



Efficiency and Sustainability in Multi-Modal Supply Chains



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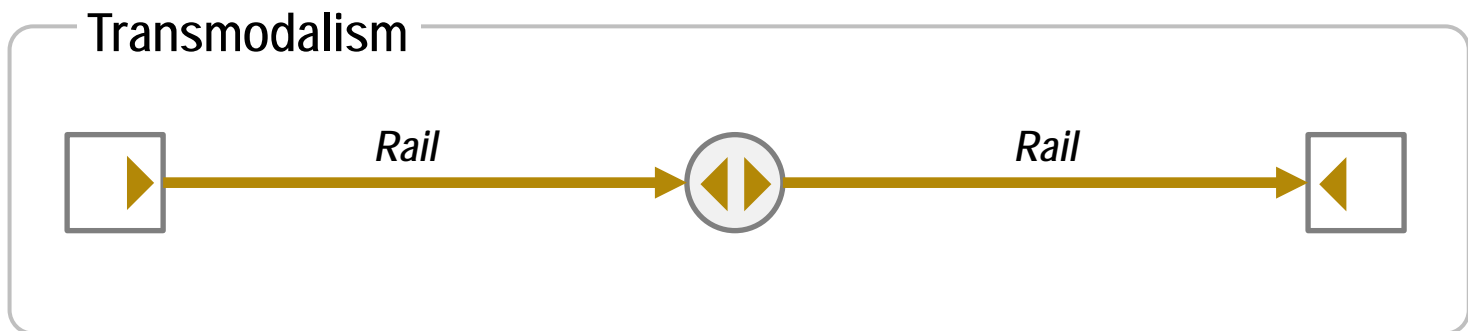
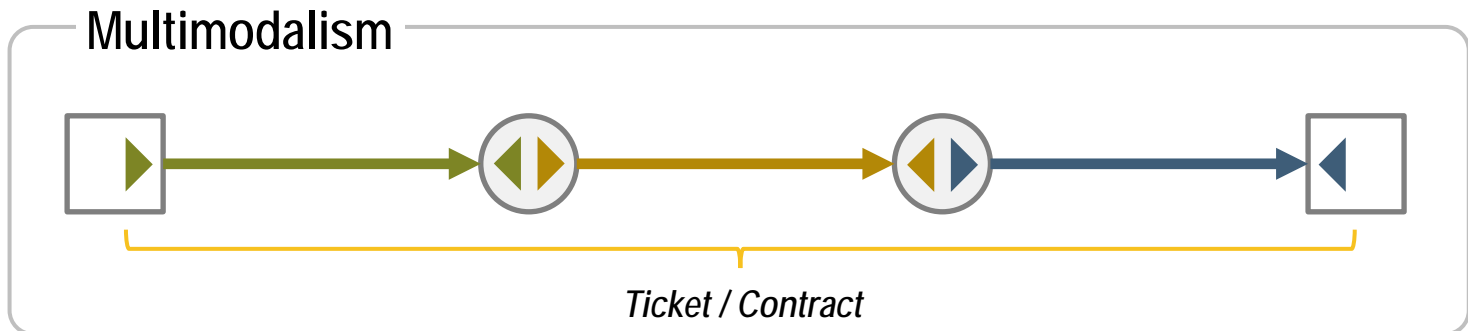
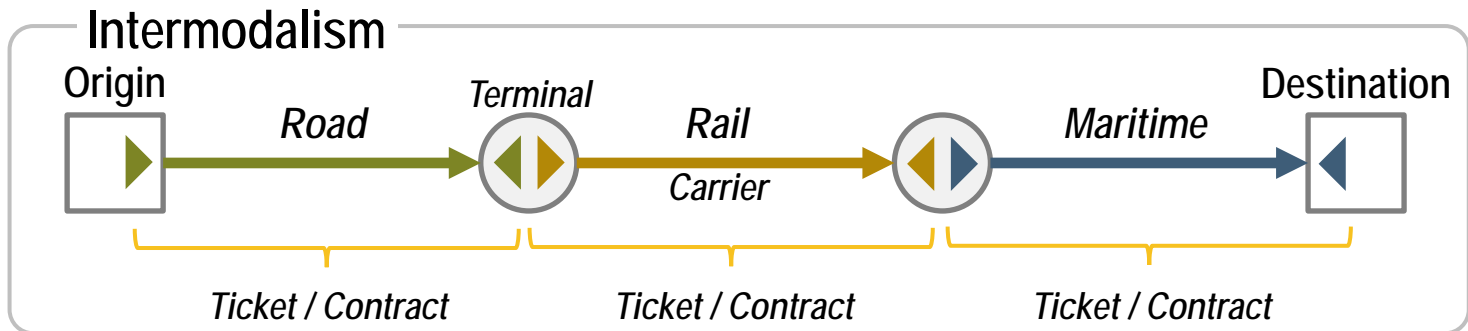
Efficiency and Sustainability in Multi-Modal Supply Chains

- Global Supply Chains and Multi-Modal Transportation
- The Greening of Supply Chains: An Elusive Goal
- Integrating Multi Modal Supply Chains
- Conclusion: Efficiency or Sustainability?

