APPENDIX B

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Table of Contents

• The Cold Chain
• Third Party Logistics Services Providers
• Transportation and Blockchains
• The Containerization of Commodities
• The Logistics of Global Food Systems
• Logistics Zones
The Cold Chain
The Cold Chain Market: Products, Geography and Distribution

Product
- Physical attributes requiring specific temperature and humidity conditions.

Geography (Origin / Destination)
- The supply and demand of perishable goods.
- Distance and seasonality.

Distribution
- Infrastructural and managerial capabilities.
- Fixed and mobile assets.
Availability of Fresh Produce by Season and Region

<table>
<thead>
<tr>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Apples**
- Argentina (Jan-Feb)
- New Zealand (Jan-Feb)
- United States (Apr-Oct)
- Chile (Apr-Oct)

**Citrus**
- United States (Jan-Oct)
- Chile (Apr-Oct)
- Peru (Jun-Oct)
- Australia (Jun-Oct)

**Avocados**
- Peru (Jan-Dec)
- Mexico (Jan-Dec)
- Chile (Jan-Dec)

**Bananas**
- Colombia (Jan-Oct)
- Costa Rica (Jan-Oct)
- Ecuador (Jan-Oct)
- Philippines (Jan-Oct)

**Pineapples**
- Costa Rica (Jan-Oct)
- Ecuador (Jan-Oct)
- Philippines (Jan-Oct)
- Brazil (Jan-Oct)

**Grapes**
- Peru (Jan-Oct)
- Mexico (Jan-Oct)
- Chile (Apr-Oct)
- United States (Apr-Oct)

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Elements of the Cold Chain

- Load integrity
- Product
- Conditional demand
- Distribution
- Origin / Destination
- Transport integrity
Operational Conditions of Cold Chain Logistics

**Conditional Demand**
- Each product has a perishability level.
- Shelf life and revenue.
- Demand conditional to qualitative attributes.

**Load Integrity**
- Packing, packaging and preparation.
- Reefers as the common load unit.
- Empty backhauls.

**Transport Integrity**
- Uninterrupted integrity of the transport chain (modes, terminals and distribution centers).
- Specialized modes (speed) and terminals.
The Cold Chain Technology

- **Fabrication**
  - Preparation methods
  - Packing

- **Transport**
  - Reefers
  - Power generators

- **Terminal**
  - Reefer storage
  - Reefer storage areas. On-dock refrigerated warehouses.

- **Storage**
  - Warehousing
  - Distribution center

- **Monitoring**
  - Sensors. Monitors and recorders (e.g. Partlow recorders).
Main Power Generators for Reefer Transport by Mode

<table>
<thead>
<tr>
<th>Power Source</th>
<th>Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td>Clip-on or underslung generator 3-4 days autonomy.</td>
</tr>
<tr>
<td>Rail</td>
<td>Genset and clip-on generator Related to volume and distance. 2 stacked gensets for 16 containers for 7 days. Clip-on generators for smaller volumes or shorter distances.</td>
</tr>
<tr>
<td>Maritime</td>
<td>Ship power plant 10 to 20% of ship slots.</td>
</tr>
<tr>
<td>Intermodal Terminals</td>
<td>Reefer plugs and gensets (rail) 1 to 5% of port terminal slot capacity.</td>
</tr>
</tbody>
</table>
Temperature Integrity along a Cold Chain

[Diagram showing temperature integrity along a cold chain with stages labeled as Origin (Loading), Cold Storage Facility, and Destination (Unloading). The diagram includes temperature range and potential integrity breaches at specific points in the chain.]

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Temperature Standards for the Cold Chain

-30 -25 -20 -15 -10 -5 0 5 10 15

Deep Freeze

Frozen

Chill

Pharmaceutical

"Banana"
Temperature Standards for the Cold Chain

-30 -25 -20 -15 -10 -5 0 +5 +10 +15

Deep Freeze Frozen Chill “Banana”

Degrees Celsius
Temperature Requirements for the Cold Chain Transport of Some Commodities

- Frozen Meat
- Frozen Fish
- Lettuce
- Oranges
- Bananas
- Potatoes
- Coffee

 Degrees Celsius

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## Shelf Life of Selected Perishable Food Products

<table>
<thead>
<tr>
<th>Product</th>
<th>Shelf Life (Days)</th>
<th>Optimum Temperature (Celsius)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td>90-240</td>
<td>0</td>
</tr>
<tr>
<td>Bananas</td>
<td>7-28</td>
<td>13.5</td>
</tr>
<tr>
<td>Bell Peppers</td>
<td>21-35</td>
<td>7</td>
</tr>
<tr>
<td>Cabbage</td>
<td>14-20</td>
<td>1</td>
</tr>
<tr>
<td>Eggs</td>
<td>180</td>
<td>1.1</td>
</tr>
<tr>
<td>Onions</td>
<td>30-180</td>
<td>1</td>
</tr>
<tr>
<td>Lettuce</td>
<td>12-14</td>
<td>0.6</td>
</tr>
<tr>
<td>Fresh Meat (beef, lamb, pork, poultry)</td>
<td>14-65</td>
<td>-2</td>
</tr>
<tr>
<td>Oranges</td>
<td>21-90</td>
<td>7</td>
</tr>
<tr>
<td>Pears</td>
<td>120-180</td>
<td>-0.6</td>
</tr>
<tr>
<td>Potatoes</td>
<td>30-50</td>
<td>10</td>
</tr>
<tr>
<td>Seafood (shrimp, lobster, crab)</td>
<td>120-360</td>
<td>-17.8</td>
</tr>
<tr>
<td>Strawberries</td>
<td>5-10</td>
<td>0.6</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>7-14</td>
<td>12</td>
</tr>
</tbody>
</table>
Lettuce Shelf Life by Storage Temperature

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Preponderance of Fresh and Frozen Cargo by Transport Mode

Global Fresh / Frozen Share in Air Cargo

- Frozen: 4
- Fresh: 96

Global Fresh / Frozen Share in Maritime Cargo

- Frozen: 37
- Fresh: 63
Main American Banana Import Ports, 2011
Amount of Dry Ice Required for Packing Frozen Food in a Well Insulated Container

- 2 lbs
- 5 lbs
- 10 lbs
- 20 lbs
- 50 lbs
Containerization, Cold Chains and the Flexibility of Supply Chains

Scotland

Langoustine (Scottish waters)

Fishing
Mechanical peeling
Maturation in warehouse (3 weeks)
Processing
Packaging
Distribution

