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RESEARCH PULSE

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WELCOME TO RESEARCH PULSE

In this issue, we continue to share the research endeavours of Curtin Singapore.

Dr Hazik Mohamed continues to lead with a thought-provoking analysis on transitioning beyond net zero greenhouse emissions. Dr Daniel Chew shares some of his practice-based view insights from his recent book publication on employment legislation in Singapore. Dr Adrian Tan follows with his research perspectives on the decoupling of supply chains in the current global trade tariff era.

Finally, we continue to feature the latest publications from our academic community.

Thank you for tuning in to Research Pulse.

Best Wishes,
Curtin Singapore Research

Beyond Net Zero: Restructuring Sustainability in an Age of Climate Disruption

Contributed by Dr Hazik Mohamed

The escalating climate crisis has prompted a global movement towards achieving "net zero" greenhouse gas emissions, wherein the amount of emissions produced is balanced by the amount removed from the atmosphere. While this goal is crucial, it represents a baseline rather than the pinnacle of our environmental aspirations. To truly address the multifaceted challenges posed by climate change, we must move beyond net zero and embrace a more holistic approach to sustainability that encompasses environmental integrity, economic resilience, and social equity.



The Limitations of Net Zero

The net zero framework is primarily concerned with balancing emissions through reductions and offsets. However, this strategy has significant shortcomings, including overreliance on offsets, disregard for biodiversity, technological uncertainty, and equity considerations.

Many net-zero plans rely largely on carbon offsets, such as afforestation or carbon capture technology. While beneficial, these strategies can shift attention away from the critical need to cut emissions at their source and may not always result in the desired environmental advantages (Cambridge Institute for Sustainability Leadership, 2025).

A solitary focus on carbon may obscure other vital environmental challenges, such as biodiversity loss, soil degradation, and water scarcity. Sustainable solutions must address these interconnected issues in order to maintain natural balance.

Many of the suggested net-zero technologies, such as carbon capture and storage (CCS) and direct air capture (DAC), are still in the early stages of development. There is no certainty that they will be scaled efficiently and inexpensively within the timescale required to avoid catastrophic climate impacts.

Net zero initiatives frequently fail to consider social factors, such as marginalized communities' needs and rights. A complete strategy for sustainability must include social fairness to achieve a fair transition. Developing countries, which contribute the least to emissions but suffer the most from climate change, need help transitioning to low-carbon economies without compromising development goals (UNEP, 2025).

Beyond Net Zero: A Holistic Approach

To overcome the constraints of the net zero paradigm, we must embrace a broader framework that considers environmental, economic, and social factors. This includes regenerative practices, the circular economy, nature-based solutions (NbS), social equity and inclusion, and behavioral change.

Moving from maintaining current systems to regenerating natural ecosystems. Regenerative agriculture practices improve soil health, water retention, and biodiversity while simultaneously sequestering carbon (The Guardian, 2025). Regenerative forestry, for example, tries to rehabilitate degraded ecosystems while also fostering large-scale carbon sequestration.

The shift from a linear "take-make-dispose" approach to a circular economy that prioritizes resource efficiency, waste minimization, and product lifetime management. This method reduces environmental impact and promotes economic resilience by lowering reliance on limited natural resources and pollution.



Investing in solutions that use natural processes to tackle climate change. Wetland restoration, urban green areas, and forestry projects can provide additional benefits such as carbon sequestration, flood reduction, and increased biodiversity.

Ensure that sustainability activities are inclusive and equitable, meeting the needs of all communities, especially those disproportionately affected by climate change. This involves establishing green jobs, promoting environmental justice, and assisting community-led conservation activities. To be effective and equitable, climate solutions must include indigenous knowledge and locally led adaptation methods.

Encouraging people, corporations, and governments to adopt sustainable behaviors and practices. This includes education, incentives, and legal frameworks to encourage environmentally friendly lifestyles, sustainable consumption patterns, and corporate accountability.

