ENGLISH EXECUTIVE SUMMARY

-- *Executive Summary of the Final Report* --
USTDA Feasibility Study for West Africa Regional Rail Integration Project

Prepared for:

The Union Economique et Monétaire Ouest Africaine

Submitted by:

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Eight Tasks & a Final Report

Introduction

What is the Market for Rail Services?

- ✓ Competition, Relative Size & Growth, traffic divertible to rail

Proposed Bamako to Ivory Coast as a New Railway

- ✓ The cost to build as a new link – either as Meter or Standard Gauge

The Existing Bamako to Dakar Corridor

- ✓ Safety repairs to keep it working & avoid accidents
- ✓ Meter Gauge repairs – including design for later gauge conversion
- ✓ Standard Gauge full conversion

Financials and Economics of the Possible West African Railway Revitalization as Task #5

- ✓ Pro Forma projected outlook for the proposed railway operating enterprise
- ✓ Economic Benefits to the Nation & to Shippers

Regulatory & Implementation Issues

- ✓ Proposed New Rail Authority for Making Changes & Obtaining Financing
- ✓ Implementation as a Critical Path with Timeline Estimates

Development Impact Assessment as Task #7

- ✓ Infrastructure improvements that can use US technology;
- ✓ Human capacity building and job creation opportunities from the project;
- ✓ Adoption of market-oriented reforms and de-regulated railway business practices;

Environmental Impacts as Task #8

- ✓ Environment Assessment & Recommendations

Summary about Local Decisions for Rail Success & Self Sustainability

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Introduction

Project Defined:

The West African Economic and Monetary Union (**UEMOA**) received project funding for part of this new railway corridor feasibility study from the US government United States Trade Development Agency (USTDA). Part of the study inside the northern Ivory Coast was financed separately by UEMOA. The client is UEMOA.

The purpose of the project was to prepare a feasibility study with recommendations for 1) modernization of the existing 1,233 km Dakar-Bamako corridor and 2) recommendations on execution of a 560 km new southern Mali and northern Ivory Coast railway link.

The original concept level plan was issued in 2008 by the Economic Community of West African States (ECOWAS) as a 17 to 18 link master plan for railways.

The Consultant Team

The lead United States consulting company is Harsco Rail Zeta Tech with offices in Cherry Hill, New Jersey. The team included Cardno Tec (TEC) located in Annapolis, Maryland and Dialla KONATE – a local Mali based expert in commerce, mining and transportation. Regulatory and legal issues were evaluated by Peter C Hansen Law LLC in Washington DC.

Table 1
Tasks of the USTDA Rail Project

Number	Description
Task 1	Review and Data Gathering
Task 2	Detailed Market Study
Task 3	Technical Assessment for New Railway Link
Task 4	Technical Study for Existing Railway
Task 5	Financial and Economic Analysis
Task 6	Project Structure and Implementation
Task 7	Analysis of Key Host Country Development Impacts
Task 8	Preliminary Environmental Impact Assessment
Task 9	Final Report