Scotland

Fishing
Freezing

UK

Processing
Packaging
Distribution

UK Market

Reefer (3 weeks)
Manual peeling
Maturation (3 weeks)

Thailand

UK Market

Extraction
Transformation
Transport

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## Fresh Flowers Cold Chain, Ecuador-United States

<table>
<thead>
<tr>
<th>Process</th>
<th>Time</th>
<th>Quality Deterioration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-harvest on farm, Ecuador</td>
<td>4 - 8 hours</td>
<td>Medium</td>
</tr>
<tr>
<td>Storage on farm</td>
<td>12 - 72 hours</td>
<td>Low - Medium</td>
</tr>
<tr>
<td>Transportation to cargo agencies</td>
<td>1 - 6 hours</td>
<td>Medium</td>
</tr>
<tr>
<td>Storage at cargo agency</td>
<td>4 hours</td>
<td>Low</td>
</tr>
<tr>
<td>Palletizing, Quito</td>
<td>6 hours</td>
<td>Medium - High</td>
</tr>
<tr>
<td>Customs clearance, Quito</td>
<td>0.5 hour</td>
<td>Low</td>
</tr>
<tr>
<td>Loading to aircraft, Quito</td>
<td>1 - 2 hours</td>
<td>Medium – High</td>
</tr>
<tr>
<td>Flight UIO-MIA nonstop</td>
<td>4 hours</td>
<td>High</td>
</tr>
<tr>
<td>Customs clearance, Miami</td>
<td>4 - 12 hours</td>
<td>Low</td>
</tr>
<tr>
<td>De-palletizing, Miami</td>
<td>2 - 4 hours</td>
<td>High</td>
</tr>
<tr>
<td>Storage at cargo agency, Miami</td>
<td>4 - 72 hours</td>
<td>Low - Medium</td>
</tr>
<tr>
<td>Transportation to U.S. retailer</td>
<td>2 hours - 5 days</td>
<td>Medium</td>
</tr>
</tbody>
</table>
North America’s Largest Public Refrigerated Warehouse Operators, 2014

- AmeriCold Logistics LLC
- Lineage Logistics
- Preferred Freezer Services
- United States Cold Storage
- VersaCold Logistics Services
- Interstae Warehousing, Inc.
- Cloverleaf Cold Storage Co.
- Burris Logistics
- Columbia Colstor, Inc.
- Henningsen Cold Storage Co.
- Nordic Logistics and Warehousing, LLC
- Frialsa Frigorificos S.A. de C.V.
- Congébec Logistics, Inc.
- Trenton Cold Storage, Inc.
- Conestoga Cold Storage
- Hanson Logistics
- Confederation Freezers
- Interstate Cold Storage, Inc.
- Allied Frozen Storage, Inc.
- Brookfield Cold Storage
- Zero Mountain, Inc.
- Trenton Cold Storage, Inc.
- Conestoga Cold Storage
- Hanson Logistics
- Confederation Freezers
- Interstate Cold Storage, Inc.
- Allied Frozen Storage, Inc.
- Brookfield Cold Storage
- Zero Mountain, Inc.
- Trenton Cold Storage, Inc.
- Conestoga Cold Storage
- Hanson Logistics
- Confederation Freezers
- Interstate Cold Storage, Inc.
- Allied Frozen Storage, Inc.
- Brookfield Cold Storage
- Zero Mountain, Inc.
- Trenton Cold Storage, Inc.
- Conestoga Cold Storage
- Hanson Logistics
- Confederation Freezers
- Interstate Cold Storage, Inc.
Reefer Cold Chains: Import Channels

Transloading
• Typical for groceries.
• Reefer brought to refrigerated transloading facility.
• Contents placed on domestic reefers and brought to DC.
• Maritime reefers brought back to port terminal (or depot).
• Cross-docked at DC; orders built to specific grocery stores.

Direct Transit
• Reefer brought directly to DC by truck or rail (long distances and less common).
• Reefer repositioned to port terminal (more common) or directly to exporter (less common).
Reefer Cold Chains: Export Channels

**Domestic Reefer Haul**
- Domestic reefer trucked to transloading facility near port.
- Contents loaded into reefers and brought to port.

**Empty Haul/ Full Backhaul**
- Empty reefer brought from port to exporter.
- Source loaded and brought back to port.
- Dominated by truck hauls.

**Repositioning Haul**
- Empty reefer repositioned (local / regional) to exporter.
- Source loaded and brought back to port.
Third Party Logistics Services Providers
Market Share of Domestic US Ground Parcel Deliveries, 2006

- UPS: 61.1%
- FedEx: 18.3%
- USPS: 14.9%
- DHL: 2.9%
- Others: 2.8%
Market Share of Domestic US Air Parcel Deliveries, 2006

Deferred
- UPS: 25.9%
- FedEx: 21.8%
- USPS: 40.6%
- DHL: 8.4%
- Others: 6%

Overnight
- UPS: 33.8%
- FedEx: 42.2%
- USPS: 13.3%
- DHL: 6%
- Others: 6%
Market Share of Parcel Deliveries, Europe, 2011
The Hub-and-Spoke Structure of Parcel Carriers
Order-Delivery Sequence of an Apple iPad

Order Fulfillment (Cycle time of 12 days 15hrs 34min)

Order placed online 3hrs 34min
Order processed 12 days 15hrs 34min
Shipment notification

Air Freight in Tons (2010)
Less than 1.0 M
1.0 to 1.4 M
1.5 to 2.5 M
More than 2.5 M

Consolidation (Shenzhen/HK)
Transfer (Anchorage)
Deconsolidation (NY Metro)

Order-Fulfillment Cycle Time

Delivery (Lead time of 48hrs 11min)

Consolidation (Shenzhen/HK)
Transfer (Anchorage)
Deconsolidation (NY Metro)
# Order-Delivery Sequence of an Apple iPad