Innovations Driving the Transition

Several developing breakthroughs, such as Sustainable Finance, Green Chemistry, Sustainable Sports Infrastructure, Hydrogen Economy, and Smart Cities and Digitalization, demonstrate the transition beyond net zero.

Financial institutions are reconsidering their policies regarding environmental, social, and governance (ESG) standards. For example, BNP Paribas is redesigning its sustainable finance strategy to prioritize lucrative investments that match long-term climate goals, with a focus on themes such as adaptation, transition, conservation, and societal resilience (Reuters, 2025). The importance of green bonds, sustainability-linked loans, and impact investing is expanding, indicating a trend toward long-term sustainable economic planning.



Green chemistry advancements make it easier to recycle rare earth metals, which are required for sustainable energy applications. Queen's University Belfast researchers devised ways using ionic liquids to efficiently recover these metals from end-of-life products, promoting a circular economy and reducing environmental harm (The Guardian, 2025). These innovations help reduce the carbon footprint of renewable energy infrastructure while ensuring the sustainable use of critical materials.

The sports industry is reducing its carbon impact by using sustainable methods. For example, Amsterdam's Johan Cruyff Arena has been renovated with solar panels and wind energy systems, and New York City FC intends to develop an all-electric stadium with net-zero emissions by 2040 (The Wall Street Journal, 2025). These initiatives show how sustainable practices can be implemented into large-scale infrastructure projects.



The development of green hydrogen as a renewable energy source has gained traction as industry seeks alternatives to fossil fuels. Countries like Japan and Germany are spending extensively in hydrogen infrastructure with the goal of decarbonizing industrial processes and transportation systems.

Emerging technologies such as artificial intelligence (AI), the Internet of Things (IoT), and blockchain are employed to optimize energy efficiency, reduce waste, and enhance sustainability efforts in urban environments.

Policy and Corporate Leadership

A holistic approach to sustainability necessitates collaborative efforts from policymakers and industry leaders through policy frameworks, industry responsibility, and public-private partnerships.

Carbon pricing, renewable energy subsidies, and resource efficiency laws are all examples of policies that governments should put in place to encourage sustainable practices. These frameworks should also consider social equality, ensuring that the advantages of sustainability are broadly distributed. International agreements, such as the Paris Agreement, must be supplemented with effective national policies and enforcement mechanisms.

Businesses have an important role in promoting sustainability. Initiatives such as the Allianz Foundation's "Beyond Net Zero Strategy" show commitment to climate responsibility by incorporating environmental issues into all parts of operations and supporting climate-just societies (Allianz Foundation, 2025). Companies are increasingly setting science-based targets to align their business models with a sustainable future.

Collaborative efforts between governments, corporations, and civil society can drive meaningful change. These partnerships can accelerate the adoption of clean technologies, enhance knowledge-sharing, and mobilize investment in sustainable projects.



The Role of Individuals and Communities

While systemic changes are necessary, individuals and local communities play an important role in promoting sustainability. Grassroots initiatives promoting sustainable agriculture, zero-waste lifestyles, and renewable energy use highlight the power of collective action. Consumer decisions, such as choosing sustainable products and reducing carbon-intensive activities, have the potential to impact market trends and company policies.

Education and awareness campaigns can inspire people to take significant action, such as decreasing single-use plastics or supporting policies that prioritize sustainability. Governments and organizations should invest in environmental literacy programs to build a culture of sustainability.



The Path Forward

Transitioning beyond net zero involves a paradigm shift in our approach to sustainability. It entails acknowledging the interdependence of environmental, economic, and social systems and adopting solutions that address these areas holistically. In the face of climate change, we can create a resilient and equitable future by adopting regenerative practices, encouraging innovation, and assuring inclusive policy.

Finally, advancing beyond net zero entails redefining our relationship with the world and embracing sustainability as a key tenet of human progress. This allows us to construct a future in which people and nature coexist peacefully.

