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The Operational, Financial and Environmental Feasibility of Short Haul Intermodal Corridors

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Outline

- Evolution of Intermodal
- Trends towards Short Haul Intermodal
- Introducing Intermodal Corridors to Improve Port Throughput
- Case Study: San Antonio-Santiago Intermodal Corridor
 - Operational Feasibility
 - Financial Feasibility
 - Environmental & Social Feasibility
- Summary & Conclusions
- Opportunities for East Africa, South Africa, West Africa

Global State of Intermodal Rail

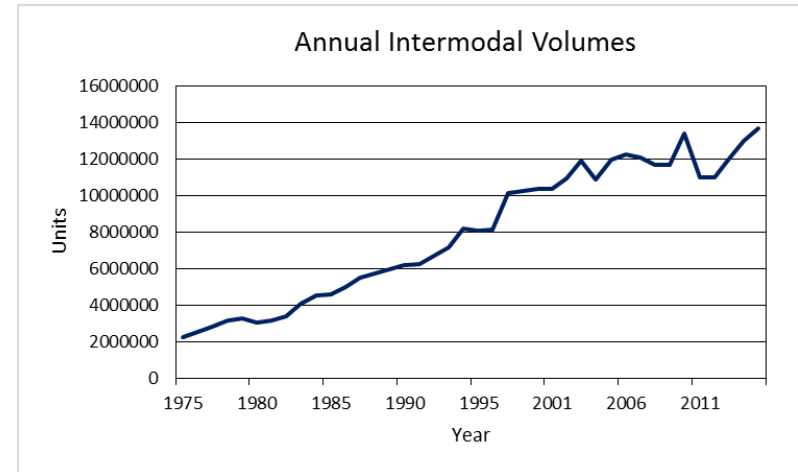
Country	Track Length (km)	Population per km	Intermodal Volume per Year*	Intermodal Loads per km of Track	GDP per Capita (USD)**
United States	226,427	1,379	23.8	105.1	\$51,749
United Kingdom	15,700	4,058	0.9	57.3	\$35,722
Canada	72,912	605	5.0	68.6	\$41,298
South Africa	24,487	2,066	0.7	28.6	\$12,198
India	64,215	18,846	3.0	36.7	\$5,138
Russia	128,000	1,117	0.5	3.9	\$23,589
Australia	41,461	548	1.2	28.9	\$43,818
China	91,000	14,722	1.6	17.6	\$10,960