<table>
<thead>
<tr>
<th>Action</th>
<th>Location</th>
<th>Date - Time (EST)</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order placed online</td>
<td>NA</td>
<td>25/07/10 – 11:52PM</td>
<td></td>
</tr>
<tr>
<td>Order processed</td>
<td>NA</td>
<td>26/07/10 – 3:26AM</td>
<td>3hrs 34min</td>
</tr>
<tr>
<td>Shipment notification</td>
<td>NA</td>
<td>3/8/10 – 8:10PM</td>
<td>12 days 15hrs 34min</td>
</tr>
<tr>
<td>Shipment picked up at supplier DC</td>
<td>Shenzhen, China</td>
<td>3/8/10 – 10:55PM</td>
<td>2hrs 45min</td>
</tr>
<tr>
<td>Left local FedEx DC</td>
<td>Shenzhen, China</td>
<td>4/8/10 – 3:18AM</td>
<td>4hrs 23min</td>
</tr>
<tr>
<td>At Hong Kong hub</td>
<td>Hong Kong, China</td>
<td>4/8/10 – 11:52AM</td>
<td>7hrs 34min</td>
</tr>
<tr>
<td>At Anchorage hub</td>
<td>Anchorage, AK, USA</td>
<td>5/8/10 – 4:56PM</td>
<td>17 hrs 04min</td>
</tr>
<tr>
<td>Cleared customs</td>
<td>Anchorage, AK, USA</td>
<td>5/8/10 – 6:53PM</td>
<td>1hr 57min</td>
</tr>
<tr>
<td>Left Anchorage hub</td>
<td>Anchorage, AK, USA</td>
<td>5/8/10 – 8:15PM</td>
<td>1hr 22min</td>
</tr>
<tr>
<td>At Newark hub</td>
<td>Newark, NJ, USA</td>
<td>6/8/10 – 2:18AM</td>
<td>6hrs 3min</td>
</tr>
<tr>
<td>Left Newark hub</td>
<td>Newark, NJ, USA</td>
<td>8/8/10 – 6:18AM</td>
<td>4hrs 0min</td>
</tr>
<tr>
<td>At local FedEx DC</td>
<td>Moonachie, NJ, USA</td>
<td>8/8/10 – 7:29AM</td>
<td>1hr 11min</td>
</tr>
<tr>
<td>Delivered</td>
<td>Fort Lee, NJ, USA</td>
<td>8/8/10 – 10:17AM</td>
<td>2hr 48min</td>
</tr>
<tr>
<td>Import demand driver</td>
<td>Furniture</td>
<td>Apparel</td>
<td>Consumer electronics</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------</td>
<td>---------</td>
<td>---------------------</td>
</tr>
<tr>
<td>End user demand in destination market</td>
<td>Nine-year growth driven by housing market slowdown</td>
<td>Volume growth in line with population growth</td>
<td>Unit price deflation is stimulating demand in all product categories</td>
</tr>
<tr>
<td>Business model share of end user demand</td>
<td>National brands like Ashley and Rooms to Go taking share</td>
<td>Retailers with high price branded products and low cost private labels controlled by large retailers</td>
<td>Consumer upgrading to flat-panel TVs and other appliances</td>
</tr>
<tr>
<td>Import share of product sourcing</td>
<td>Import sourcing increased significantly in last few years</td>
<td>Already high and will continue to rise</td>
<td>Specialty big box retailers like Best Buy continue to take share from traditional channels</td>
</tr>
<tr>
<td>Origin country share of imports</td>
<td>China is largest importer and furniture is single largest commodity</td>
<td>Goto surpluses causing dramatic shift in origin country shares. China has captured majority of transnational growth</td>
<td>China, Malaysia, Korea</td>
</tr>
<tr>
<td>Shipment size and modal mix</td>
<td>Primarily ocean FCL due to unit value and density characteristics</td>
<td>Combination of ocean FCL and LCL; Air freight LCL used for both strategic and operating purposes</td>
<td>Combination of ocean FCL and LCL; Air freight LCL used for both strategic and operating purposes</td>
</tr>
<tr>
<td>U.S. region destination mix (DC locations)</td>
<td>DC footprint rates by competitor</td>
<td>Apparel is large user of decollation on West and East coasts</td>
<td>DC locations driven by population concentrations</td>
</tr>
<tr>
<td>Routing/service level share</td>
<td>All-man to Gulf Coast, South Atlantic, and North Atlantic ports preferred to avoid damage and high M&amp;A prices</td>
<td>Apparel will continue to flow to eastern DCs via WB's in West coast decollation for large retailers</td>
<td>Heavy flow through West coast ports</td>
</tr>
</tbody>
</table>

Source: Marco Global research
Breakdown of a $299 iPod US Retail Price, 2005

- **$85**: Major Components
- **$75**: Distribution and Retail
- **$19**: Other Inputs
- **$40**: Apple (Margin)
- **$27**: Japan (Margin)
- **$7**: USA (Margin)
- **$5**: Taiwan (Margin)
- **$1**: Korea (Margin)
Value of an iPhone 3G Components and Labor, 2009

Total: $178.96

- Japan: 34%
- Germany: 17%
- South Korea: 13%
- United States: 6%
- China: 3%
- Other: 27%

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Costs of a Shoe Sold $100 in the United States and Made in China
Main Distribution Centers of TJ Maxx in the United States

- Evansville
- Charlotte
- Pittston
- Worcester
- LA / LB
- Oakland
- Las Vegas
- Seattle / Tacoma

Landbridge (double-stack)
Transportation and Blockchains
The Digitalization of Supply Chains: Blockchains

Transportation Flows:
- Distribution Center → Truck → Port → Ship → Port → Rail → Inland Port → Truck → Distribution Center

Logistical Flows:
- Supplier → Carrier → Manufacturer → Carrier → Distributor → Carrier → Customer

Information Flows:
- Certificate of origin
- Commercial invoice
- Packing list
- Insurance
- Booking
- Order #
- Container #

Bill of lading (master, truck, rail, etc.)

Information Networks:
- Blockchains
- Internet of Things
- Automation
- Mobile Devices

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The Core Principles of Blockchains

- **Sequence of Blocks**: Creation and transfer of unique digital objects in a decentralized structure
- **Digital Trust**: Encryption, transparency, verifiability and immutability
- **Smart Contracts**: Programmable actions that can be traced
- **Open Source**: Accessibility and inclusiveness
Main Types of Blockchain Uses

**Static Registry**
- Distributed database for storing reference data.
- Asset ownership and registration information.

**Smart Contracts**
- Recorded conditions triggering automated actions when met.
- Transportation fares.

**Dynamic Registry**
- Distributed database that is updated as assets are exchanged.
- Supply chain management.

**Payment Infrastructure**
- Distributed database that is updated as cryptocurrencies are exchanged.
- International contract settlements.
Blockchains and Value Creation

Principles
- Information blocks
- Distributed
- Encryption
- Smart contracts

Functions
- Verifiability
- Transparency
- Immutability
- Consistency

Information Use
- Sharing
- Visibility
- Traceability

Processes
- Contract management
- Coordination
- Disintermediation

Outcome
- Efficiency
- Effectiveness
- Resilience
The Containerization of Commodities
## Growth Factors behind the Containerization of Commodities