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Getting to Know About Employment Legislation in Singapore

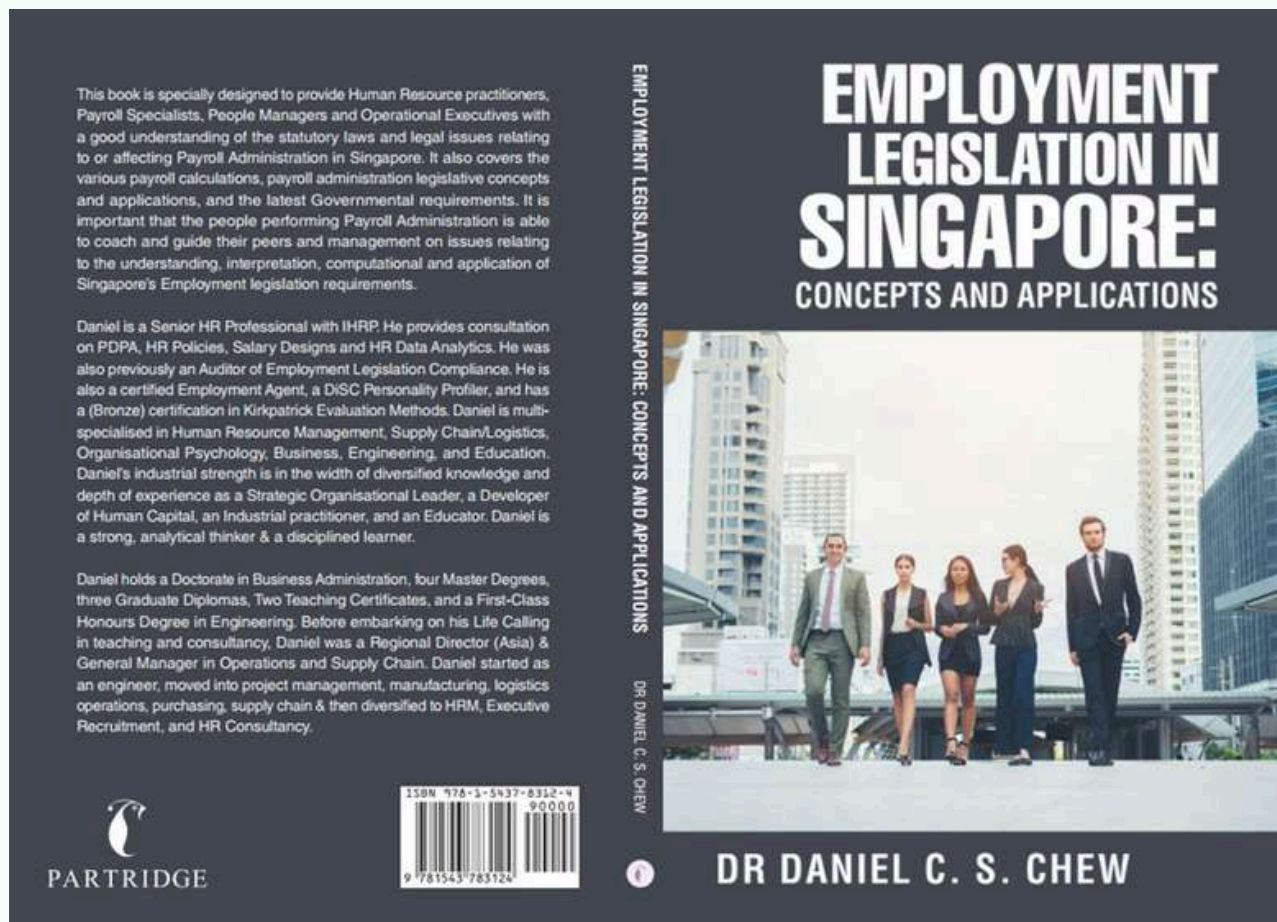
Contributed by Dr Daniel Chew

I recently published a book entitled "Employment Legislation in Singapore: Concepts and Applications" which was released in February 2025. And I am delighted to be able to share my perspectives on employment legislation in Singapore as written in the book.