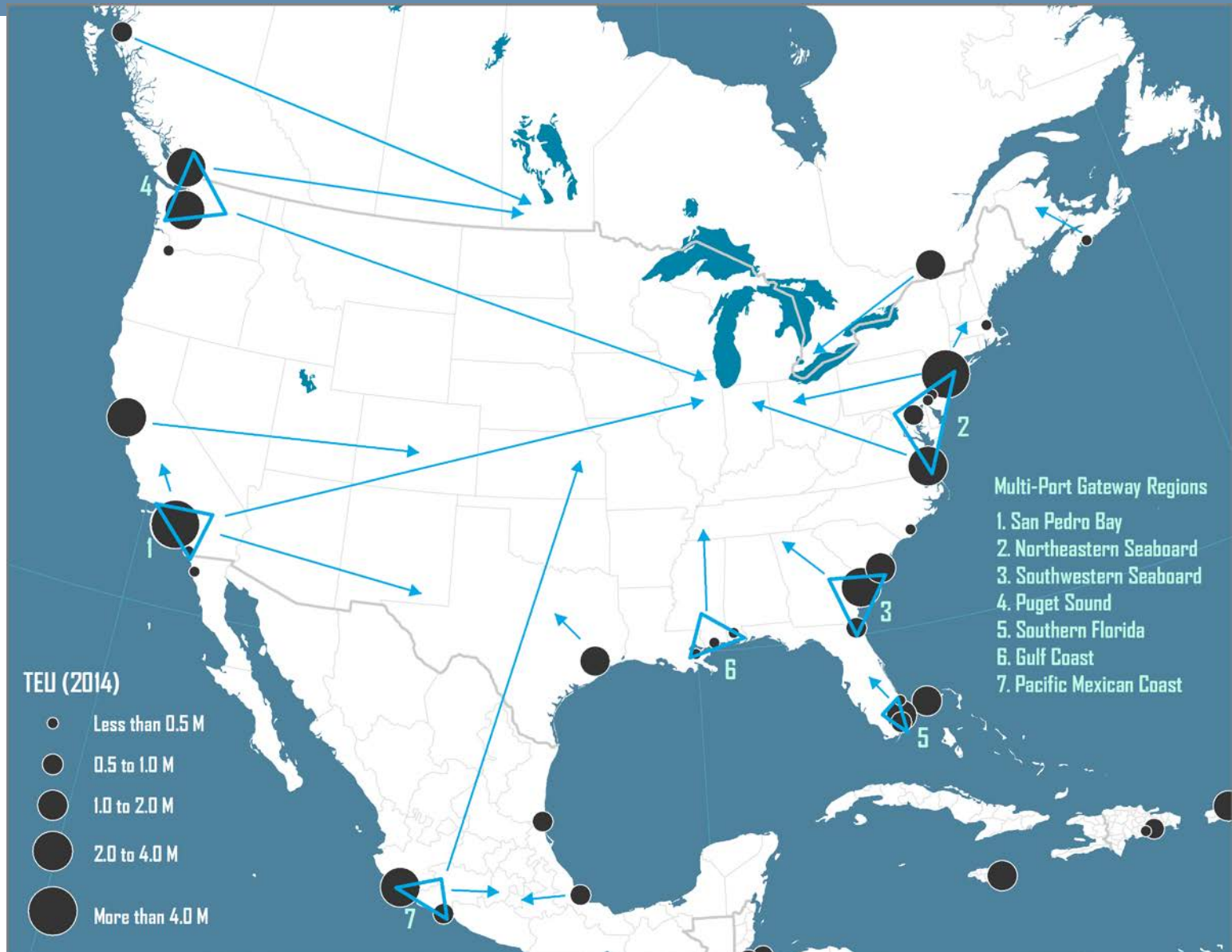


Global Supply Chains and Multi-Modal Transportation

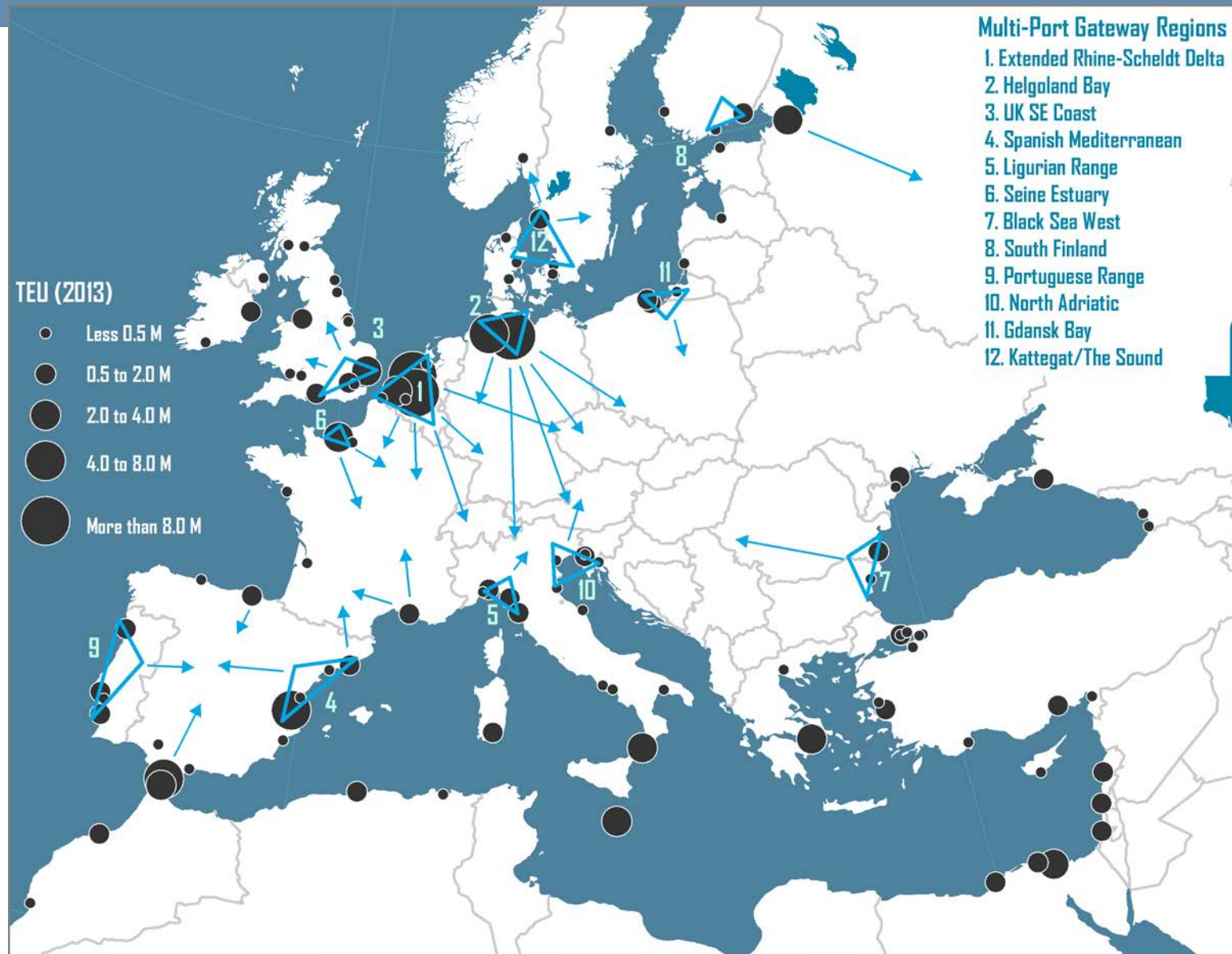
Intermodalism, Multimodalism and Transmodalism



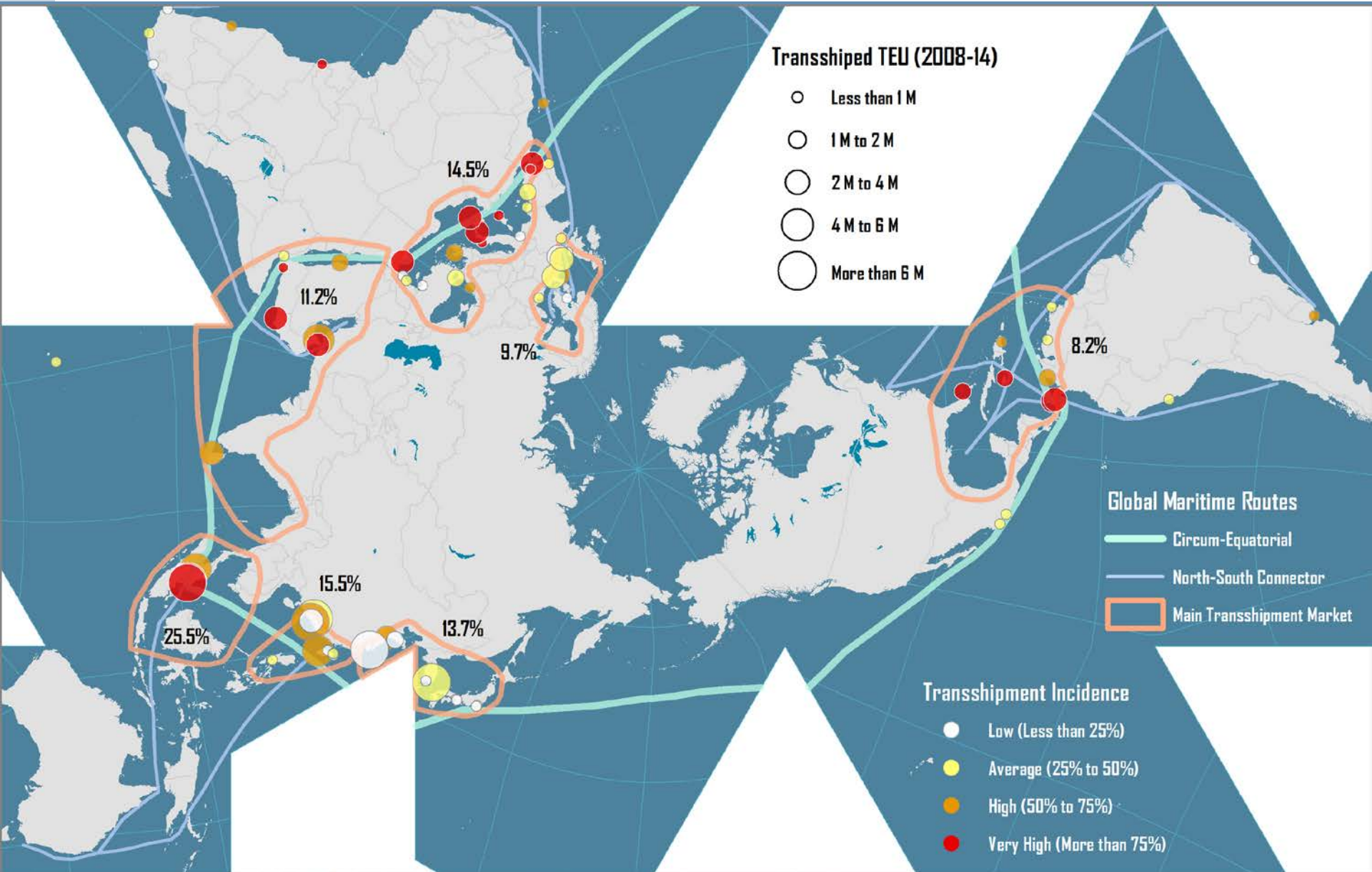
Intermodalism: North-American Gateway Regions and Corridors