<table>
<thead>
<tr>
<th>Factor</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Growing availability of containers</strong></td>
<td>More containers available on freight markets.</td>
</tr>
<tr>
<td></td>
<td>Ubiquitous transport product.</td>
</tr>
<tr>
<td><strong>Rising demand and commodity prices</strong></td>
<td>More commodities in circulation (usage of containerization to accommodate growth).</td>
</tr>
<tr>
<td></td>
<td>New producers and consumers (marginal markets penetration).</td>
</tr>
<tr>
<td><strong>Fluctuations and rises in bulk shipping rates</strong></td>
<td>Decrease in the ratio cargo value per ton shipping rate for commodities.</td>
</tr>
<tr>
<td></td>
<td>Volatility (rates) and risk (hedging).</td>
</tr>
<tr>
<td></td>
<td>Search for options to bulk shipping.</td>
</tr>
<tr>
<td><strong>Low container shipping rates</strong></td>
<td>Increase in the ratio cargo value per TEU shipping rate for commodities.</td>
</tr>
<tr>
<td></td>
<td>Relative rate stability.</td>
</tr>
<tr>
<td></td>
<td>Containerization more attractive as an option.</td>
</tr>
<tr>
<td><strong>Imbalances in container shipping rates</strong></td>
<td>Export subsidy for return cargo.</td>
</tr>
<tr>
<td><strong>Empty containers repositioning</strong></td>
<td>Pools of containers available for backhauls.</td>
</tr>
<tr>
<td><strong>Processing</strong></td>
<td>Processing close to production shifts from bulk to containerized shipping.</td>
</tr>
</tbody>
</table>
IMF All Commodity Index and Average Container Shipping Rates, 2000-2015
(2000=100)
<table>
<thead>
<tr>
<th>Comparison Between Bulk and Containerized Commodity Transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sectors</strong></td>
</tr>
<tr>
<td><strong>Driving force</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Mode of shipment</strong></td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
</tr>
<tr>
<td><strong>Flows</strong></td>
</tr>
<tr>
<td><strong>Terminals</strong></td>
</tr>
<tr>
<td><strong>Seasonality</strong></td>
</tr>
<tr>
<td><strong>Exchange Markets</strong></td>
</tr>
</tbody>
</table>
From Bulk to Containers: Breaking Economies of Scale

Entry Barriers
- Container as an independent load unit.
- Minimal load unit; one TEU container.

Required Volumes
- Limited differences in scale economies for a producer.
- Incremental / linear cost-volume function.

Market Potential
- New producers (smaller).
- Product differentiation (more variety).
<table>
<thead>
<tr>
<th>Category (SITC)</th>
<th>Examples</th>
<th>Containerization (Existing or Potential)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food &amp; Live Animals</td>
<td>Meat, Fish, Wheat, Rice, Corn, Sugar, Coffee, Cocoa, Tea</td>
<td>Low (grains) to high (cold chain products)</td>
</tr>
<tr>
<td>Beverages &amp; Tobacco</td>
<td>Wine, Beer, Tobacco</td>
<td>High</td>
</tr>
<tr>
<td>Raw Materials</td>
<td>Lumber, Rubber, Cotton, Iron ore</td>
<td>Commodity specific</td>
</tr>
<tr>
<td>Fuels &amp; Lubricants</td>
<td>Coal, Crude oil, Kerosene, Natural gas</td>
<td>Very limited</td>
</tr>
<tr>
<td>Animal &amp; Vegetable Oils</td>
<td>Olive oil, Corn oil</td>
<td>High</td>
</tr>
<tr>
<td>Chemicals</td>
<td>Salt, Fertilizers, Plastics</td>
<td>Low to average</td>
</tr>
<tr>
<td>Manufactured Goods</td>
<td>Paper, Textiles, Cement, Iron &amp; Steel, Copper</td>
<td>Commodity specific</td>
</tr>
<tr>
<td>Machinery &amp; Transport</td>
<td>Computer equipment, Televisions, Cars</td>
<td>Very high (already containerized)</td>
</tr>
<tr>
<td>Miscellaneous Manufactures</td>
<td>Furniture, Clothes, Footwear, Cameras, Books, Toys</td>
<td>Very high (already containerized)</td>
</tr>
</tbody>
</table>
### Commodity Group and Containerization Level

<table>
<thead>
<tr>
<th>Category (SITC)</th>
<th>Examples</th>
<th>Containerization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0. Food &amp; Live Animals</strong></td>
<td>Meat, Fish, Wheat, Rice, Soybeans, Corn, Sugar, Coffee, Cocoa, Tea</td>
<td></td>
</tr>
<tr>
<td><strong>1. Beverages &amp; Tobacco</strong></td>
<td>Wine, Beer, Tobacco</td>
<td></td>
</tr>
<tr>
<td><strong>2. Raw Materials</strong></td>
<td>Lumber, Rubber, Cotton, Iron ore</td>
<td></td>
</tr>
<tr>
<td><strong>3. Fuels &amp; Lubricants</strong></td>
<td>Coal, Crude oil, Kerosene, Natural gas</td>
<td></td>
</tr>
<tr>
<td><strong>4. Animal &amp; Vegetable Oils</strong></td>
<td>Olive oil, Corn oil</td>
<td></td>
</tr>
<tr>
<td><strong>5. Chemicals</strong></td>
<td>Salt, Fertilizers, Plastics</td>
<td></td>
</tr>
<tr>
<td><strong>6. Manufactured Goods</strong></td>
<td>Paper, Textiles, Cement, Iron &amp; Steel, Copper</td>
<td></td>
</tr>
<tr>
<td><strong>7. Machinery &amp; Transport Equipment</strong></td>
<td>Computer equipment, Televisions, Cars</td>
<td></td>
</tr>
<tr>
<td><strong>8. Miscellaneous Manufactures</strong></td>
<td>Furniture, Clothes, Footwear, Cameras, Books, Toys</td>
<td></td>
</tr>
</tbody>
</table>

- **Grains (~5%)**
- **Rice (~50%)**
- **Cold chain (~75%)**
- **Soybeans (~10%)**
- **Sugar (~60%)**
- **Coffee (~95%)**

- **Iron ore**
- **Lumber**
- **Cotton**
- **Coal (~2%)**
- **Paper**
- **Textiles**
- **Cement**
- **Metals**
- **Vehicles**
- **Very high**
- **Low to average**
- **Very high**
## Containerized Weight for Selected Commodities

