



**SITUATION ANALYSIS AND MAPPING OF CRITICAL
TECHNOLOGIES**

**INTEGRATED NEW STANDARD
FOR SMART MULTIMODAL
CORRIDORS**

Authored by

Salma Abbasi, FRGS, FCMI

*Chairperson and CEO, eWorldwide Group and
Vice Chair, Digital Resilience Initiative, IEEE*

Rezwanul Haque Jami

*Head of eCommerce, a2i, ICT Division
People's Republic of Bangladesh*

Stuart Monks

*Chief Innovation Science and Technology Officer
eWorldwide Group*

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INTEGRATED NEW STANDARD FOR SMART MULTIMODAL CORRIDORS

ABSTRACT

The compounding effects of COVID-19, climate change, ongoing wars, political tensions, and trade restrictions are exacerbating the global food crisis, and urgent actions are needed to holistically strengthen the resilience and sustainability of agrifood systems globally. This paper outlines the need to address and streamline the transportation and logistics system in the agrifood sector through the adoption of a smart multimodal corridor approach, which is resilient, green, and inclusive, to ensure that agrifood products reach those most in need swiftly and safely.

EXECUTIVE SUMMARY

The transportation and logistics system in the agrifood sector can be divided into six interrelated components, which form the foundation of a holistic framework: (i) infrastructure building; (ii) systems interoperability and data exchange, including for real-time tracking and tracing and end-to-end cold chain development; (iii) ethics and governance in robotics and artificial intelligence (AI) for automation and intelligence; (iv) human capacity development and continuous reskilling and upskilling; (v) safety, security, and well-being of the transportation and logistics workforce; and (vi) cooperation, data exchange, and collaboration for cross-border agrifood trade. These key principles of resilience building, green transition, and inclusion that should be embedded in the design and development of smart multimodal corridors cut across all components of the framework.

There is a significant advancement in the development of global standards for systems interoperability and data exchange across smart multimodal corridors. However, they do not address other components necessary for the successful development and deployment of resilient, green, and inclusive smart multimodal corridors. A comprehensive package of standards is needed for smart multimodal corridors that incorporate the principles of resilience, green transition, and inclusion and the six components of the framework for transportation and logistics systems for the agrifood sector, building on existing relevant standards developed by global standards-setting organizations.

1. INTRODUCTION

The United Nations estimates that the global population will reach almost 10 billion by 2050, with the majority living in lower- and middle-income countries in Africa and Asia. Yet, about a third of the world's food produced is lost due to poor handling, transportation and storage, and lack of cold chain logistics.¹ The rapidly growing population and longer life expectancy are creating greater demands for food and placing pressure on agrifood systems to increase production, reduce spoilage and wastage, and ensure that nutritious and safe food is accessible to everyone.

Now more than ever, agrifood systems need to be resilient to multiple and compounding shocks and crises, such as climate change impacts, pandemics, conflicts, wars, and trade restrictions that are transboundary in nature. Global standards are needed for harmonized and seamless transportation and logistics linkages across nations and regions to enhance the delivery of agrifood products. In addition to ensuring that agrifood products reach those most in need swiftly and safely, improvements in agrifood transportation and logistics systems can contribute to increased employment and better livelihoods, especially since two-thirds of the global extremely poor earn their livelihood in farming. Productivity growth in the agriculture sector appears to have the largest impact on poverty reduction when compared with other sectors.² Improvements in agrifood transportation and logistics systems will also support advancements in other sectors, such as healthcare, particularly in the delivery of medicine, vaccines, and other necessary perishables.

The agrifood transportation and logistics system is a complex system that involves the management of the flow of goods, resources, and information between the point of origin and the destination. It requires an integrated process of planning, optimizing, and implementing the multimodal transportation of goods by air, rail, road, sea, and/or inland waterways, as well as the various logistical operations, which include receiving and recording goods from different suppliers, storing goods at appropriate locations, retrieving and picking goods when they are needed, and preparing shipment to buyers. The agrifood supply chain requires careful temperature control across a cold chain, which adds to the complexity of the logistics.

¹ Food and Agriculture Organization. *Seeking End to Loss and Waste of Food Along Production Chain*. [Online]. Available: <https://www.fao.org/in-action/seeking-end-to-loss-and-waste-of-food-along-production-chain/en/>

² World Bank. (2019). *Harvesting Prosperity: Technology and Productivity Growth in Agriculture*. [Online]. Available: <https://openknowledge.worldbank.org/bitstream/handle/10986/32350/9781464813931.pdf>

Companies and countries are digitalizing their operations to enhance efficiency and gain a competitive advantage. However, the actors in a traditional logistics network are often siloed from each other—warehouse management has separate dashboards from freight forwarders. An integrated smart transportation and logistics system breaks these silos and gives each stakeholder in the logistics network end-to-end visibility. With enhanced visibility and transparency, trust can be built to share infrastructure and resources, such as warehousing and transportation facilities, across the supply chain through a digitally integrated cross-border transportation and logistics system.

This paper outlines the justification and need for an integrated framework for transportation and logistics systems for the agrifood sector, which adopts a smart multimodal corridor approach, and is resilient, green, and inclusive. Each of the terms will be unpacked in turn with highlights on existing bottlenecks and gaps that need to be addressed in order to ensure food security for all.

2. WHAT IS A SMART MULTIMODAL CORRIDOR?

This section discusses the characteristics of smart multimodal corridors.

2.1. SMART SYSTEMS

Smart implies fully and effectively leveraging frontier digital technology and data to meet the goals of providing resilient and sustainable agrifood transportation and logistics systems. Frontier digital technologies like artificial intelligence (AI), big data analytics, cloud computing, and the Internet of Things (IoT) are bringing enormous opportunities for transformation. But existing, small, cheap, and easy-to-manage systems, when integrated properly, also have a substantial role to contribute.