Intermodalism: European Gateway Regions and Corridors



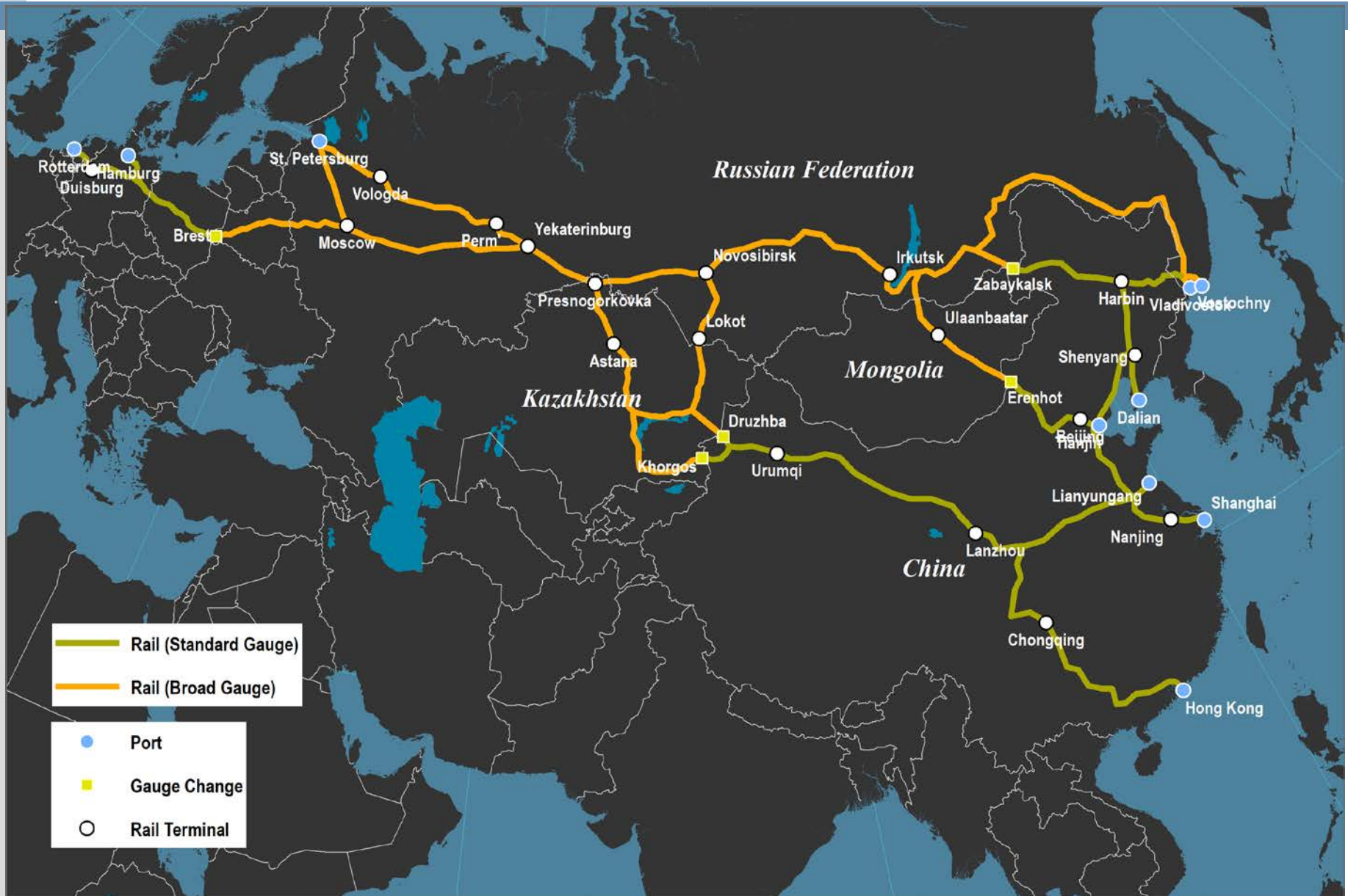
Transmodalism: Transshipment Hubs



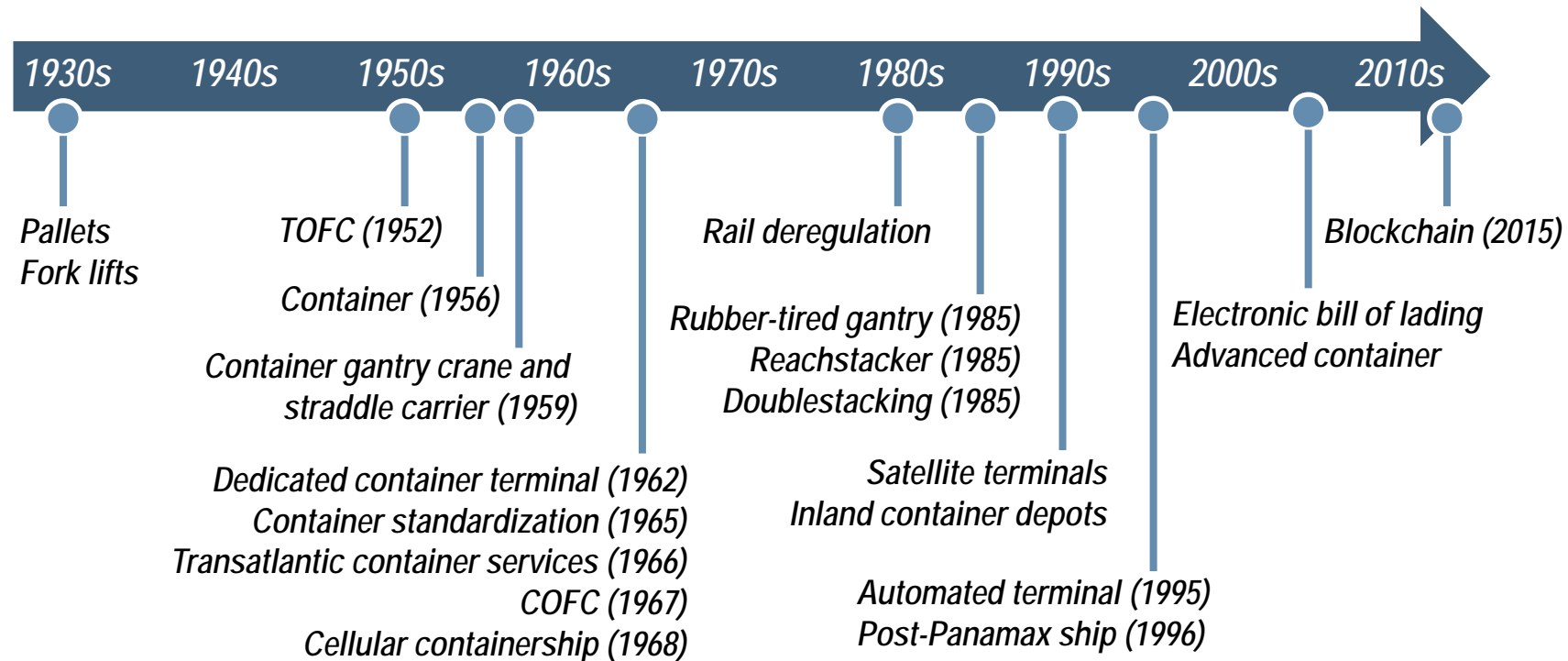
Transmodalism: North American Landbridge