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Pounds per cubic foot</th>
<th>Weight in a 20 foot container</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>48</td>
<td>28 tons</td>
</tr>
<tr>
<td>Corn</td>
<td>45</td>
<td>26 tons</td>
</tr>
<tr>
<td>Dry peas, beans and lentils</td>
<td>37</td>
<td>22 tons</td>
</tr>
<tr>
<td>Vegetable oil (e.g. canola)</td>
<td>60</td>
<td>30 tons (35 tons)</td>
</tr>
<tr>
<td>Coffee (fresh beans)</td>
<td>35</td>
<td>21 tons</td>
</tr>
<tr>
<td>Lumber (2x4s)</td>
<td>45</td>
<td>26 tons</td>
</tr>
<tr>
<td>Hay (e.g. alfalfa)</td>
<td>14</td>
<td>8 tons</td>
</tr>
<tr>
<td>Potash</td>
<td>80</td>
<td>30 tons (46 tons)</td>
</tr>
<tr>
<td>Coal (Anthracite)</td>
<td>70</td>
<td>30 tons (41 tons)</td>
</tr>
<tr>
<td>Paper or wood pulp</td>
<td>75</td>
<td>30 tons (44 tons)</td>
</tr>
</tbody>
</table>
Share of Main American International Trade Commodities Transported by Containership, 2000

- Wood
- Pulp
- Organic Chemicals
- Refrigerated Produce
- Iron and Steel
- Food
- Motor Vehicle Parts
- Refrigerated Meat/Fish/Dairy
- Beverages
- Furniture
- Animal Feed
- Metal Products
- Paper Products
- Manufactured Goods
- Waste Paper
## Shipping Time between Bulk Handling and Containerization (Canadian Wheat)

<table>
<thead>
<tr>
<th>Bulk Handling System</th>
<th>Days</th>
<th>Container System</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm storage</td>
<td>Start</td>
<td>Farm storage</td>
<td>Start</td>
</tr>
<tr>
<td>Local delivery</td>
<td>1</td>
<td>Local delivery</td>
<td>1</td>
</tr>
<tr>
<td>Primary elevator</td>
<td>40</td>
<td>Intermodal terminal</td>
<td>2</td>
</tr>
<tr>
<td>Rail hopper cars</td>
<td>11</td>
<td>Double stack train</td>
<td>2</td>
</tr>
<tr>
<td>Export terminal</td>
<td>19</td>
<td>Container port</td>
<td>2</td>
</tr>
<tr>
<td>Bulk ship</td>
<td>15</td>
<td>Containership</td>
<td>11</td>
</tr>
<tr>
<td>Import terminal</td>
<td>10</td>
<td>Container port</td>
<td>2</td>
</tr>
<tr>
<td>Local delivery</td>
<td>1</td>
<td>Local delivery</td>
<td>1</td>
</tr>
<tr>
<td>Final customer</td>
<td>End</td>
<td>Final customer</td>
<td>End</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>97</strong></td>
<td><strong>Total</strong></td>
<td><strong>21</strong></td>
</tr>
</tbody>
</table>
## Challenges for the Containerization of Commodities

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container availability</td>
<td>Locational and load unit availability.</td>
</tr>
<tr>
<td>Weight</td>
<td>Limitations to about 30 tons (40 footer). 20 footer the preferable load unit (26-28 tons).</td>
</tr>
<tr>
<td>Container preparation</td>
<td>Pre-use and post-use cleaning (avoid contamination). Dedicated containers?</td>
</tr>
<tr>
<td>Weight distribution</td>
<td>Containership load (10-14 tons per TEU). Trade imbalances create mitigation strategies.</td>
</tr>
<tr>
<td>Land consumption at port terminals</td>
<td>Space consumption (4 times more than bulk) mitigated by velocity.</td>
</tr>
<tr>
<td>Existing distribution channels</td>
<td>Considerable accumulated investments (modes &amp; terminals). Established distribution practices. Modal shift inertia.</td>
</tr>
</tbody>
</table>
The Logistics of Global Food Systems
The Agri-food Supply Chain

Stages and Actors in Europe

1. Farmers / producers: 3,200,000
2. Second tier suppliers: 160,000
3. First tier suppliers: 80,000
4. Manufacturers: 8,600
5. Buying desks: 110
6. Supermarket chains: 600
7. Retail outlets: 170,000
8. Customers: 89,000,000
9. Consumers: 160,000,000

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Length of Growing Period (LGP), in Days
Most Suitable Cereal
World Agricultural Area, 1961-2016 (in 1,000 hectares)
Global land use for food production

- **29% Land**
  - 149 Million km²

- **71% Ocean**
  - 361 Million km²

- **71% Habitable land**
  - 104 Million km²

- **50% Agriculture**
  - 51 Million km²

- **37% Forests**
  - 39 Million km²

- **11% Shrub**
  - 12 Million km²

- **19% Barren land**
  - 28 Million km²

- **10% Glaciers**
  - 15 Million km²

Data source: UN Food and Agriculture Organization (FAO)

OurWorldinData.org - Research and data to make progress against the world's largest problems.

Licensed under CC-BY by the authors Hannah Ritchie and Max Roser in 2019.
Dominance of Food versus Feed Agriculture

- Green - crops consumed mostly by humans
- Orange - crops consumed equally by humans and animals
- Red - crops consumed mostly by animals
Meat Production, United States and China 1961-2019 (in tons)
Food Prices Relative to Average Hourly Wages, United States, 1919-2019

- Oranges (Dozen): 2019-0.31, 1919-1.23
- Coffee (lb): 2019-0.12, 1919-1.0
- Beef (lb): 2019-0.09, 1919-0.44
- Cheese (lb): 2019-0.09, 1919-0.97
- Bananas (Dozen): 2019-0.06, 1919-0.74
- Eggs (dz): 2019-0.04, 1919-1.43
- Fresh Milk (qrt): 2019-0.03, 1919-0.36
- Onions (lb): 2019-0.03, 1919-0.17
- Flour (lb): 2019-0.02, 1919-0.07
- Rice (lb): 2019-0.01, 1919-0.35
- Sugar (lb): 2019-0.01, 1919-0.26

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Harvesting and Field Transport
• Lack of cushioning during (manual) harvesting
• Rough and muddy field tracks
• Damaged or misplaced cushioning in field trailers
• Unsecured bunches during field transport

Pack House Operation
• Manual cutting and splitting of clusters
• Rough (worn out) conveyor belts
• Level drops and obstacles in conveyers
• Over-fillin/under-filling of cartons
• Improper use of liners
• Misaligned stacking of packages during palletizing

