearshoring by Moving Production Closer to Home.* To minimize exposure to global risks, companies are shifting toward regionalized supply chains or nearshoring—moving production facilities closer to major consumer markets. The shift reduces reliance on distant countries and minimizes delays caused by international shipping disruptions.

4. *Inventory Buffers and Just-in-Case Production via Inventory Stockpiling.* Rather than following the Just-in-Time (JIT) model, which minimizes inventory to reduce costs, companies are building inventory buffers to have extra supplies on hand in case of disruptions.
5. *Digital Transformation via Automation and Digital Tools.* Investing in automation and digital tools of robotics, machine learning, and cloud-based systems makes operations more efficient and flexible. Digital twins, a technology that creates a virtual replica of supply chains, allows businesses to simulate and predict potential disruptions, testing how changes in one part of the chain can affect the whole system.
6. *Collaboration and Public-Private Partnerships via Collaboration with Governments.* Industries are increasingly forming partnerships with governments and international organizations to improve resilience. Governments can offer support through subsidies, logistics assistance, or policy frameworks that make rerouting supply chains easier or quickly setting up new production facilities.
7. *Sustainability and Circular Economy via Reducing Dependency on External Inputs.* By embracing sustainability practices and moving toward a circular economy, industries can reduce their reliance on finite global resources and external suppliers. The circular economy involves reusing materials, remanufacturing, and recycling, which can buffer industries against shortages of raw materials.
8. *Scenario Planning and Stress Testing via Preparedness for Different Scenarios.* Industries can adopt scenario planning to simulate various potential disruptions (pandemics, geopolitical conflicts, climate disasters) and create contingency plans. Regular stress tests help identify supply chain and business operations weaknesses so companies can act proactively rather than reactively.

**Table 3** Strategic Supply Chain Resilience: External Analysis Research Process

ANALYSIS		Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Sustainable Development Goals - SDGs	SSRC Analysis PRIORITY	Infrastructure Initiatives	Geopolitical Institutions	NGOs	Consulting	Multinational Corporations
1 No Poverty	3		WBG, IMF, UNDP	OXFAM, CARE, Borgen	Deloitte, McKinsey, Accenture	Unilever, Nestle, Mastercard
2 Zero Hunger	3		FAO, WFP, IFAD	Action Against Hunger, WFP	KPMG, PWC, Bain	Cargill, Pepsico, Danone
3 Health, Well-Being	2		WHO, Global Fund, GAVI	Doctors Without Borders, PATH, Global Fund	BCG, McKinsey, EY	Pfizer, Johnson & Johnson, Novo Nordisk
4 Quality Education	2		UNSECO, GPE, World Bank	Room to Read, Save the Children, GPE	Deloitte, PWC, Capgemini	Microsoft, IBM, Google
5 Gender Equality	3		UN Women, WBG, ILO	Women for Women Intl, Plan Intl, Equality Now	Accenture, McKinsey, EY	Accenture, P&G, L'Oréal
6 Clean Water, Sanitation	2	PIDA	UN-Water, WHO, GWP	Water.org, Charity: Water, Water Project	Jacobs Engineering, AECOM, Tetra Tech	NESTLE, Coca-Cola, Grundfos
7 Affordable Clean Energy	1	BRI, EUGG, PIDA	IRENA, UNEP, World Bank	Practical Action, Solar Aid, Barefoot College	Schneider Electric, Siemens, Deloitte	Tesla, Siemens, Enel
8 Decent Work, Economic Growth		BRI, B3W, EAEU	ILO, World Bank, OECD	Fair Trade Intl, ILRF, Grameen Foundation	PWC, McKinsey, Bain	IKEA, Starbucks, Mastercard
9 Industry, Innovation, Infrastructure	1	EUGG, PQI, PIDA, IRIS, EAEU, BDN	UNIDO, WEF, ADB	Engineers Without Borders, Technoserve, Greenpeace	Bechtel, Siemens, KPMG	Siemens, GM, 3M
10 Reduced Inequality	3	G3W, B3W	UNDO, OECD, World Bank	Equality Trust, Amnesty Intl, Global Citizen	McKinsey, Bain, PWC	Salesforce, PayPal, Unilever
11 Sustainable Cities, Communities	1	EUGG, IRIS	UN-Habitat, GEF, World Bank	Habitat for Humanity, ICLI, C40 Cities	AECOM, Arup, Jacobs Engineering	Siemens, ABB, Schneider Electric
12 Responsible Consumption and Production	1	PQI	UNEO, WBCSD, OECD	Eileen MacArthur Foundation, Slow Food Intl, WWF	Accenture, EY, McKinsey	Patagonia, IKEA, Unilever