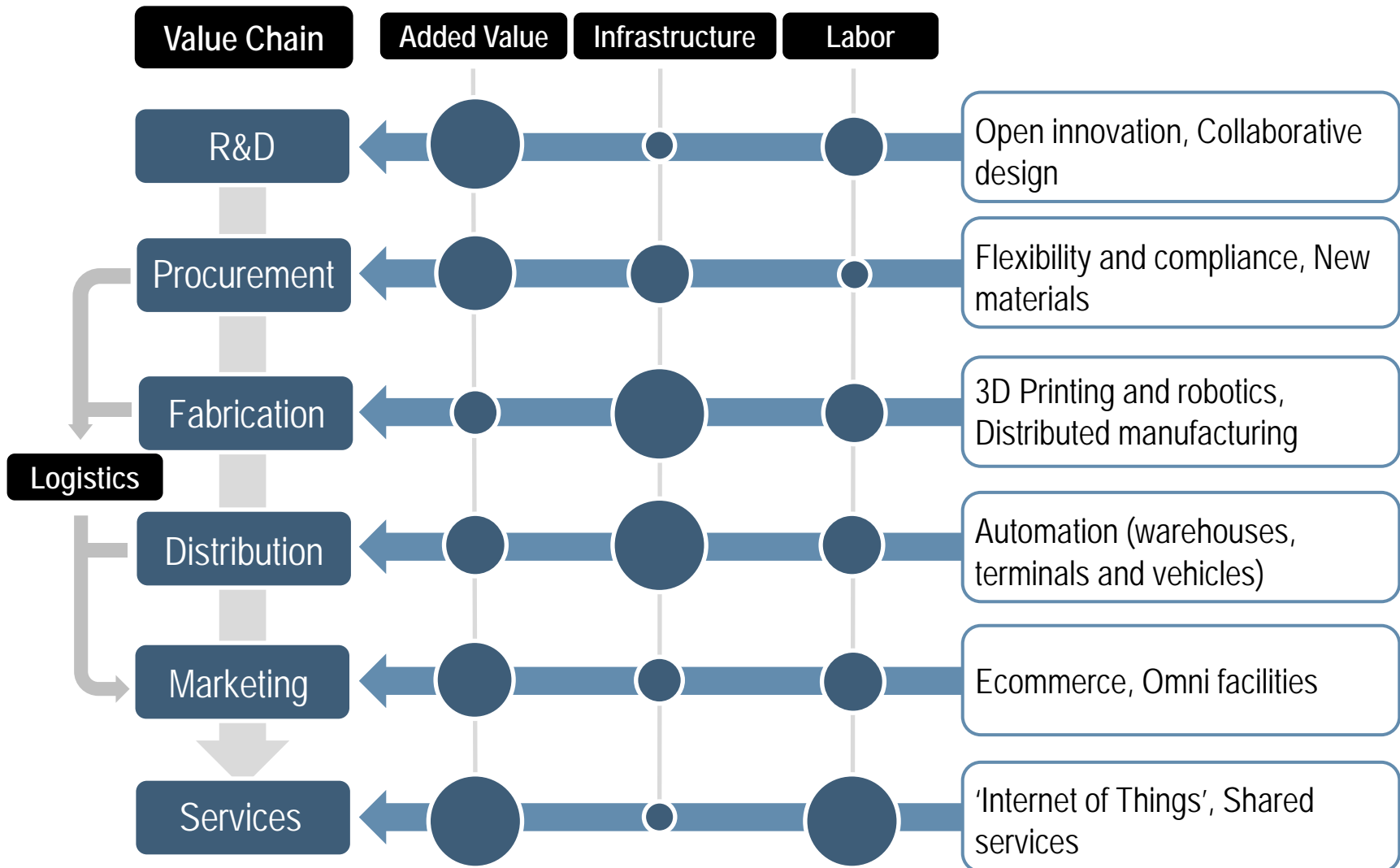
Transmodalism: The Eurasian Landbridge



Major Steps in Intermodal Integration



Value Chain Drivers of the Fourth Industrial Revolution



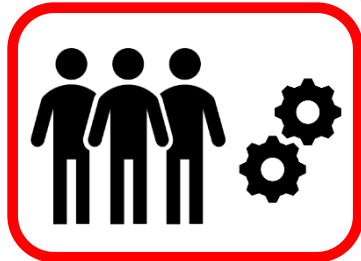
Automation changes processes but also locations

High automation potential (>50%)