This book is specially written to provide Human Resource practitioners, Payroll Specialists, People Managers and Operational Executives with a good understanding of the statutory laws and legal issues relating to or affecting payroll administration in Singapore. It educates readers on the various payroll calculations, payroll administration legislative concepts and applications, and the latest Government requirements. My opinion is that there is inadequate knowledge on employment legislation amongst employers and it is important that people performing payroll administration are able to coach and guide their peers and management on issues relating to the understanding, interpretation, computational and application of Singapore's Employment legislation requirements.



The book is recommended for all supervisors, executives, managers and self-employed individuals who are managing employees in any type of organisation in Singapore. It is essential that managers operating in Singapore understand, interpret and apply the legislation accurately in compliance with the Singapore Governmental requirements. As for employees, knowledge of Singapore's Employment legislation requirements helps one to know their legislative rights - what are mandatory and what are discretionary benefits - to ensure a strong employer-employee relationship.



Decoupling of Supply Chains: Bane or Boon?

Contributed by Dr Adrian Tan

With the world economy set into uncharted territories with unprecedented generic global trade tariffs imposed by the US since April 2025 and with impending sectoral tariffs also to be imposed, in particular starting with 100% duties on the pharmaceutical sector for branded drugs from 1 October 2025, it is expected that supply chains are naturally set for reconfiguration to manage the impact and ripple effects of these tariffs. How supply chains react and reconfigure will ultimately affect the state of businesses and the livelihoods of people. It may be probable that supply chains could fragment to reconfigure. Although such an idea might seem unlikely in the near to medium term, the uncertainty it casts certainly brings anxiety to individuals, communities, societies, businesses and governments. It is in this context that the research question arises, seeking to push boundaries and provoke deeper reflection.



Are decoupled supply chains a bane or boon for the global economy?

In order to address this question, it would be interesting to visit the concept of decoupling from the lens of electrical engineering. In electrical engineering, parallel circuits allow current to flow through multiple independent paths. If one path fails, the circuit still functions via the remaining paths. By contrast, series circuits are fragile wherein the failure of a single element disrupts the entire system.

Drawing from this metaphor, we can argue that supply chain design resembles a circuit configuration. A coupled (series-like) supply chain relies on tightly integrated, sequential partners, where disruption at any node can ripple across the network. In contrast, a decoupled (parallel-like) supply chain is modular and diversified, enabling continuity even when certain nodes or pathways are impaired. The argument can be represented by the visualisation in Figure 1.

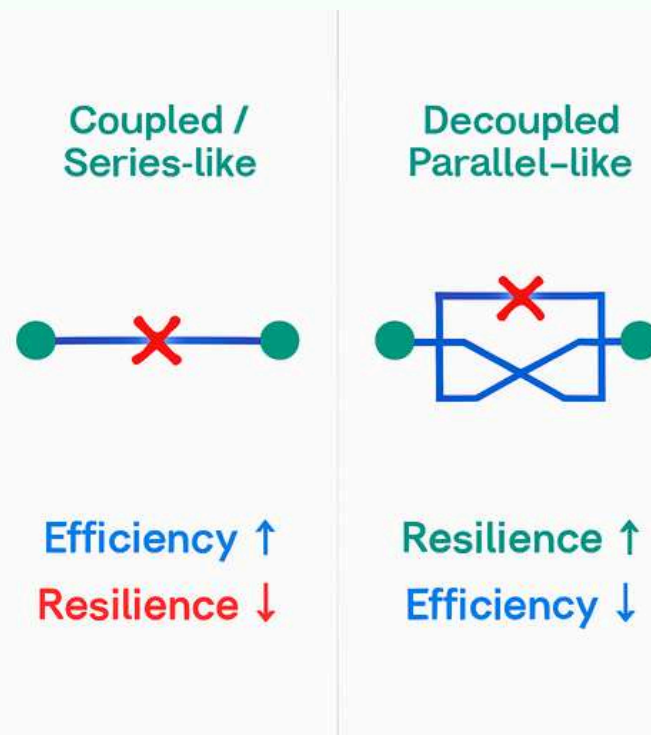


Figure 1: Comparison of coupled and decoupled circuit (supply chain) design.
[Note X Red represents failure points or disruptions which break the flow]

