Submission to the review of the National Freight and Supply Chain Strategy

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In support of our national economic competitiveness, besides efficiency and productivity, the freight and logistics sector in Australia also need to address the challenges related to achieving goals such as net zero emissions, enhancing public health and safety as well as improving resilience, especially in the face of the increasing frequency and intensity of natural hazard events. To ensure that all these goals are being attained, we consider that following areas need to be incorporated into the revised National Freight and Supply Chain Strategy:

1. Sustainability, the SDGs and Climate Change Mitigation
2. Physical Internet RoadMap
3. Hyperconnected City Logistics
4. Network Efficiency, Reliability and Resiliency
5. Land use planning

A brief overview of how these areas can contribute to enhancing Australia's Freight and Logistics is provided below.

1. Sustainability, the SDGs and Climate Change Mitigation

The United Nations adopted the Sustainable Development Goals (SDGs) in 2015 as a standard framework to focus, measure and monitor sustainable development. A total of 17 goals, 169 targets, and 231 unique indicators are defined to support countries in achieving sustainability by 2030 (United Nations, 2015). Aside from assessing sustainable development generally, the SDGs can also be used to evaluate and benchmark the level of sustainable logistics (Kahalimoghadam, Thompson and Rajabifard, 2023). This work identified that 13 out of 17 SDGs are directly related to sustainable logistics (at varying levels of influence). At the lower level of analysis, we have identified 21 targets relevant to sustainable logistics.

Going beyond the traditional indicators of the freight and logistics sector performance, broader sustainability metrics that are directly mapped to the relevant SDGs need to be added. These need to be supported by collecting and monitoring data, and developing procedures that can be used by jurisdictions and by organisations involved in freight and logistics to monitor how their performance is tracking against these targets, and, if/when needed, how to make adjustments to meet them.

In particular, the sector's greenhouse gas (GHG) emissions or (equivalent) carbon footprint needs to be determined and monitored against national targets, or the sector's portion of the national target (e.g., based on our Paris Agreement Nationally Determined Contribution and/or science-based targets). This means explicitly defining the sector's emissions reduction target, which can be turned into a "carbon budget". This also means collecting relevant data (which will include setting requirements and protocols for data reporting from industry), and designing policies and initiatives to support meeting the target at designated periods.

2. Physical Internet RoadMap

The Physical Internet (PI) aims to improve the sustainability, efficiency and resilience of freight systems by promoting more collaborative, integrated and open networks (Montreuil, 2011). PI endeavours to reduce the amount of unladen trips and increase load factors of vehicles as well as utilisation of vehicles and storage facilities.

Following the Digital Internet's manner of super-efficient moving of data and information across the global digital network based on transfer protocols and shared assets and resources, PI aims to transform the way physical objects are moved, stored, realized, supplied & used, pursuing global logistics efficiency & sustainability. Key elements are open and shared networks, standardised and modular load carriers as well as track and trace protocols & certificates.

PI involves compatible load units and coordinated transfers between modes. Instead of focusing on the right mode for the right load, PI aims to achieve *the right modes and load factors for the right loads*. This involves designing multi-modal networks that integrate vehicles, loads and transhipment facilities. PI can improve sustainability by significantly reducing vehicle kilometres of travel and facilitating low and zero emission vehicles. PI can also substantially increase supply chain resilience (Peng et al., 2021).

Our global logistics systems are currently inefficient from economic, environmental, and societal perspectives. The accelerating demands of e-commerce will continue the pressure on our country's air, sea and land transport infrastructure and our cities, which have to face the worsening congestion, pollution and GHG emissions impacts. Furthermore, the increasing frequency and intensity of natural hazard events lead to a broad range of disruptions.

But the above also means that the opportunities for freight transport and logistics transformation are significant. The challenge of climate change mitigation, the prevailing market changes and rapid technological trends are driving a reconfiguration and transition.

At heart of the PI concept is the ideal of sustainable, efficient and robust supply chains, in which different forms of transport can be matched with the required movement of goods. This is underpinned by the shared-economy model, propelled by digital innovations and facilitated via transfer points in the network, designed to improve efficiency and performance of freight systems. R&D in this field has grown exponentially in the last decade especially in North America and the European Union.

The European Technology Platform (ETP) has set-up the Alliance for Logistics Innovation through Collaboration in Europe (ALICE) to develop a comprehensive strategy for research, innovation and market deployment of logistics and supply chain management innovation in Europe. ALICE has identified the critical components for realising the PI concept and developed a *Roadmap to the Physical Internet* by 2040 with the following vision:

> "Future logistics, from global to urban, will be founded on a global open system of systems enabling assets and resources in logistics networks to be interconnected facilitating their use to the maximum capacity and productivity while increasing agility and resilience of supply chains."

More details of the ALICE initiative can be found at: ALICE. The Roadmap can be found at: PI Roadmap.