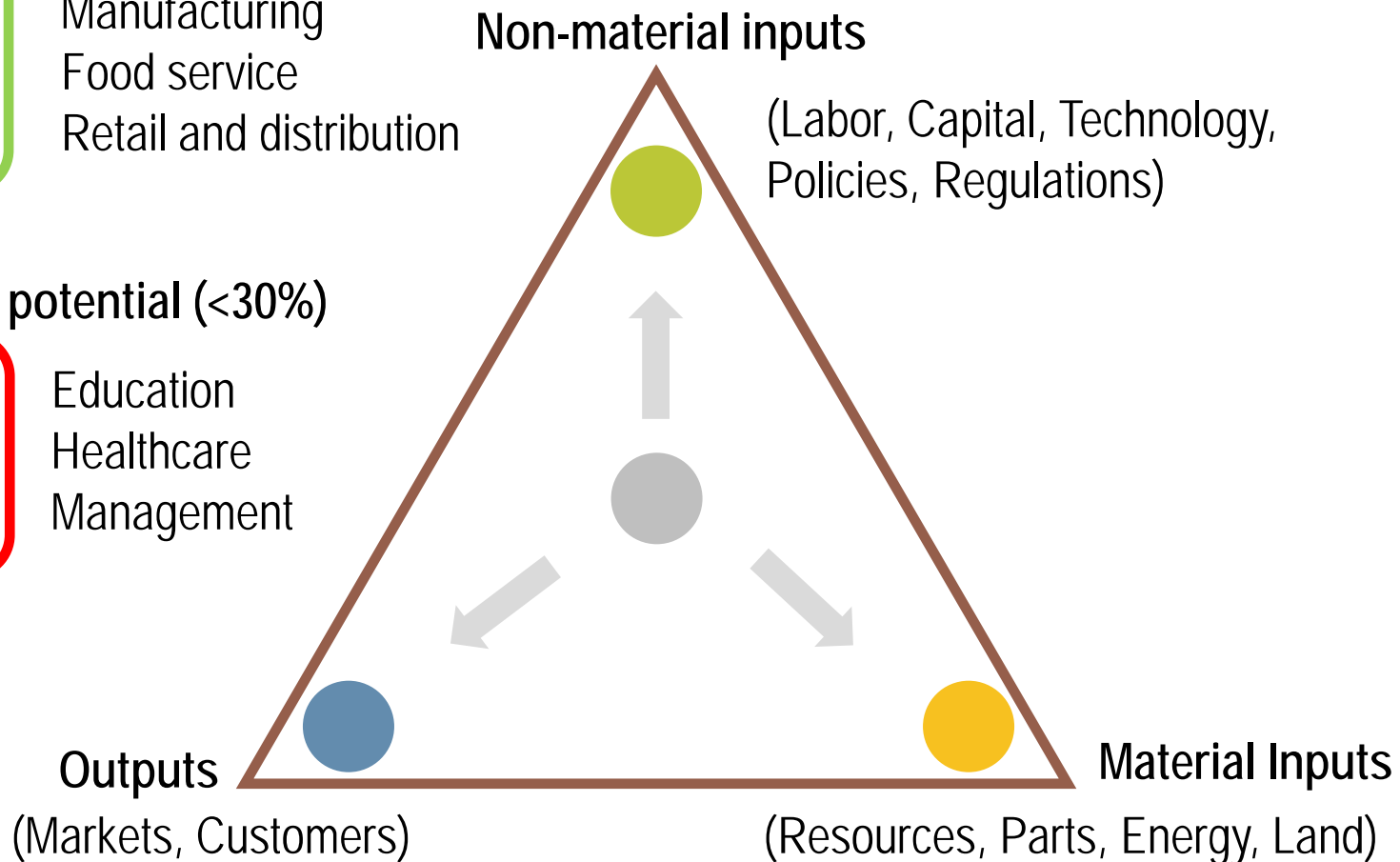


Manufacturing
Food service
Retail and distribution

Low automation potential (<30%)