* Estimates, in millions of TEUs 2011 Source: AAR, CONCOR, Journal of Commerce

** 2012 est. Source: World Bank

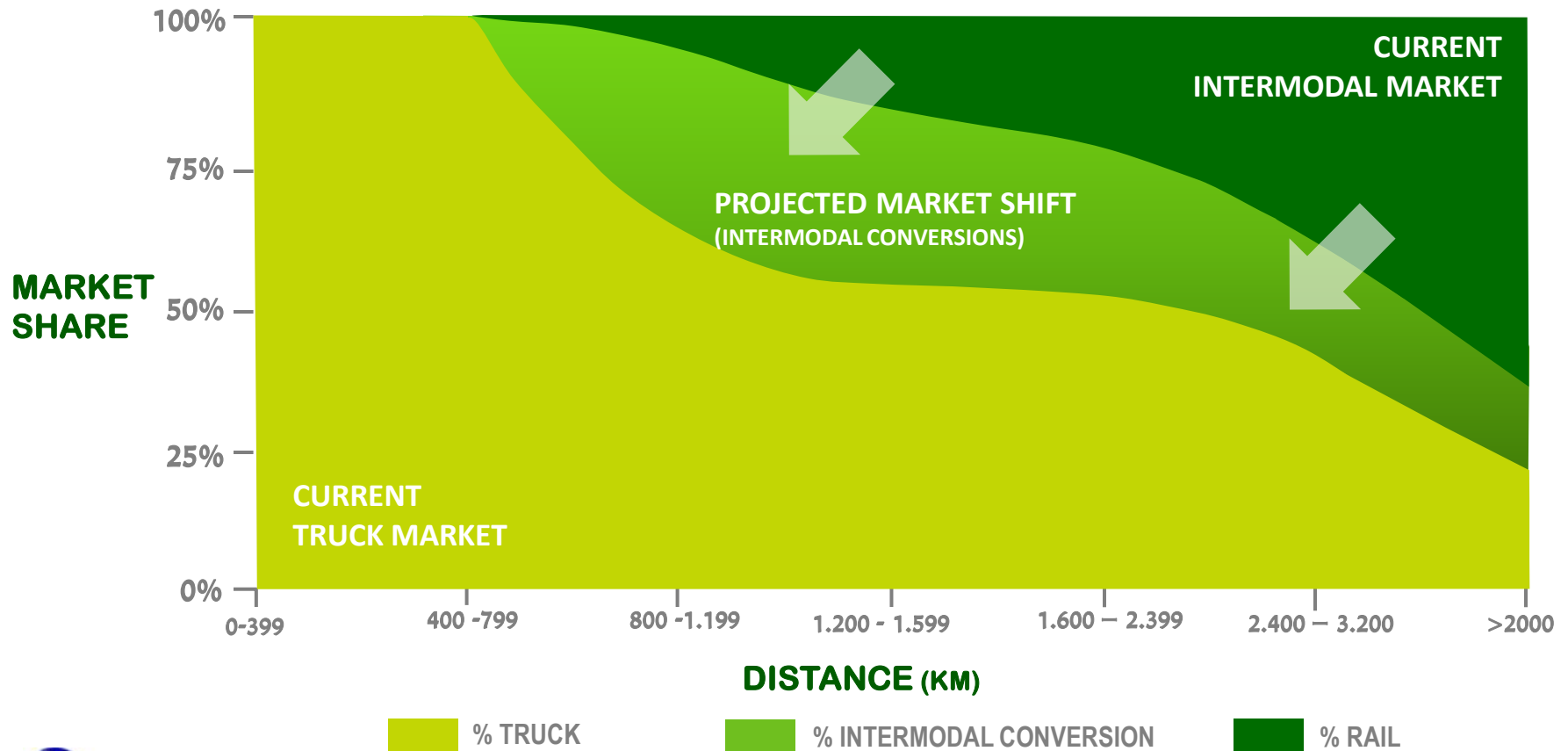
Intermodal Growth has Been Steady in North America and Globally

- The intermodal rail freight industry is large and growing throughout the world
- Intermodal is now the fastest growing segment for railroads in North America



- The old myth was that distance had to be minimum 1000 km to be viable
- More than 50% of truck traffic over 3000 kilometers has been converted to intermodal rail
- Conversion of truck traffic to intermodal rail in shorter haul lanes is growing rapidly with improving service and compelling economics