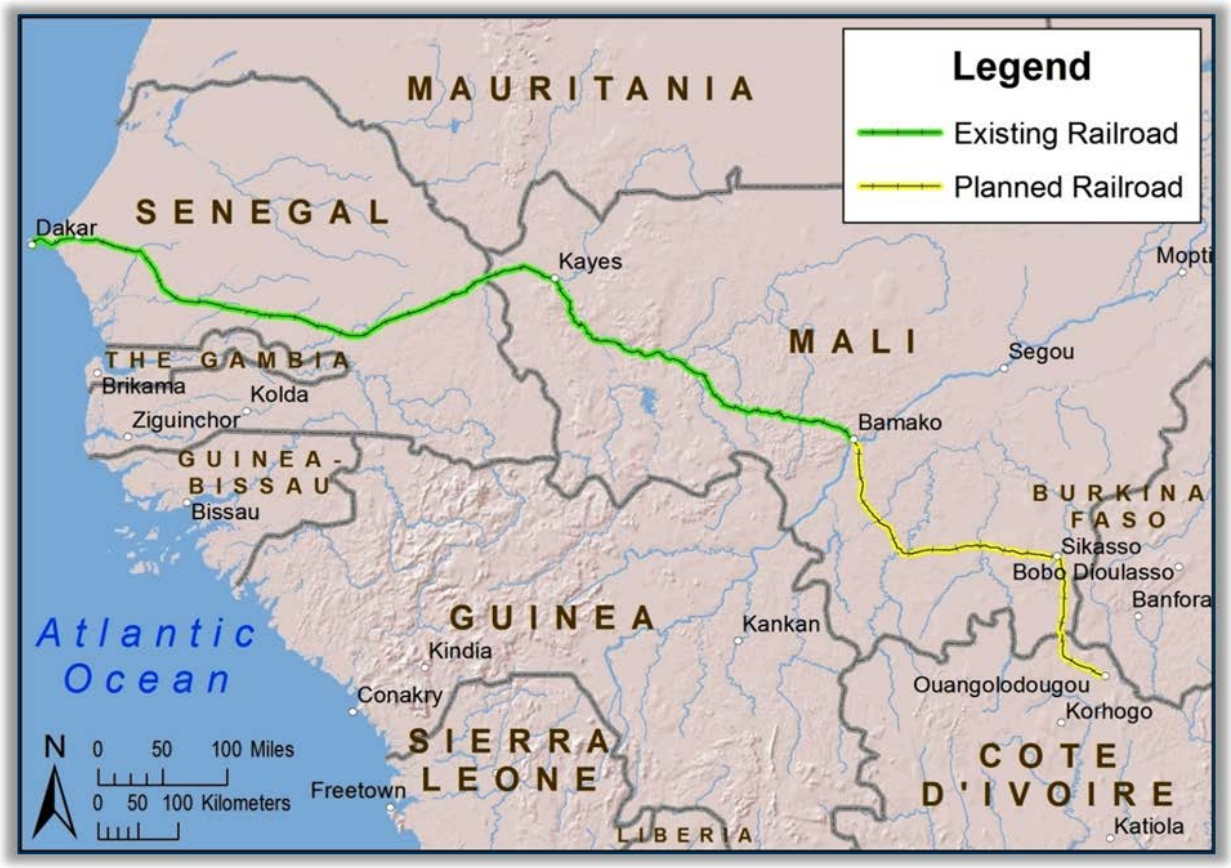
One strategic objective of both ECOWAS and UEMOA is to integrate the railways so that eventually a common gauge (width of track) is used by the member states. Approximately 55% of the world uses railway track gauge (called Standard European and North American gauge) of 1435 mm spacing between the steel rails. In contrast only about 14% of all railway tracks used

throughout the African Continent are international standard gauge. More than half of the African railway projects actively being considered during 2010-2012 appear to be standard gauge options.

In Senegal, Mali and the Ivory Coast, a narrow metric spacing between the steel rails @ 1,000 mm is used. This meter gauge is estimated at just 8% or less of global tracks. This meter gauge is supported by the smallest number of global railway equipment vendors. This makes meter gauge a NICHE OR BOUTIQUE MARKET.

While a meter gauge railway can be made more efficient than the one that runs today in West Africa, it will never equal the productivity of the North American standard gauge when large amounts of cargo are being moved by rail.

Figure 1
The Senegal – Mali – Northern Ivory Coast Rail Map



Green Line is the existing Dakar to Bamako rail line.
Yellow represents the proposed new southern Mali rail link

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Figure 2
Standard Gauge Steel Rail Distance between the rails (Blue shows Meter Gauge width)

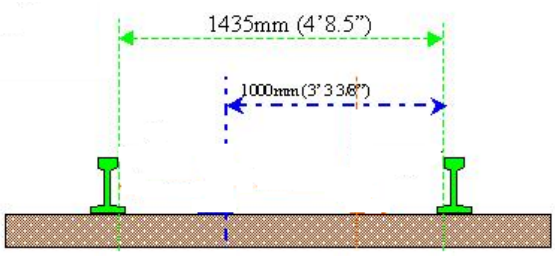


Figure 3 Shows UEMOA (in Green)

A THREE GENERATION LIFE SPAN

The life of a large railway capital project is measured in decades. A brand new railway has a steel rail and sleeper life span that is in the 50 years or more target. Bridges and drainage culverts have life cycles that can exceed 100 years. The design standard selected by UEMOA planners will set the economics in place for the next three or more generations of citizens and shippers. Planners will have to choose their design options wisely.

CONSTRUCTION TIMELINE

A practical construction timetable, once a decision to finance and build is made, would take three to four years to complete for a brand new rail line or for a complete modernization of an existing route.