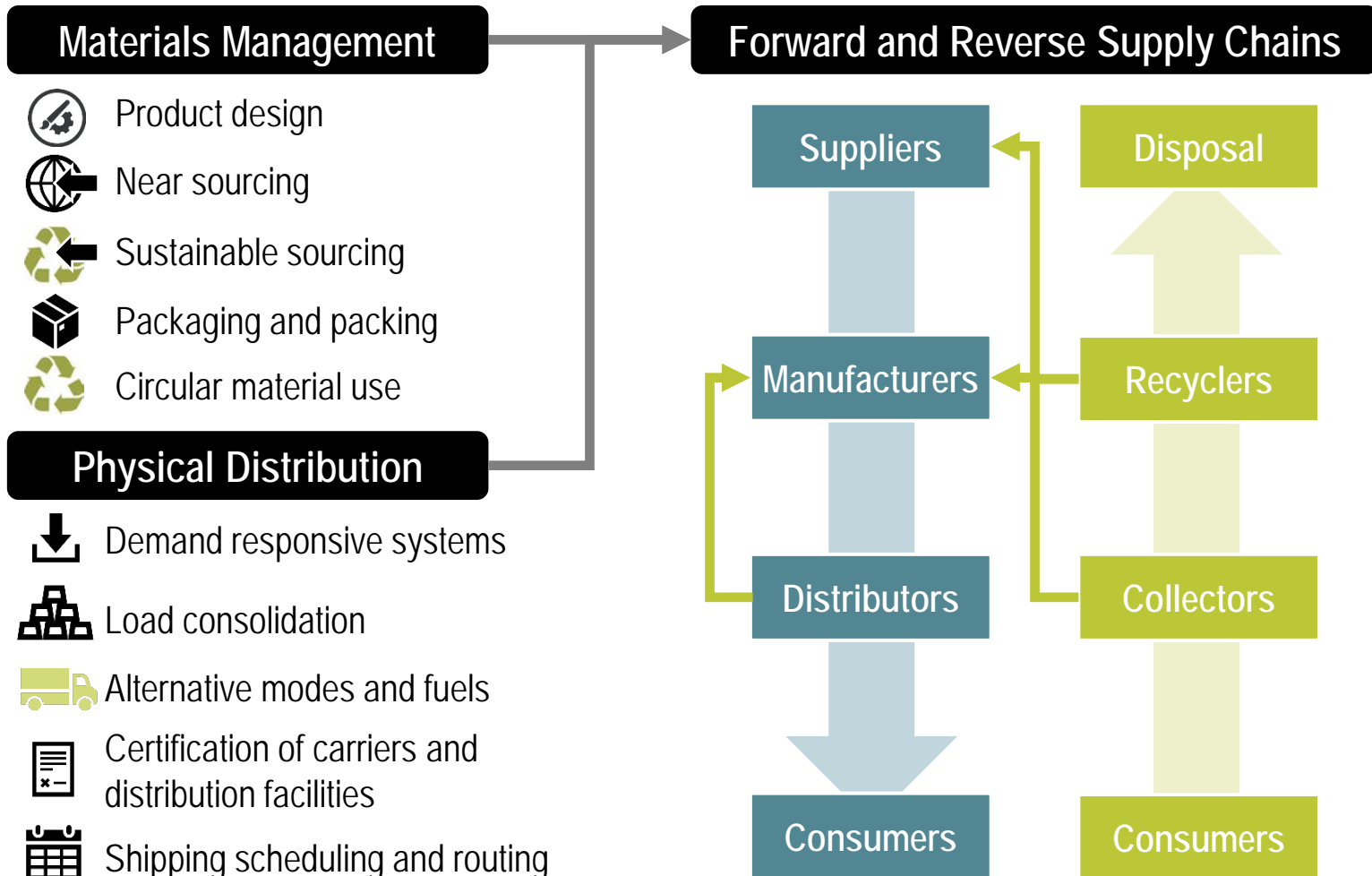
Education
Healthcare
Management



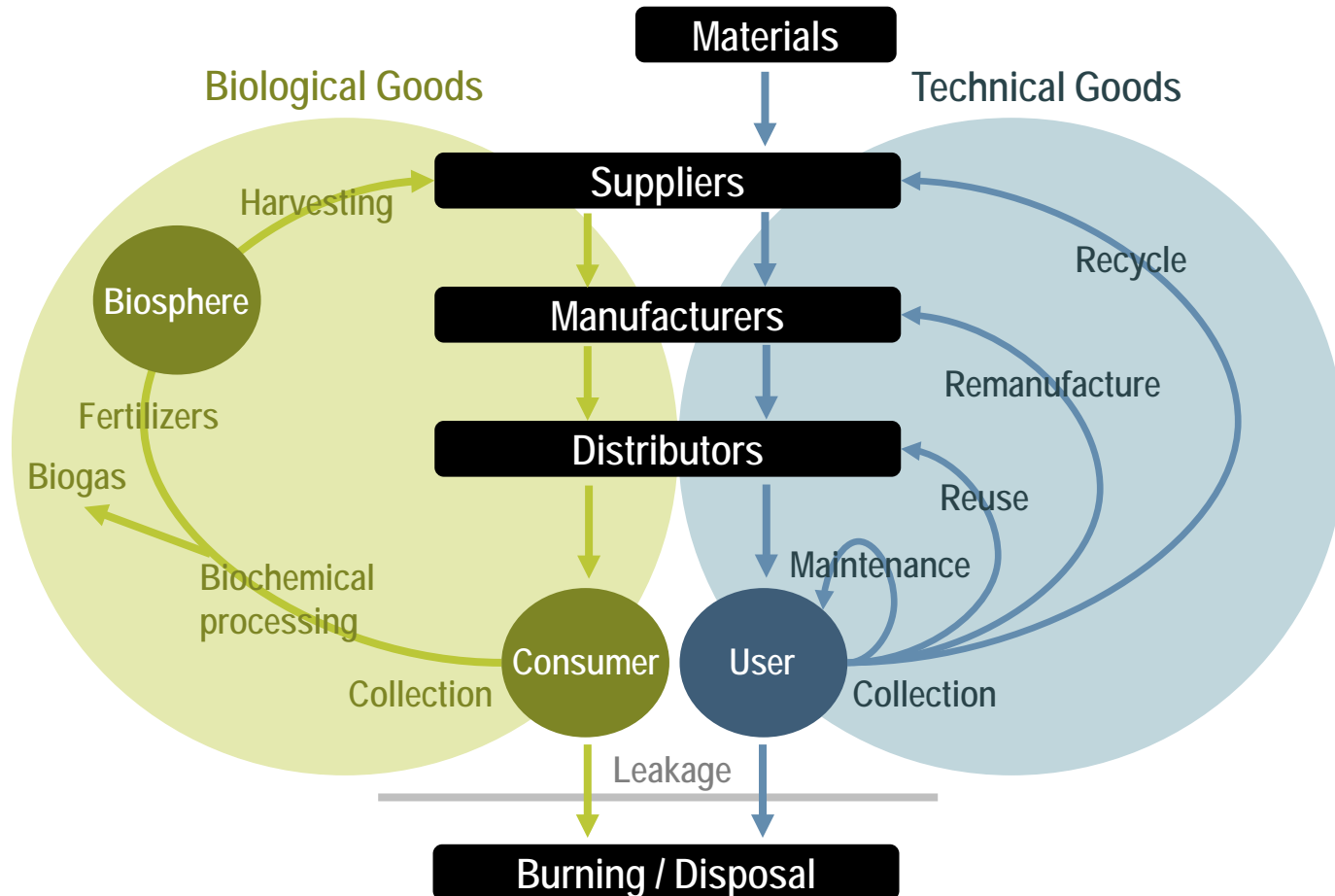


The Greening of Supply Chains: An Elusive Goal

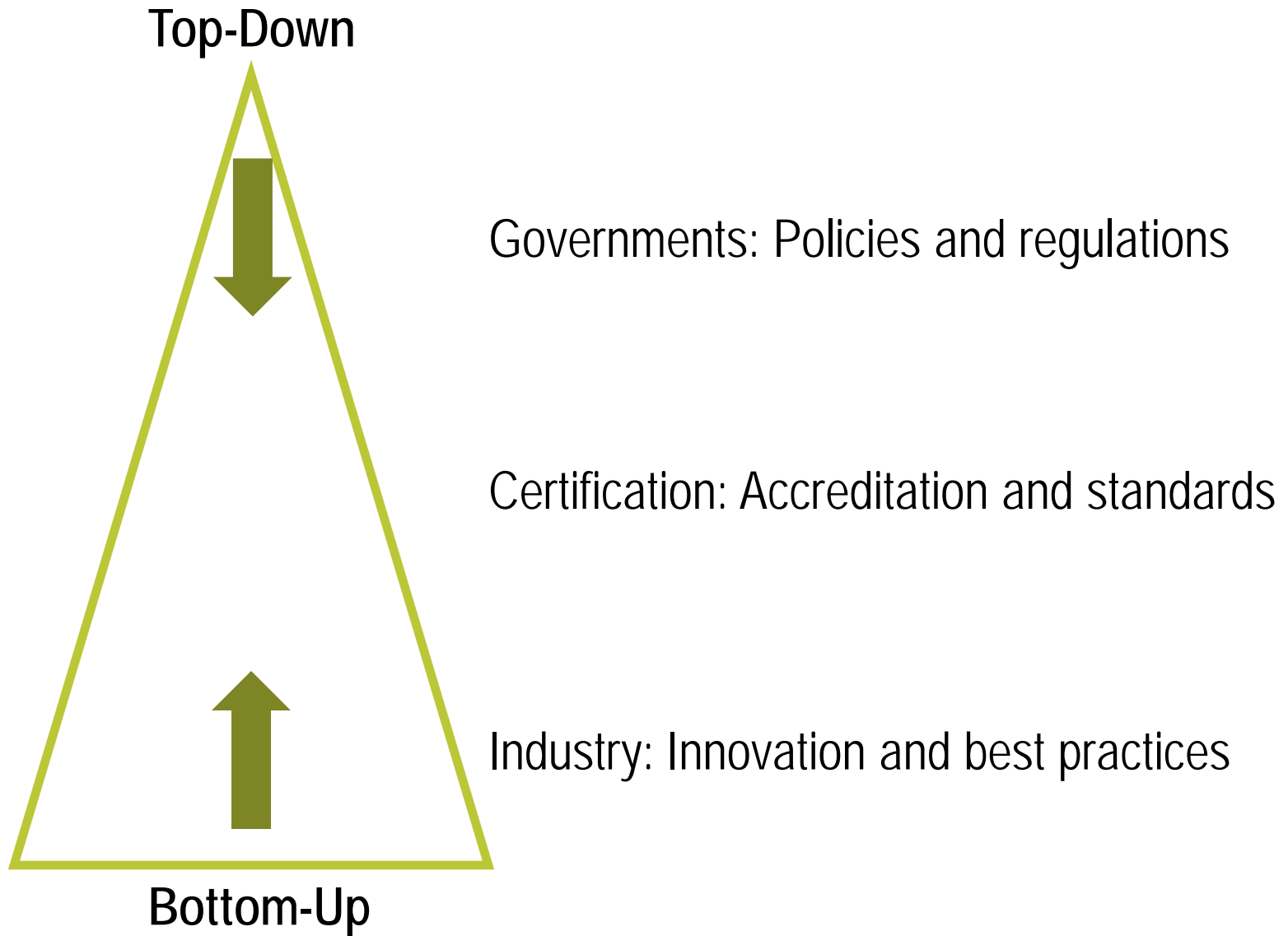
Logistic Activities and their Green Dimensions



The Circular Economy and Supply Chains



The Balance between Regulation, Innovation and Certification



Effective Environmental Practices



Match activities with environmental components

What are the environmental components the logistics activities of the firm?



Link environmental components with regulations

What is the regulatory standing of each environmental component?



Assess risks, impacts and responsibilities

What are the risks of doing nothing? What are the rewards of improvements?



Identify environmental issues to be addressed

What are the most important issues to be addressed and their priority?



Develop commercial strategies

Which improvements can be implemented in management and operations?



Introduce best practices

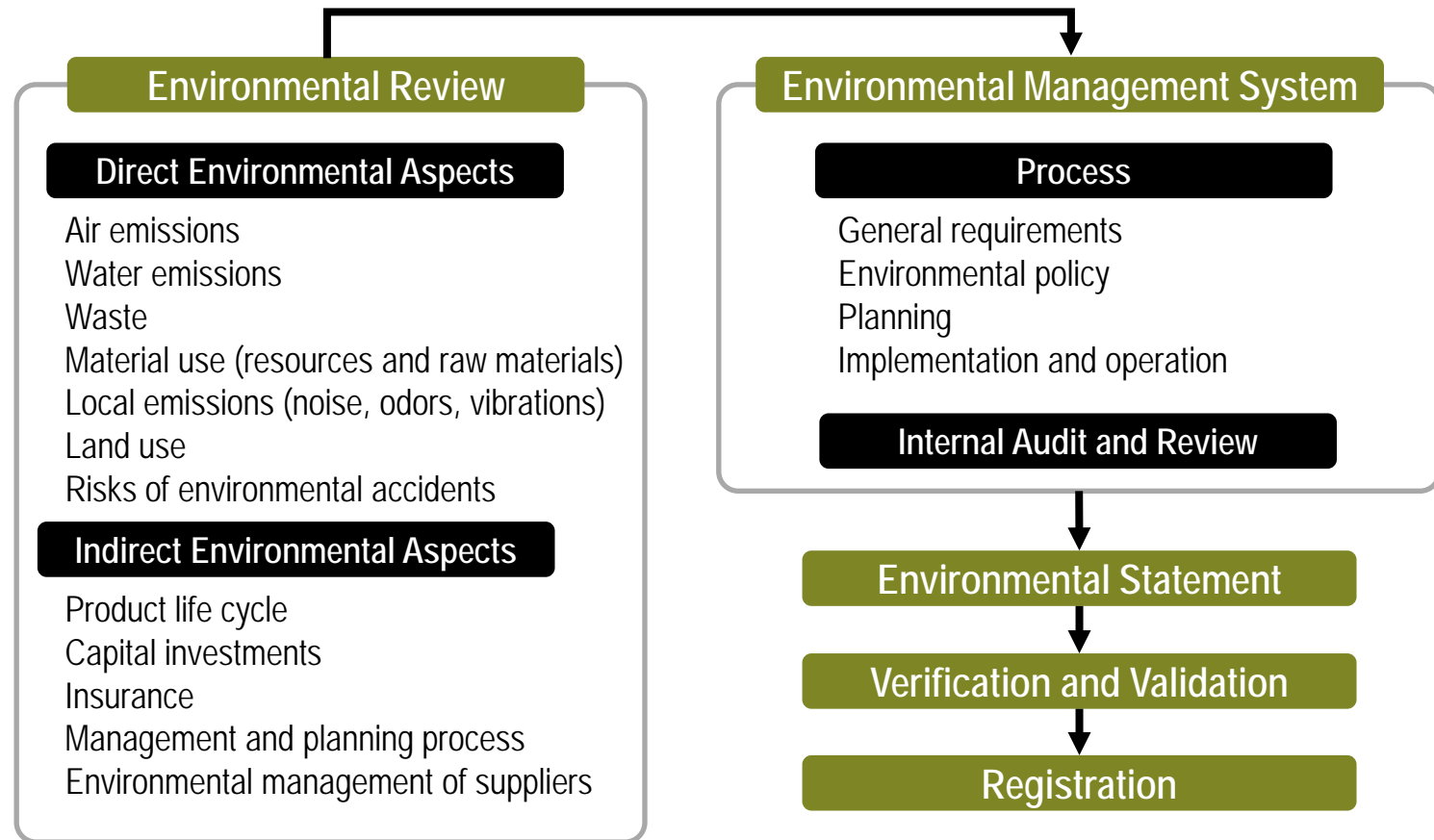
How improvements can be implemented?