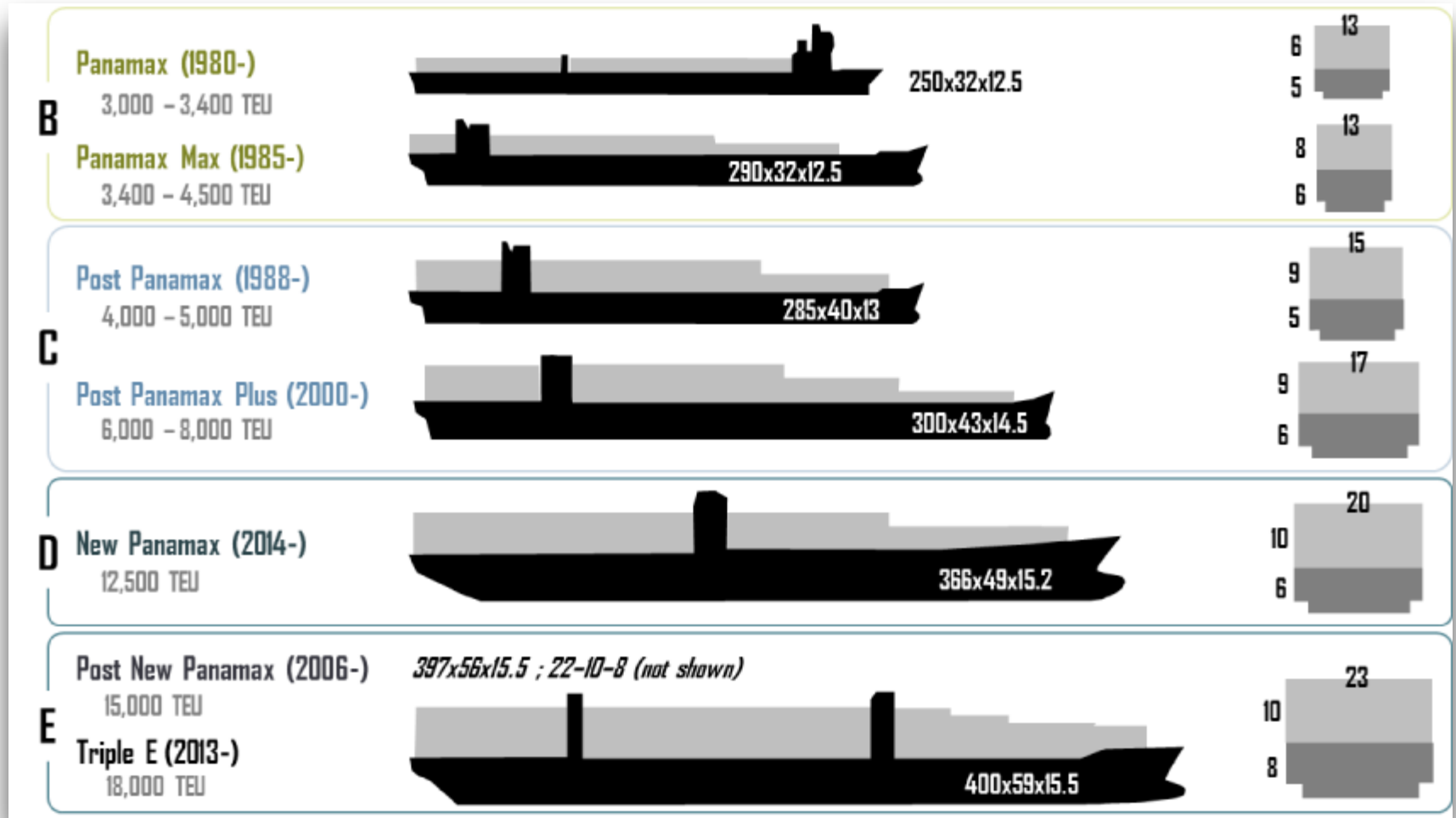
Conversion from Truck to Intermodal is Occurring in Shorter Haul Corridors



Several Factors Will Contribute to a Continued Shift from Truck to Intermodal

- Growth in containerized imports
- Improved service and market reach
- Higher fuel cost will shift more truck traffic to rail
- Congested and deteriorating road and highway system make intermodal an attractive alternative
- Driver shortages and hours of service rules will limit truck capacity
- Social and environmental considerations strongly favor intermodal
- Larger container vessels require greater port throughput

Larger Vessels Will Force Ports to Improve Productivity and Throughput



Short Haul Intermodal Corridors are Growing

- Common keys to successful short haul intermodal rail service include:
 - **Automation** at intermodal terminals
 - Volume and **Density** - Rail's advantage lies in trainload lots
 - Balanced flows - Unequal demand means moving empty rail cars and containers
 - **Competitive travel times** - Routes with excessive circuitry cannot be competitive
 - Reasonable drayage costs - These can sometimes exceed the line-haul rail cost
 - **Clearances** - Use of double-stack rail equipment greatly reduces cost

Examples of Short Haul Intermodal Corridors

- Thailand Short Haul Intermodal Rail Service
 - Laem Chabang Port (LCP) to Lat Krabang Inland Container Depot (LICD), Bangkok
 - Intermodal service introduced to reduce traffic congestion at Bangkok Port
 - Distance from LICD to LCP is 100 km by motorway and 118 km by rail
- Alameda Corridor Southern California
 - 32 km freight rail expressway
 - Connecting the Ports of LA and Long Beach to the national rail system
- San Antonio-Santiago Corridor
 - 100 km corridor linking Port of San Antonio to the largest market in Chile
 - 95% of containers in the corridor have historically moved by truck

Case Study: San Antonio-Santiago Corridor

Advisian completed a feasibility study in 2015 to analyze the technical, financial, social and environmental feasibility of developing an Intermodal Rail Corridor between San Antonio and Santiago (Approx. 100 km)

- Developed a phased implementation plan to build the corridor
- Provided financial analysis and estimates of required OPEX and CAPEX
- Performed analyses to determine the project's sensitivity to changes in key variables
- Applied a parametric model of railway capacity to estimate the maximum fluid capacity, and calculate the capacity gains from improvements to the rail corridor
- Used our business case model to determine to proper sequence/timing of upgrades
- Used our intermodal terminal operations model to determine best layout and equipment configuration for the intermodal terminals

Infrastructure and Operational Upgrades

- For the rail corridor, we evaluated several infrastructure and operational upgrades to **incrementally** add capacity to the corridor
 - Lengthening passing sidings
 - Adding passing sidings
 - Adding power switches
 - Adding signaling
 - Constructing a fly-over
 - Adding track
 - Increasing train speeds
 - Enabling double-stack operations
- The investments with the lowest CAPEX cost per unit of incremental capacity gained will be made earlier in the program

Conceptual Design of Intermodal Network

Conceptual Map of Rail Network

A shuttle train service would connect San Antonio with Santiago, with potential additional future stops.