RECOMMENDED RAILWAY PERFORMANCE STANDARDS

Zeta Tech recommended the following high performance standards as examples of practical day-to-day operations for a modern efficient freight enterprise.

1) Locomotive daily availability set at 90% to 94%
2) Wagon daily availability to load customer freight at 90 to 94%

3) Capital cost per horsepower at less than $550 USD
4) Capital cost per pound of pulling power (tractive effort) at $15 range
5) Average km run by each main line freight locomotive each day of 500 to 600 km
   Passenger locomotives @ 800+ km/day
6) Average km per day per each loaded wagon in the 400 to 500 km range
7) Maximum load/reload cycle time for a 1,200 standard length of haul @ 5-days
   Passenger train one-way trip Abidjan to Bamako @ maximum of 24 hours @ average speed including stops of 50 km/h
8) Freight train set on time arrival at destination @ 90+ percent goal within 1 hour of promised time
   Passenger train final destination arrival @ 98% on time within 15 minutes of schedule
9) Number of LOADS per freight wagon per year set at 60 or more
   100 wagons per train if built or rebuilt to a standard gauge design
10) Loaded wagons per unit iron ore or mineral train at 80 to 100
11) Net-to-tare weight of a freight wagon set at 4.0 rather than the current 2.0
   This eliminates too much dead wagon weight per possible loaded cargo weight
12) Loaded freight train top speed needs to be no more than 65 km per hour
   At a top freight train speed in any one location of about 55 to 60 km/h
   Top passenger train speed of 75 to 90 km/h
13) Typical gross ton-km per a US gallon of fuel in the 500 km range

What is the Market for Rail Services?

Task #2 was to define the rail market. The size of the total market for traffic bound to and from Mali that is available to future/improved rail transportation is less than 3 million annual tons using a 2011 base line. That 3 million annual tons IS THE SHORT TERM MARKET for BOTH TRUCK AND RAIL to COMPETE for a share.

If the rail share were speculatively one-third, that would convert in 2012 to one daily freight train of just under 100 modern railway wagons.

With volume so low for the next decade or more the first threat to railway feasibility is that dividing the existing base line traffic to and from Mali between two competing rail routes (one new via the new Ivory Coast and the other via Dakar) would result in even shorter (less efficient) trains for each competing railway enterprise.