Undertake monitoring and auditing

What is the effectiveness of the best practices and which adjustments are required?

The Implementation of an Environmental Management System (EMAS)



EMAS and ISO 14001

- Identify environmental factors and their impacts.
- Evaluate the potential damage to the environment and their legal obligations.
- Adopt an environmental policy.
- Implement an EMS.



1996
2015



Eco-Management and
Audit System; 1993
2010



Internationally



All the firm's activities



Does not require environmental review



Publicly available environmental policy



Infrequent audits



European Union



Site specific



Requires environmental review



Publicly available environmental
statement, policy and EMS



More frequent and rigorous audits

Benefits and Challenges for Supply Chains

Benefits



Improved environmental performance



Improved company image



Competitive advantage in regulated markets



Mitigation of non-tariff trade barriers

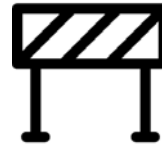


Reduction of capital and insurance costs

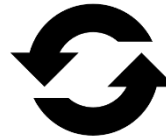
Challenges



Can be biased to protect specific interests



Barriers to entry due to costly time and resources commitment



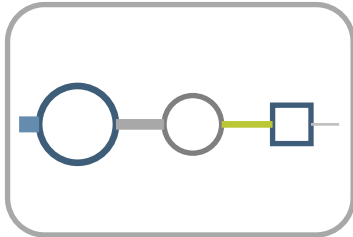
Long term commitment and recurring auditing

The benefits have been difficult to demonstrate



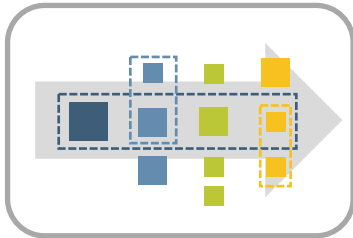
Integrating Multi Modal Supply Chains

Main Elements in Supply Chain Integration and Connectivity



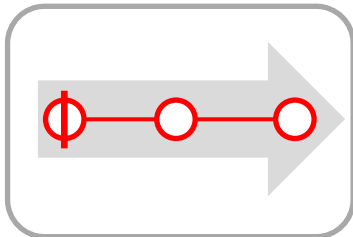
Transport Connectivity

Improving connectivity and interoperability of modes and terminals (intermodalism).
Infrastructure and superstructure improvements (capacity and throughput).
Synchronizing terminals and hinterland flows to increase throughput and reliability.



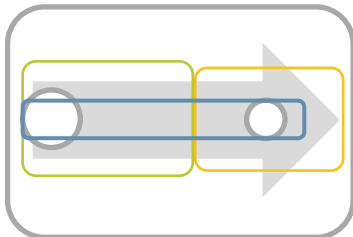
Commercial Integration

Trade and commercial agreements. Mergers and acquisitions along the supply chain.
Cost, time and reliability of transport and distribution services.
Vertical and horizontal integration of actors and processes (e.g. bill of lading).



Customs and Security Integration

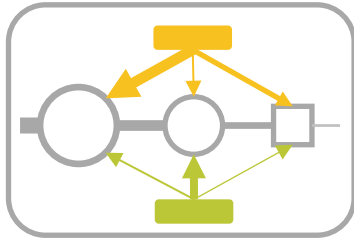
Moving cargo more efficiently across borders through prescreening and inspections.
Harmonization of customs and security procedures.
Assessments of cargo contents, cargo integrity, route integrity and information integrity.



Regulatory Integration

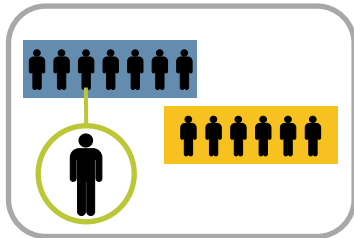
Promote modal choice and avoid subsidized modal preference.
Harmonization of regulations across jurisdictions such as for vehicles, goods handling and transport, land use, labor and finance. Promotion of standards and certification.

Main Elements in Supply Chain Integration and Connectivity



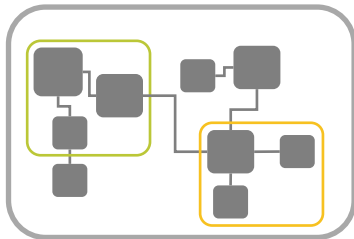
Planning and Funding Integration

Planning and funding of infrastructure provision from an integrated multi-modal and logistics chain perspective.
Respective roles and competencies of the public and private actors.