The Asia-Pacific and South-East Asian (SEA) region needs to be a major partner and active contributor and collaborator towards this vision. The region's priorities and unique context and challenges need to be better understood and addressed as part of a global effort to bring this vision to reality. Thus, we propose a work program be conducted in Australia that aims to review and establish a transformative national freight and logistics vision and develop the strategic and implementation pathways in harmony with the ALICE PI Roadmap to promote regional and global R&D collaboration and information sharing and hasten the freight transport and logistics sector's PI transformation process.

The review should propose that an Australian PI roadmap be developed at the earliest opportunity, and to lead the burgeoning interest in PI development in the Asia-Pacific, such as Japan, China, Singapore and in the Philippines.

The ALICE PI Roadmap has identified government leadership in setting policy and rules, standards, data infrastructure and access, freight documentation requirements, investment opportunities and related matters as critical elements to achieve the PI vision. The primary aims are to develop a 2040 national freight and transport logistics transformation vision or agenda, with a special focus on the development and implementation of PI in the specific context of Australia.

Amongst other things, the roadmap would document the current challenges and future directions of the urban freight and logistics sector in Australia against the ALICE PI Roadmap and identify the country's and the Asia-Pacific region's R&D priorities and opportunities to address national and region-specific issues while also contributing to global PI development and implementation efforts. As part of the process, it is also expected that initial baselining of measures of sustainability and resilience performance can be initiated in Australia – for example, facilitating the measuring and monitoring of the sector's carbon footprint – and some high-priority research themes will be identified based on Australian stakeholder challenges and priorities.

For relevant government agencies, for example, PI can be embedded into strategic and operational plans to ensure that the right projects and investments can be undertaken in the right order to facilitate implementation of PI in the future.

The support of government partners would be required to: (a) share their vision, challenges and priorities towards a more sustainable, resilient and innovative freight transport and logistics future; (b) invite and encourage the active participation and feedback of sector stakeholders, esp. those from industry; (c) host the proposed local seminar-workshop events; and (d) help promote the PI concept, vision and roadmap recommendations.

3. Hyperconnected City Logistics

Hyperconnected City Logistics (HCL) based on the principles of the Physical Internet (Montreuil, 2011) and City Logistics (Taniguchi and Thompson, 2015), involves creating more sustainable urban distribution systems by promoting collaborative, integrated and open networks (Crainic and Montreuil, 2016). HCL involves developing new approaches to create multi-modal networks, consisting of trucks, vans, bikes and walkers with transfers of goods being conducted at micro-consolidation centres or parcel locker banks. Existing urban distribution networks can be transformed by shippers and carriers sharing vehicles and storage facilities to dramatically reduce distances travelled allowing electric and non-motorised vehicles to become more practical and viable.

The revised National Freight and Supply Strategy should provide guidance and planning principles for implementing initiatives that have high potential for improving the sustainability and efficiency of urban logistics systems, including:

Micro-consolidation Centres: for facilitating cost effective use of low and zero emission vehicles to perform last kilometre deliveries (Thompson, et al, 2023).

Intermodal terminals: for promoting more freight on rail.

Public Parcel Lockers: for reducing the number and distances travelled by delivery vans in local areas (Pan et al., 2021).

Digital platforms: for coordinating and negotiating the exchange of goods between modes (Guo et al, 2021).

4. Network Efficiency, Reliability and Resiliency

Current vehicle load factors in urban areas are low due to rising levels of eCommence and rapid response logistics systems. Consolidation has been identified as key to achieving sustainable urban goods transport (OECD, 2003).

Increasing network efficiency is considered to be important for reducing environmental impacts of freight. *Improved vehicle loading* or the tonnes moved by km driven (tonne-km / vehicle–km ratio) has been identified as a key driver for decreasing emissions (ITF 2018). This involves reducing the number of empty trips or km driven by freight vehicles, increasing the use of *available capacity* of vehicles and reducing the overall distances driven by vehicles while transporting the same amount of goods.

Network efficiency should be considered a key performance indicator (KPI) for assessing the sustainability of the Australian freight system. Therefore, a program to measure and track vehicle load factors and network efficiency should be established.

The pursuit for efficiency, however, should be balanced also with the goals of network reliability and resilience, especially considering the potential disruptions from extreme events including those related to the increasing frequency and intensity of natural hazard events caused by climate change.

Thus, measures and targets for network reliability and resiliency are also needed.

5. Land use planning

As part of the relatively medium to longer term goal for the development of PI in Australia (i.e., multi-tiered networks) and the more contemporary need to improve the efficiency and sustainability of urban freight and logistics, there is a need to preserve freight & logistics areas in inner and middle areas of major cities to reduce the amount of transport of goods between ports, storage facilities and final consumers. Logistics sprawl has been identified as major trend and threat to sustainable and efficient in urban freight systems (Aljohani and Thompson, 2016). The relocation of Melbourne's wholesale fruit and vegetable market from West Melbourne to Epping has contributed to a substantial increase in emissions and transport costs for wholesalers and retailers (Aljohani and Thompson, 2018). Redevelopment of inner industrial areas and freight terminals for housing such as Port Melbourne will significantly increase distribution costs and emissions from freight vehicles.

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