Ripening and Storage
• Exposure of packages to high relative humidity (RH)
• Weakening and failure of the cartons at high RH
• Collapsing of the pallets (due to improper stacking)

Transport (Interstate and DC to Retail)
• Vibration Transmissibility
• Location of the pallet on the trailer of the truck
• Height of the package in a stacked pallet
• Unsecured pallets

DC Storage and Dispatch
• Rough handling of packages
• Forklift and Layer-Picker handling
• Order consolidation
• Unstable and unsecured pallets
• Misaligned packages in pallets

Retail
• Improper storage
• Unpacking of packages
• Lack of cushioning on shelves
• Over-stacking the shelves
• Handling by consumers
# Types of Mechanical Damage on Fruits

<table>
<thead>
<tr>
<th>Damage Type</th>
<th>Damage Mechanism</th>
<th>Nature of Damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bruising</td>
<td>Sudden impact forces or compression (pressure) on body</td>
<td>Deformation of the fruit; grey/ brown area on the peel without clear edges</td>
</tr>
<tr>
<td>Scars</td>
<td>Friction between fruit and hard surfaces</td>
<td>Moderate to severe wet scar marks (sap oozing) with clear edges and appear as dried out black scar marks upon ripening</td>
</tr>
<tr>
<td>Fruit Rubs</td>
<td>Rubbing against other fruit</td>
<td>Creates a dark brown or black patch mark with clear edges mostly in the top or the basal end on the fruit body</td>
</tr>
<tr>
<td>Scuffing</td>
<td>Superficial (light) widespread rubbing of the fruit against contact surfaces such as other fruit and carton box</td>
<td>Light brown skin marks in the body of the fruit without clear edges</td>
</tr>
<tr>
<td>Blacked Rubs</td>
<td>Rubbing of the edges of the fruit from top to bottom against hard surfaces such as corrugated box</td>
<td>Thin black or grey line along the edges (mostly back) of the fruit</td>
</tr>
<tr>
<td>Neck Damages</td>
<td>Movement of individual fruits in a cluster with respect to the stem</td>
<td>Neck breaks lead to detachment of the fruit from its cluster</td>
</tr>
</tbody>
</table>
Food Consumed, Selected Countries (in grams per capita per day)

1961

China: 600g Sugar, 400g Animal products, 100g Pulses, 150g Fruits, 200g Vegetables, 100g Starchy roots, 600g Cereals
Thailand: 300g Sugar, 200g Animal products, 50g Pulses, 100g Fruits, 200g Vegetables, 100g Starchy roots, 300g Cereals
India: 200g Sugar, 100g Animal products, 20g Pulses, 50g Fruits, 150g Vegetables, 50g Starchy roots, 200g Cereals
Egypt: 100g Sugar, 50g Animal products, 10g Pulses, 25g Fruits, 100g Vegetables, 25g Starchy roots, 100g Cereals
Peru: 50g Sugar, 25g Animal products, 5g Pulses, 12.5g Fruits, 50g Vegetables, 12.5g Starchy roots, 50g Cereals

2009

China: 1500g Sugar, 400g Animal products, 150g Pulses, 300g Fruits, 500g Vegetables, 150g Starchy roots, 500g Cereals
Thailand: 1000g Sugar, 300g Animal products, 100g Pulses, 200g Fruits, 400g Vegetables, 100g Starchy roots, 300g Cereals
India: 750g Sugar, 150g Animal products, 50g Pulses, 125g Fruits, 375g Vegetables, 50g Starchy roots, 250g Cereals
Egypt: 500g Sugar, 100g Animal products, 25g Pulses, 75g Fruits, 150g Vegetables, 25g Starchy roots, 125g Cereals
Peru: 250g Sugar, 50g Animal products, 12.5g Pulses, 37.5g Fruits, 125g Vegetables, 18.75g Starchy roots, 125g Cereals

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Estimated Famine Victims since the Mid 19th Century

- India and China
- China and Soviet Union
- WWII
- Maoist Famines
- North Korea
- Congo
- Cambodia
- Sudan
- Uganda
- Somalia

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Logistics Zones
The Benefits of Logistics Improvements

- **Infrastructures**
  - Lower costs (imports & exports)

- **Operations**
  - Supply chain integration
  - Transport assets utilization

- **Human Resources**
  - Employment opportunities

Outcomes
<table>
<thead>
<tr>
<th>Logistic Zone</th>
<th>Acreage</th>
<th>Ownership</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CentrePort Canada</td>
<td>20,000</td>
<td>Public</td>
<td>Rail-airport co-location</td>
</tr>
<tr>
<td>Global Transportation Hub</td>
<td>3,250</td>
<td>Public</td>
<td></td>
</tr>
<tr>
<td>CN Calgary Logistics Park</td>
<td>580</td>
<td>Private</td>
<td>Opened in 2013</td>
</tr>
<tr>
<td>Alliance Texas</td>
<td>17,000</td>
<td>Private</td>
<td>Opened in 1994</td>
</tr>
<tr>
<td>CenterPoint Intermodal Center - Elmwood</td>
<td>2,200</td>
<td>Private</td>
<td></td>
</tr>
<tr>
<td>CenterPoint Intermodal Center - Joliet</td>
<td>3,600</td>
<td>Private</td>
<td>Opened in 2004; BNSF</td>
</tr>
<tr>
<td>CenterPoint Intermodal Center - Houston Metro</td>
<td>630</td>
<td>Private</td>
<td>Opened in 2011</td>
</tr>
<tr>
<td>CenterPoint Intermodal Center - Suffolk</td>
<td>921</td>
<td>Private</td>
<td>Opened in 2009</td>
</tr>
<tr>
<td>CenterPoint Intermodal Center - Crete</td>
<td>1,000</td>
<td>Private</td>
<td>Opened in 2010; CSX</td>
</tr>
<tr>
<td>CenterPoint Intermodal Center - Kansas City</td>
<td>1,340</td>
<td>Private</td>
<td>KCS</td>
</tr>
<tr>
<td>Dallas Logistics Hub</td>
<td>6,360</td>
<td>Private</td>
<td></td>
</tr>
<tr>
<td>Huntsville International Intermodal Center</td>
<td>1,470</td>
<td>Public</td>
<td>Opened in 1986</td>
</tr>
<tr>
<td>Rickenbacker Global Logistics Park</td>
<td>1,300</td>
<td>PPP</td>
<td>Opened in 2008</td>
</tr>
<tr>
<td>Raritan Center</td>
<td>2,350</td>
<td>Private</td>
<td>Rail link planned</td>
</tr>
<tr>
<td>Terminal Intermodal Logistica de Hidalgo</td>
<td>400</td>
<td>Private</td>
<td>Opened in 2012</td>
</tr>
</tbody>
</table>
Components of a Logistics Cluster