Work Practices Integration

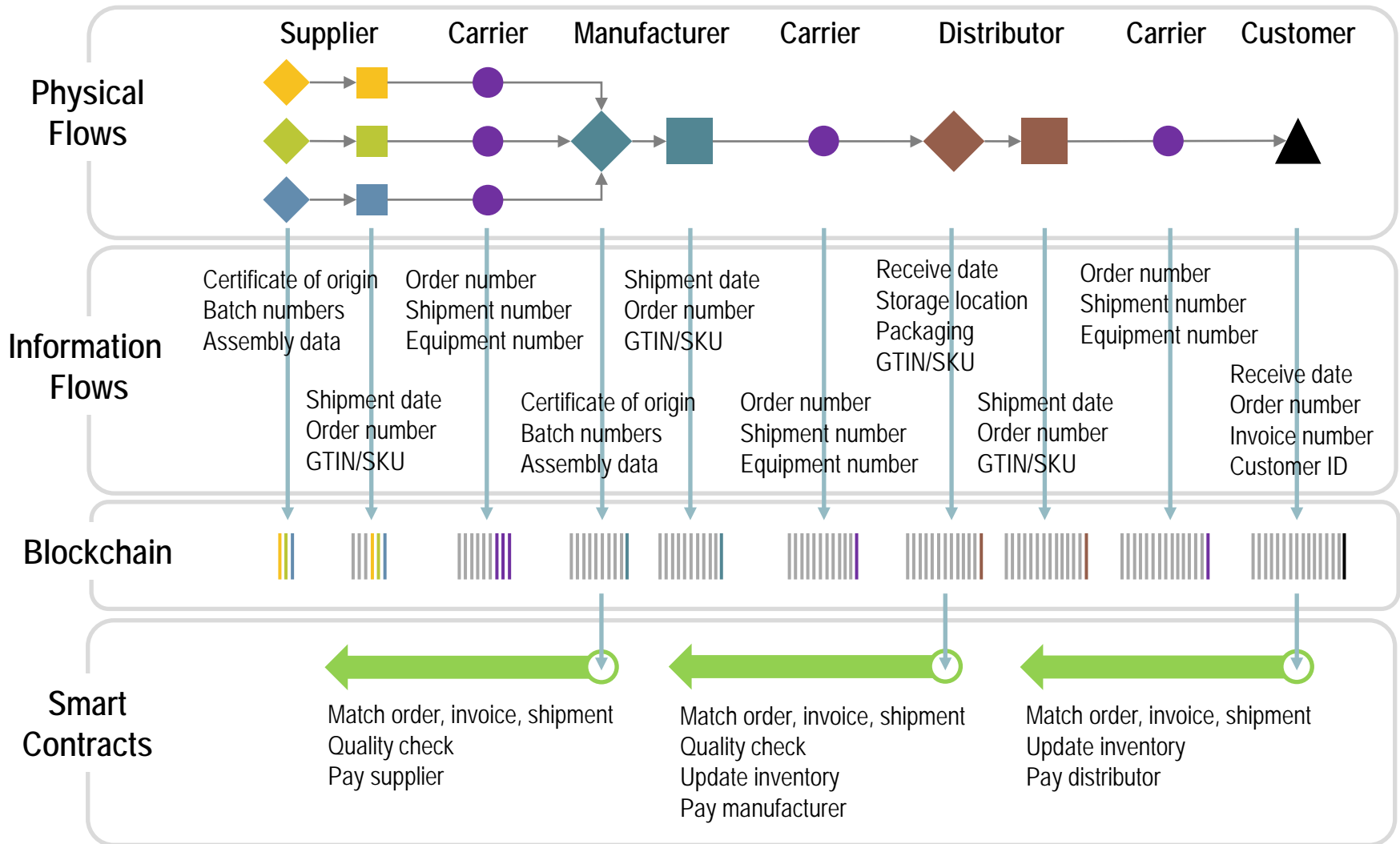
Organizational (managing labor as a group) and skills (managing individual workers) competencies to move cargo efficiently.
Operational window (working hours), minimal service levels and essential services.



Information Systems Integration

Interconnectivity of information systems with blockchains.
Asset tracking, status monitoring, customs facilitation, freight status information and transport network status information.

Supply Chains and Blockchains



Expected Benefits of Blockchains on Supply Chains



Velocity of Supply Chains

Faster transactions.
Less latency, improving cash flow and inventory carrying costs.



Supply Chain Visibility (Tracking)

Track shipments along an intermodal transport chain and identify issues causing delays.
Create a market where service providers bid to handle “blocs”.



Supply Chain Security (Tracing)

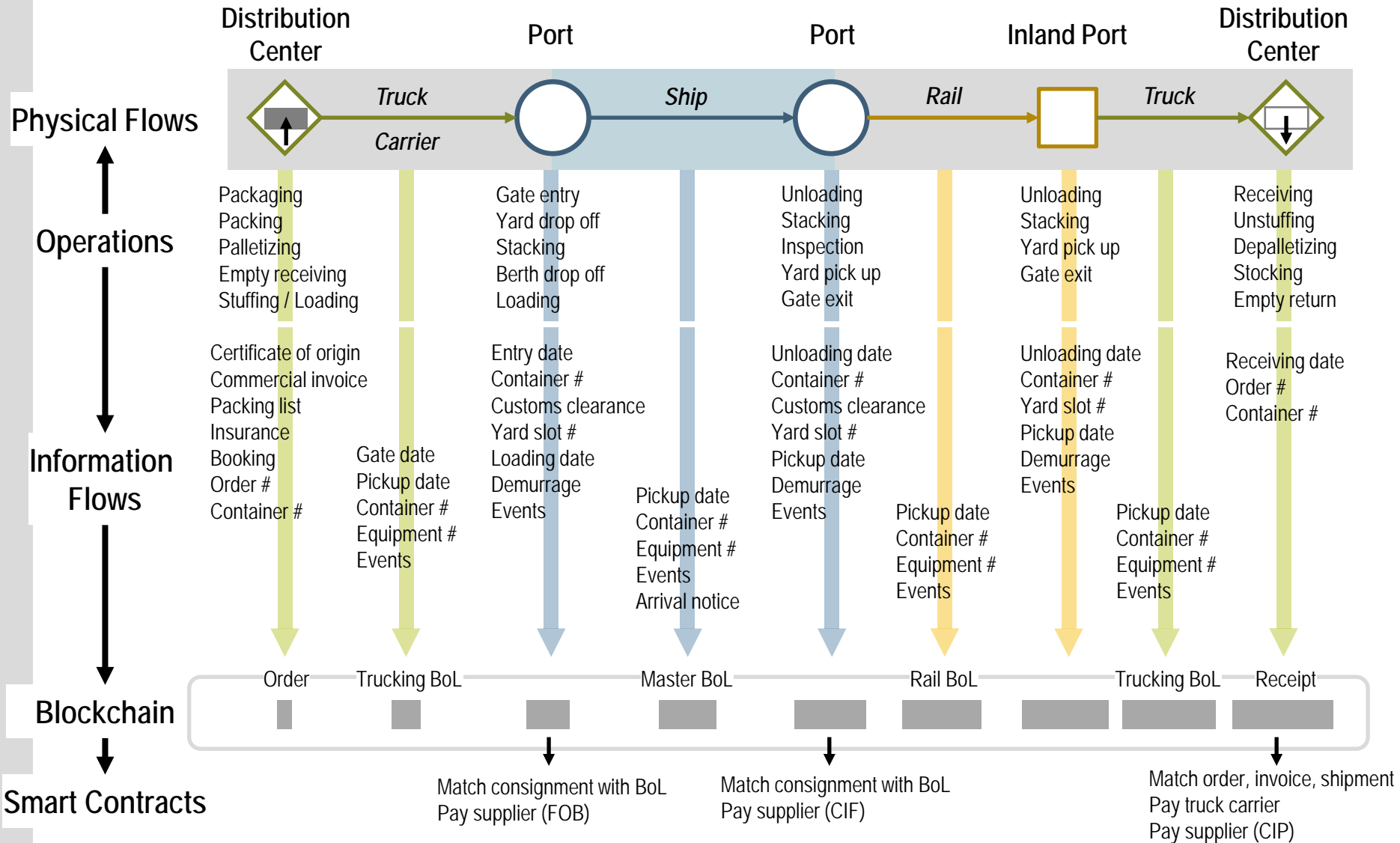
See where, when and how a specific event took place (e.g. cold chain logistics).
Counterfeiting and the use of sub-par materials easier to detect.



Standards and Certification Compliance

Proof that cargo was handled by specific modes, carriers and distribution centers.
Calculate accurately energy use and environmental impacts (e.g. CO2 footprint).

A Multimodal Blockchain Sequence





Conclusion: Efficiency or Sustainability?

Efficiency or Sustainability?

- Sustainability remains contingent on efficiency improvements
 - Improvements are ad hoc because of the diversity of actors, their goals and strategies.
 - Environmental benefits are usually derived from other goals.
 - Complex propagation of benefits within supply chains.
- The appeal of certification
 - Natural outcome of standard setting behavior.
 - A self examination process under the EMS framework.

Efficiency or Sustainability?

- Circular economy
 - An emerging paradigm combining forward and reverse supply chains principles.
 - Requires significant changes in producer, distributor and consumer behavior.
- Multi-modal supply chain integration
 - Functional integration led to physical connectivity improvements.
 - Blockchains of supply chains (digital multimodalism).
 - Enables efficient EMS.