Current Situation: San Antonio - Santiago

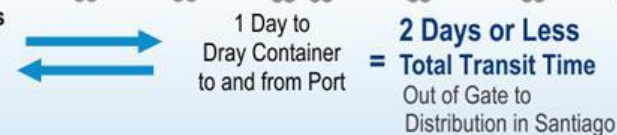
- Containers move almost exclusively by truck with negligible intermodal volume on EFE
- Port of San Antonio is space constrained
- Expansion at the Port of San Antonio will attract large volumes, and will result in port congestion and worsening highway traffic without an effective way to move containers by rail

Shuttle Description

- Integral train set does not get switched
- Frequent service
- Double stack trains provides higher slot utilization
- Expedited loading and unloading at terminals
- Higher rail asset utilization



Conceptual Shuttle Schedule



Conceptual Road Schedule



13-SAN-LS02

Financial Feasibility of the Corridor

- The San Antonio - Santiago Intermodal Corridor is a viable investment opportunity for an investor looking to establish or expand a presence in a growing trade hub with favorable macroeconomic conditions
- Conclusion is based on our study of four separate development options
- Our base case scenario assumed 40% conversion to rail and a network design with one inland terminal
- Base case scenario yields an IRR of 22.9%

	Percentage of Port TEUs that move by Rail	
	40%	70%
N & S Terminals	19.2%	30.1%
West Terminal	22.9%	35.7%

Financial Analysis & Sensitivity Analysis

- We performed sensitivity analyses on the Base Case scenario
- The Project can withstand up to a 9% drop in container demand and maintain a minimum of 20% Equity IRR
- Sensitivity analyses underscore the importance of a comprehensive design process and implementation plan, a qualified EPC contractor, and a competent terminal operator to spearhead the Project's development and operation
- From a financial perspective, the Project is supported by a strong macroeconomic environment in a stable, low risk economy
- As part of its effort to reduce highway congestion the government may introduce a “congestion tax” to reduce truck flows which would enhance the proposed intermodal corridor's competitiveness

Environmental and Social Impacts

- Environmental benefits of the project will offset both the capital investment cost and environmental costs associated with the project
- The primary environmental benefits of the project include
 - Improved air quality associated with a reduction in truck traffic and congestion
 - CO₂ emissions would drop by 24-42%
 - More efficient use of diesel in freight transport
 - Improved traffic and roadway conditions
 - Fewer vehicle accidents
 - Accidents would drop by a factor of 6.82 times for freight shipped by rail instead of truck

*Assuming 1.5 million Rail TEUs/yr

Estimated Benefits of Intermodal

- Safety

5,722 Highway Fatalities Avoided

- Economics

12.5 Billion Gallons of Fuel Savings

- Sustainability

139 Million Tons of CO₂ Emissions Reductions

- Livability

2.3 Billion Travel Hours Saved

- Impact on Infrastructure

214 Billion Kilometers of Truck Traffic Avoided



Summary & Conclusions

- Short Haul Intermodal Corridors can be operationally, financially, socially and environmentally feasible
- A phased sequence of capacity improvement measures allows for matching of investment timing with volume growth
- Short Haul Intermodal Service / Shuttle Trains can alleviate port congestions more effectively than trucks
- Intermodal Corridors can have positive social and environmental benefits
 - Positive impact on regional employment
 - Improved air quality
 - Reduction in truck traffic and congestion
 - Improved traffic and roadway conditions
 - Fewer vehicle accidents and traffic fatalities
- Opportunities exist in Africa to develop/expand short haul intermodal corridors
 - Mombasa - Nairobi Corridor
 - Gauteng Intermodal Corridor
 - Dar es Salaam - Isaka Corridor
 - Beira Mozambique Regional Gateway
 - Walvis Bay Intermodal Corridor



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