**Table 3** Strategic Supply Chain Resilience: External Analysis Research Process (Con’t)

ANALYSIS		Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Sustainable Development Goals - SDGs	SSRC Analysis PRIORITY	Infrastructure Initiatives	Geopolitical Institutions	NGOs	Consulting	Multinational Corporations
13 Climate Action	1	B3W, PQI, IRIS, EAEU, BDN	IPCC, UNFCCC, GCF	350.Org, The Climate Group, Friends of the Earth Intl	Bain, McKinsey, Deloitte	Apple, Google, NIKE
14 Life Below Water	2		UNEP, GEF	Oceana, Ocean Cleanup, Sea Shepherd, Global Fishing Watch	The Nature Conservancy, Jacobs Engineering, PWC	Unilever, NESTLE, DELL
15 Life on Land	2		UNCCD, CBD, WWF	WWF, Rainforest Alliance, Conservation International	Tetra Tech, McKinsey, Bain	Apple, Mars, Amazon
16 Peace, Justice, Strong Institutions	3		UNODC, ICJ, Transparency International	Transparency Intl, Intl Crisis Group, Human Rights Watch	KPMG, PWC, McKinsey	PWC, Deloitte, EY
17 Partnerships for the Goals	2	BRI, BDN	UNDO, WEF,	CIVICUS, WEF, GPEDC	Deloitte, EY	SAP, Accenture, Microsoft

Industries are shifting toward diversified, regionalized supply chains, increasing their digital capabilities, and collaborating more with governments and international partners to protect themselves and become resilient against global crises. Through tools like supply chain transparency, inventory buffers, and digital transformation, industries can adapt more quickly to disruptions and minimize the impact of crises like pandemics or geopolitical conflicts. The goal is to build supply chains and operational systems that are flexible, adaptive, and capable of recovering quickly in the face of external shocks.

## 6. CONCLUSIONS

Unprecedented disruptions, including the COVID-19 pandemic, the Russia-Ukraine conflict, and escalating climate-related crises, have fundamentally reshaped the global supply chain landscape. These disruptions have exposed critical vulnerabilities in supply chain structures, challenging traditional frameworks and theories. This research highlights cases and frameworks of how multinational enterprises (MNEs) are navigating crises through strategic supply chain resilience measures, including diversification, regionalization, and collaboration. We have presented the role of geopolitical infrastructure initiatives, like China’s Belt and Road Initiative (BRI) and alternatives like the EU’s Global Gateway and G7’s B3W, to bolster supply chain resilience. By integrating insights from the UNCTAD World Investment Report and Sustainable Development Goals (SDGs), particularly SDG9, this research underscores the urgency of adopting a multi-stakeholder approach combining technological innovation, policy alignment, and robust investment in infrastructure to mitigate future disruptions.

This study presents an opportunity for researchers to delve deeper into the intersection of geopolitical strategies and supply chain resilience, mainly focusing on

underexplored areas such as labor elasticity, supply chain visibility, and the role of emerging economies in global trade. On the other hand, companies are encouraged to adopt the Strategic Supply Chain Resilience (SSCR) framework outlined in this paper, prioritizing diversification, digital transformation, and public-private partnerships. Future efforts should also emphasize integrating sustainability practices into supply chains, reducing dependency on finite resources, and fostering collaboration across industries and governments. These strategies will fortify supply chains against future crises and contribute to achieving long-term global development goals.

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