The figure summarises that a parallel circuit or a decoupled supply chain design is a design for resilience, and manifests the trade-off for supply chain resilience. While the sacrifice is short-term efficiency, long-term adaptability to uncertainties is developed. However, it is arguable that a coupled supply chain system design is effective and cost-efficient for stable and certain business environment conditions.

Hence, it is possible to develop a further probable argument that while parallel (decoupled) supply chain systems usually mean higher costs (due to the enactment of policies such as the maintenance of multiple suppliers, inventory buffers and redundant logistics) and complex coordination challenges within the supply chain, a decoupled supply chain may be “better off” because of its characteristics of resilience, flexibility, risk diversification and adaptive capacity. Decoupled supply chains are resilient because the multiple parallel pathways it has means the supply chain is less likely to collapse from a single disruption. There is also flexibility such that firms can switch between suppliers or logistics routes depending on conditions. Exposure to geopolitical, environmental, or operational risks is spread out, hence the enactment of risk diversification. Decoupled supply chains are also easier to reconfigure when technology, demand, or policy shifts, hence breeding adaptive capacity.

In view of the arguments, it is possible to propose the following propositions:

Proposition 1:

Supply chains designed with decoupled, parallel structures will demonstrate higher resilience under conditions of disruption compared to tightly coupled, series-like supply chains.

Proposition 2:

While decoupled supply chains increase resilience through redundancy and flexibility, they also incur higher coordination and resource costs, suggesting a trade-off between operational efficiency and systemic robustness.

Proposition 3:

The relative advantage of decoupled supply chains is contingent on (business) environmental uncertainties. In stable contexts, coupled systems may outperform on efficiency, but under uncertainty, decoupled systems provide superior adaptive capacity.

It is in my view that these propositions may be visited further through appropriate theoretical lenses such as systems theory (proposition 1), resource dependency theory (proposition 2), complex adaptive systems theory (proposition 3) for hypothesis development and testing for contribution to the study of supply chain resilience in uncertain times.



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Latest Publications

By Dr Zahirah Zainol, Dr Ashley Tong, Dr Dang Thao Trang Duong and Dr Nurhafihz Noor:

"Key attributes of mobile apps for halal tourism: an analysis of online reviews using Leximancer"

~ Journal of Islamic Accounting and Business Research (DOI: 10.1108/JIABR-03-2025-0173)

By Dr Zahirah Zainol, Dr Ashley Tong and Dr Nurhafihz Noor:

"ChatGPT and higher education student well-being: role of subjective norm and anthropomorphism with TAM"

~ Journal of Information, Communication and Ethics in Society (DOI: 10.1108/JICES-03-2025-0071)

By Mr Jeffrey Woo and Dr Adrian Tan:

"Nurses' and Nursing Students' Experiences of Using Generative Artificial Intelligence: A Scoping Review"

~ To be presented at Sigma Asia Regional Conference 2025 (5–6 December, Hong Kong)

By Mr Bruce Kee Hong Huat (PhD Candidate) with PhD supervisors (Associate Professor Richard Oloruntoba and Dr Adrian Tan):

"Enacting Circular Economy Practices through Collaborative Buyer-Supplier Engagements: A Practice-Based Study of Singapore's Grocery Food Supply Chains"

~ To be presented at Australian Maritime Logistics Research Network Symposium 2025 (27 November, Adelaide, Australia)