Core Activities

Transportation Services
Logistics Services
Infrastructure Operators

Related Activities

Institutional Setting
Taxonomy of Logistics Clusters

Modal Orientation
- Port
- Airport
- Rail

Geographical Scope
- Urban
- Regional
- International

Function
- Single
- Sectorial
- Comprehensive

- Port-Centric
- Industrial Park
- Inland Port
- Intermodal Logistics Park

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A Typology of Logistics Zones

**Port-centric**
- Co-location (port / logistic park)
- Inventory management and security
- Port authorities the key actors
- Supported by satellite terminals

**Intermodal Corridor**

**Intermodal Terminal**

**Inland Port**
- Co-location (inland terminal / logistic park)
- Hinterland integration and massification
- Import and export platform (load center)

**Drayage**

**Logistics Park**
- Land for logistics with agglomeration economies
- Regional accessibility (mostly road)
- Variety of private or public actors

**Freight Village (FV)**
- Service and transactional dimensions of freight distribution
- Office space, hotels, convention centers
Port Centric Logistics

Port Terminal

Imports
- Storing (Full)
- De-stuffing
- Transloading

Exports
- Stuffing
- Storing (Full + Empties)

Transshipment
- Storing (in terminal)

Distribution
- Warehousing
- Repositioning

First Tier

Second Tier
- Manufacturing / Commodities

Port Cargo Logistics

Port-Related Production and Distribution
### Main Advantages of Port-Centric Logistics Zones

<table>
<thead>
<tr>
<th>Land</th>
<th>Container Assets</th>
</tr>
</thead>
</table>
| Availability of land and labor.  
Co-location. | Direct transloading.  
Limited dwell time.  
Fast repositioning of empties.  
Mitigate land weight restrictions. |
| Drayage | Supply Chain Management |
| Direct access to terminal gates.  
Little / no congestion.  
Short distances. | Lower lead times.  
Less inventory.  
Direct deliveries to customers. |
<table>
<thead>
<tr>
<th>Model</th>
<th>Characteristics</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Ownership</td>
<td>Public or a private actor entirely responsible for development and operations. Single vision and specific role.</td>
<td>Potential lack of adaptability to changes (single mandate). High level of risk.</td>
</tr>
<tr>
<td>Public-Private Partnership</td>
<td>Combine public planning of infrastructures with private operational expertise. Public (local) interests represented.</td>
<td>Tendency to prioritize public interests over private interests.</td>
</tr>
<tr>
<td>Landlord Model</td>
<td>Public ownership and private operations (a form of PPP). Long term concession agreements.</td>
<td>Managerial flexibility between the owner, the site manager and the operators. Most of the risk assumed by private operators.</td>
</tr>
</tbody>
</table>
## Economic Benefits and Costs of Logistic Zones

<table>
<thead>
<tr>
<th>Economic Benefits</th>
<th>Economic Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment creation (direct, indirect, induced).</td>
<td>Opportunity cost of public fund usage.</td>
</tr>
<tr>
<td>Attracting capital investment.</td>
<td>Potential duplication of services.</td>
</tr>
<tr>
<td>Increased distribution efficiency and lower costs to consumers.</td>
<td>Loss of public land.</td>
</tr>
<tr>
<td>Increased trade and cross-border traffic.</td>
<td>Negative community impacts.</td>
</tr>
<tr>
<td>Reduced congestion and emissions.</td>
<td></td>
</tr>
</tbody>
</table>
### Operational Advantages of Foreign Trade Zones

<table>
<thead>
<tr>
<th>Custom Clearance</th>
<th>Duties</th>
<th>Settlement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Done inland instead of at the gateway port.</td>
<td>Duties and merchandise processing fee not paid until the consignment is released and moved out of the FTZ (storage).</td>
<td>Vendors often not paid until consignments leave the facility for delivery (Delay settlement).</td>
</tr>
<tr>
<td>Simpler and faster.</td>
<td>Not paid if goods are exported or re-exported.</td>
<td>Remove damaged or defective products from the settlement.</td>
</tr>
<tr>
<td>Higher security level (lower insurance rates).</td>
<td>Deferred if goods moved to another FTZ.</td>
<td></td>
</tr>
<tr>
<td>Consignment can stay for an unlimited amount of time in the FTZ.</td>
<td>Not paid for damaged, defective or obsolete goods.</td>
<td></td>
</tr>
<tr>
<td>Consignee gets further advance notice that shipment is ready.</td>
<td>Lower insurance rates since no duties.</td>
<td></td>
</tr>
<tr>
<td>Quotas can be managed through postponement.</td>
<td>If transformation is performed in the FTZ, the duty class may change (Select the taxation regime).</td>
<td></td>
</tr>
</tbody>
</table>