Smart means that systems and data related to all infrastructures and facilities along the agrifood transportation and logistics chain, such as roads, rail, inland waterways, sea and air routes, as well as ports, terminals, border post facilities, logistics parks and hubs, warehouses and cold storage facilities, and other logistics services, are digitalized and integrated with each other to provide real-time visibility and end-to-end transparency of operations for enhanced efficiency and effectiveness toward sustainable development.

However, as frontier digital technologies also present significant challenges and risks related to access, privacy, security, and trust, these challenges and risks need to be recognized and mitigated from the start in the planning and design of smart systems. There is a need to consider the persistent divides related to access to affordable digital connectivity, transportation, and logistics services. Legal, ethical, and accountability systems also need to be in place to protect people against maligned and inappropriate use of data and technologies, with assurance that people's rights, safety, and well-being are prioritized. The lack of such safeguarding systems could potentially erode trust in the smart system, resulting in stakeholders' reluctance to share infrastructure, resources, and data necessary for the successful implementation of end-to-end smart multimodal systems.

A United Nations report on the impact of COVID-19 on transportation and logistics shows that ports with "smart port" features generally fared better during the disruption caused by COVID-19. These ports had invested in digital infrastructure and connectivity and promoted data exchange among port authorities, shippers, and freight forwarders. Digital platforms facilitated the submission and processing of documentation, permits, operations, and certificates, while improved coordination between stakeholders and relevant public authorities kept information flowing and actions aligned.³ A World Bank report also finds that end-to-end supply chain digitalization, especially in emerging economies, is allowing countries to shorten port delays by up to 70% compared to those in developed countries.⁴

2.2. MULTIMODAL CORRIDORS

Countries around the world have been adopting a multimodal corridor approach that links different infrastructure sectors together. It refers to the process of spatially organizing two or more transportation and logistics infrastructure assets into corridors to enhance the social and economic development of the corridor countries. This approach implies a deliberate focus on regional integration in which all the previously mentioned infrastructures and facilities complement one another.

Multimodal transport optimizes the use of different transport modes to provide an efficient use of relevant resources and reduce the cost of transportation and logistics, particularly for bulk products across long distances. Countries are promoting multimodal transport and shifting a large part of the freight

³ United Nations Conference on Trade and Development. (May 17, 2022). *Sustainable and Resilient Transport and Trade Facilitation in Times of Pandemic and Beyond: Key Challenges and Opportunities*. [Online]. Available: https://unctad.org/system/files/official-document/cimem7d26_en.pdf

⁴ World Bank. (Apr. 21, 2023). *Press Release: World Bank Releases Logistics Performance Index 2023*. [Online]. Available: <https://www.worldbank.org/en/news/press-release/2023/04/21/world-bank-releases-logistics-performance-index-2023>

journey away from the road to rail and waterway transport that is generally more environmentally friendly. Yet, multimodal transport is typically slower than road transport and considered unsuitable for the delivery of urgent or perishable products. For less-developed multimodal systems, there may be delays, lower levels of traceability, and higher risk of damage, especially in the transition to different transport modes. However, with digitalization and the use of technology, multimodal transport is becoming more efficient, reliable, and safe.

For the developing regions with large numbers of landlocked developing countries, like Eastern Africa, the United Nations underscores the importance of transportation corridors.⁵ United Nations agencies and development banks have promoted infrastructure project preparation, funding, and maintenance based on a corridor approach to optimize access to landlocked developing countries. In Africa, the Programme for Infrastructure Development in Africa (PIDA), which is a flagship programme of the African Union to develop the infrastructure in transport, energy, information and communications technology (ICT), and transboundary water resources, has mainstreamed all projects along designated corridors.⁶

In the implementation of the multimodal corridor approach, the current trend points to the application of synchromodality, which is the synchronization of multimodal services with different speeds and lead times, and the alignment of equipment and services on corridors and hubs with the multimodal networks. For synchromodality, real-time information is needed for decision-making. The development of smart infrastructure and intelligent transportation systems using sensors, IoT networks, cloud technologies, and AI has enabled real-time monitoring and the application of synchromodality. In addition, these technologies that allow real-time monitoring have helped to optimize transportation and logistics operations, reduce the cost of infrastructure and equipment maintenance, enhance safety, and reduce carbon emissions.⁷

⁵ UN-OHRLS. (2020). *Report on Best Practices for Effective Transit Transport Corridor Development and Management*. [Online]. Available: https://www.un.org/ohrls/sites/www.un.org.ohrls/files/ldcs_publications/corridor-report--final- un-ohrls_28may2020.pdf

⁶ AU. (Feb. 27, 2020). *Strategic Note: The Integrated Corridor Approach: A Holistic Infrastructure Planning Framework to Establish PIDA-PAP 2*. [Online]. Available: https://pp2.au-pida.org/wp-content/uploads/2020/04/English-Strategic-Note_Integrated-Corridor-Approach-and-Selection-Criteria-AUC.pdf; and AU. (Feb. 27, 2020). *Elaboration of the 2021–2030 Priority Action Plan for the AU Program for Infrastructure Development in Africa (PIDA)*. [Online]. Available: <https://pp2.au-pida.org/wp-content/uploads/2020/04/English-Analytical-Report-Integrated-Corridor-Approach-and-Selection-Criteria.pdf>.

⁷ Y. de Blic. (2018). *IT Technologies for Inland Waterway Transport*. European Regional Development Fund. [Online]. Available: https://duepublico2.uni-due.de/servlets/MCRFileNodeServlet/duepublico_derivate_00046730/ST4W_IT_Technologies.pdf