- Duties and merchandise processing fee not paid until the consignment is released and moved out of the FTZ (storage).
- Not paid if goods are exported or re-exported.
- Deferred if goods moved to another FTZ.
- Not paid for damaged, defective or obsolete goods.
- Lower insurance rates since no duties.
- If transformation is performed in the FTZ, the duty class may change (Select the taxation regime).
- Vendors often not paid until consignments leave the facility for delivery (Delay settlement).
- Remove damaged or defective products from the settlement.
<table>
<thead>
<tr>
<th>Type of Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rail services</strong></td>
<td>Long distance rail transportation for suppliers and customers. Commonly involve a co-located intermodal terminal.</td>
</tr>
<tr>
<td><strong>Trucking services</strong></td>
<td>Drayage and long distance truck services for suppliers and customers. Shuttles to nearby rail and maritime terminals.</td>
</tr>
<tr>
<td><strong>Loading / consolidation</strong></td>
<td>Packing, palletizing, stuffing of cargo into containers or trailers. Cargo consolidation from multiple suppliers. Mostly linked to exports.</td>
</tr>
<tr>
<td><strong>Unloading / deconsolidation</strong></td>
<td>Unpacking, de-palletizing, and de-stuffing of cargo in distribution centers. Mostly linked to imports.</td>
</tr>
<tr>
<td><strong>Transloading / crossdocking</strong></td>
<td>Transfer from one cargo unit to another, such as a maritime container into a domestic container (or vice-versa). Crossdocking implies the transfer of truckloads, including changes in the composition of loads of each transport unit with minimal and short duration warehousing.</td>
</tr>
<tr>
<td><strong>Warehousing</strong></td>
<td>Standard function protecting the integrity of cargo units (e.g. damage, theft) while waiting to be released to customers.</td>
</tr>
<tr>
<td><strong>Bonded warehousing</strong></td>
<td>Cargo waiting to be released by customs. If part of a free trade zone, cargo can be transformed for re-export.</td>
</tr>
<tr>
<td><strong>Container and chassis depot</strong></td>
<td>Empty container storage waiting to be used. Transfer custody of containers between shippers. Consolidation center for containers used by maritime and rail terminals. Chassis pools.</td>
</tr>
<tr>
<td><strong>Container and chassis maintenance</strong></td>
<td>Container preparation and inspection before usage. Container cleaning and repair. Chassis inspection and repair. Important for the container and chassis location industry.</td>
</tr>
<tr>
<td><strong>Equipment maintenance</strong></td>
<td>Maintenance of vehicles and intermodal equipment.</td>
</tr>
<tr>
<td><strong>Fabrication</strong></td>
<td>Light manufacturing activities often undertaken at the distribution center. Include labeling, assembly, testing and quality control. Can also include the bagging of bulk cargo. Provides added value.</td>
</tr>
<tr>
<td><strong>Cold chain</strong></td>
<td>Activities maintaining the thermal integrity of cargo. Includes temperature-controlled warehousing but also preparation, transformation and inspection.</td>
</tr>
<tr>
<td><strong>Recycling</strong></td>
<td>“Green logistics” activities. Returns of defective or discarded merchandises. Recycling of components used in freight distribution, such as boxes.</td>
</tr>
</tbody>
</table>
# Logistics Zones: Corporate Services

<table>
<thead>
<tr>
<th>Type of Service</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Office space</td>
<td>Provision and location of office space to fill the management needs of logistics activities, such as the activities below.</td>
</tr>
<tr>
<td>Customs clearance</td>
<td>Availability of custom officers to support the custom clearance process. Services supporting compliance to custom procedures for imports and exports.</td>
</tr>
<tr>
<td>Security</td>
<td>Site integrity (e.g. access). Important if there is a free trade zone or custom activities.</td>
</tr>
<tr>
<td>Site maintenance</td>
<td>General activities related to cleaning, garbage collection as well as technical maintenance such as utilities.</td>
</tr>
<tr>
<td>Parcel services</td>
<td>Support the high transactional level of logistical activities.</td>
</tr>
<tr>
<td>Certification and quality control</td>
<td>Certifying and benchmarking agencies to insure that users meet recognized criteria.</td>
</tr>
<tr>
<td>Cargo inspection</td>
<td>Expert assessment in cargo losses and damages. Specialized laboratories.</td>
</tr>
<tr>
<td>Logistics equipment location</td>
<td>Sale and location of logistical equipment, such as racks, fork lifts, conveyors, etc. Maintenance of this equipment.</td>
</tr>
<tr>
<td>Container and chassis location</td>
<td>Availability of maritime and domestic containers for export and import activities. Availability of chassis.</td>
</tr>
<tr>
<td>Export facilitation</td>
<td>Activities promoting exports such as certification, financing and marketing.</td>
</tr>
<tr>
<td>Work supplies</td>
<td>Uniforms, work equipment (e.g. gloves), wraps, labels, boxes, security equipment (fire extinguishers), etc.</td>
</tr>
<tr>
<td>Temporary workers agencies</td>
<td>Supplying temporary workers to cope with fluctuations in the demand.</td>
</tr>
<tr>
<td>Office supplies</td>
<td>Sale and rental of office equipment and supplies.</td>
</tr>
<tr>
<td>IT equipment</td>
<td>Sale and rental of computers, telecommunication equipment and software. IT network setting and management.</td>
</tr>
<tr>
<td>Human resources</td>
<td>Personnel management from recruiting to payroll. Labor training and certification.</td>
</tr>
<tr>
<td>Accounting</td>
<td>Management of transactions and finances.</td>
</tr>
<tr>
<td>Insurance and financial services</td>
<td>Variety of insurance products for people and merchandises. Activities facilitating commercial transactions at the national and international levels (e.g. letters of credit).</td>
</tr>
<tr>
<td>Legal services</td>
<td>Expertise for contract redaction and commercial dispute resolution.</td>
</tr>
</tbody>
</table>
## Logistics Zones: Personal Services

<table>
<thead>
<tr>
<th>Type of Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitality</td>
<td>Availability of hotel and meeting facilities to support the transactional intensity of logistics zones. Extended stay facilities. Overnight facilities for truckers.</td>
</tr>
<tr>
<td>Restoration</td>
<td>Availability of restaurants for workers and truckers. Lounges for short term relaxation and informal meetings.</td>
</tr>
<tr>
<td>Personal services</td>
<td>Array of services for workers (e.g. convenience store, hair salon, sports club, daycare, clinic, postal services, etc.)</td>
</tr>
</tbody>
</table>
Advantages of Logistic Zones

### Geographical Advantages

- **Land**
  - Availability (ownership or zoning).
  - Lower acquisition (or renting) costs.
  - Preferential taxation.

- **Accessibility and Connectivity**
  - Proximity to terminals, suppliers and customers.
  - Lower distribution costs (distance).
  - Site accessibly 24/7.

- **Infrastructures**
  - Provision of utilities and roads.
  - Leasing of warehousing space and equipment.

### Operational Advantages

- **Planning and Regulations**
  - “Fast track” (construction and operation).
  - Incremental infrastructure (development phases).
  - Compliance to safety, security and environmental regulations.
  - Foreign trade zone status.

- **Economies of Agglomeration**
  - Lower distribution costs (scale); shuttles to terminals.
  - More full truck loads.
  - Shared services (labor, transloading, telecommunications).

- **Multiplying Factors**
  - Anchor tenants (major actors in logistics).
  - Diffusion of best practices (managerial, technical).
  - Service industries.
Distribution of the Size of Logistics Zones

- More than 2,500 hectares: 2
- 1,500 to 2,500 hectares: 5
- 800 to 1,500 hectares: 11
- 400 to 800 hectares: 13
- 200 to 400 hectares: 17
- 100 to 200 hectares: 23
- 50 to 100 hectares: 20
- 25 to 50 hectares: 11
- Less than 25 hectares: 6

N = 105
Average size: 435 hectares
Median size: 130 hectares