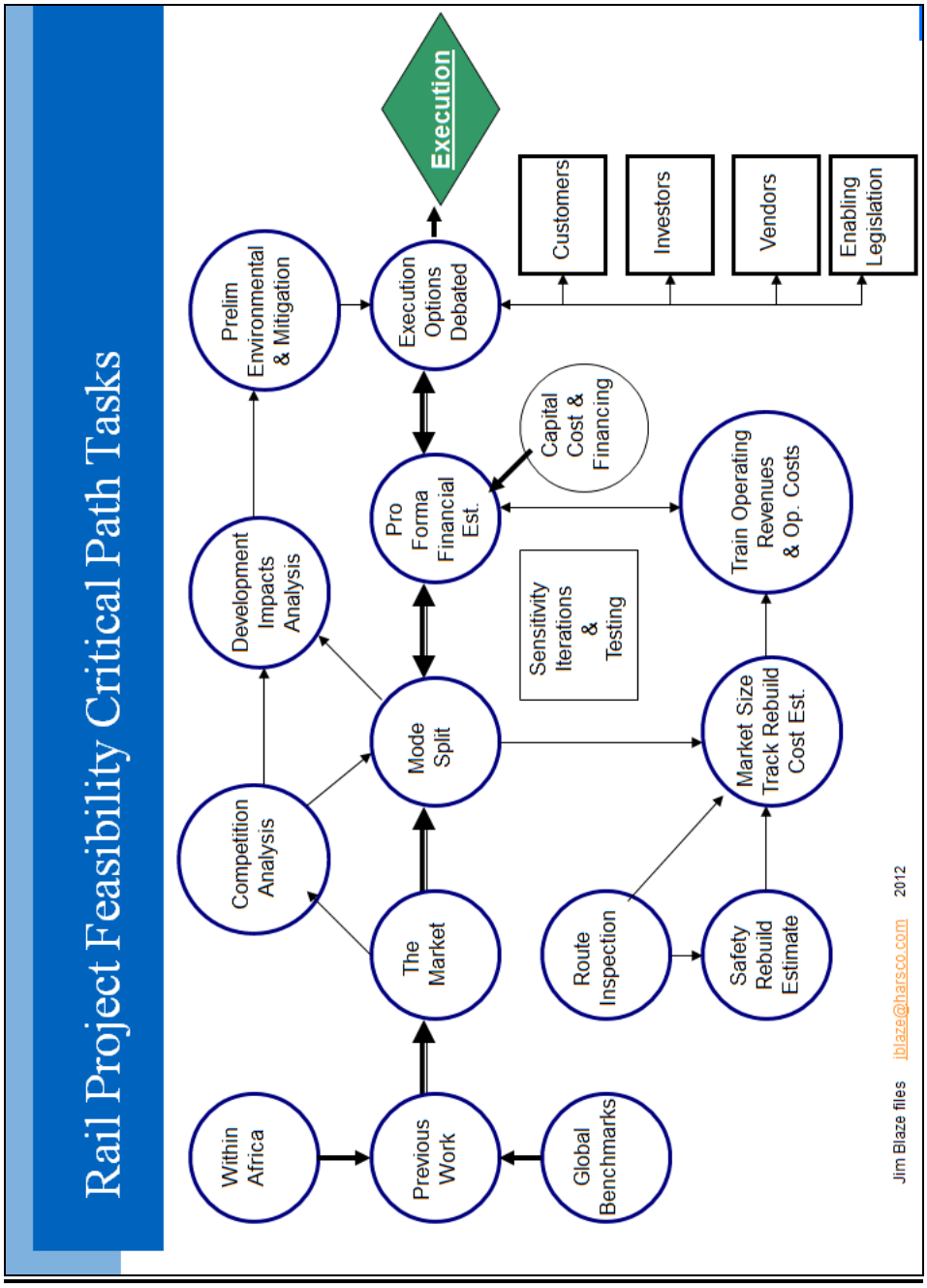
TRUCKING IS THE FREIGHT MODE OF CHOICE

Freight customers (shippers) do not use rail as their preferred carrier mode to and from Senegal and Mali. In a free market, they choose truck. Trucking is very expensive.

To truck 6 or more new automobiles into Mali from the Port of Dakar adds about $5,000 to the price of an imported vehicle.

Alternately, if a shielded side (for protection) railway wagon service was available (as in North America), the transport price per imported car should be less than $500 a vehicle.

Figure 4
Overview of the Zeta Tech Team Feasibility Study Process
for this UEMOA Railway Study



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The overall economic impact to Mali consumers from just this one freight commodity shift to an efficient rail service is a significant $4 to $5 million saving per thousand vehicles.

The railways will not be first choice of most shippers when the cargo length of haul is short. Short distance cargo movements on traffic corridors such as between Sikasso Mali and Bamako or between Bamako and Bobo Dioulasso in Burkina Faso -- while physically possible once a new railway is built -- **are unlikely given the trucking economic advantage in these short distances.**

The global evidence is overwhelmingly clear that distances less than 400 kilometers are the domain of the truck and road network. Railway planners have to recognize these fundamentals.

DOUBLESTACKING CONTAINERS could be a breakthrough new freight service if a standard gauge railway is built to North American standards

Shorter distance railway freight movements for general cargo are possible when a two-high container configuration on railway wagon method is used. Called doublestacking, such railway movements can give railways an advantage when the trucking costs are high (primarily because of fuel) if the distances are at least 700 to 800 kilometers. As energy costs increase in the coming decades, it is likely that the doublestack competitive window may drop to less than 600 kilometers in some corridors.

Where doublestacks have been used in the North American market (since 1983), the railway share can vary by as much as 30% to 70% versus trucking.

This is what marketing professionals call “a game changer”.

How important might Doublestacking of containers be to West Africa and its economic future? That is a fundamental public policy question.

> It is fundamental because Cape Gauge (1067 mm) and Meter Gauge tracks cannot accommodate Doublestacked container trains. The center of gravity balance on narrow gauge track would be unstable.

> Doublestacking of containers on trains realistically demands a 6.1 to 6.5 meter overhead clearance and a minimum 27 + metric ton axle load.

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Figure 5

Movement of finished goods by Doublestacked Container Trains represents a TRUCK KILLER "break through" for UEMOA Region

Rail Transportation as a Market for Passengers

The global evidence is that railway transportation for passengers is not financially viable and, if implemented, would require significant upfront and continuous financial support.

- As evidence, the Dakar to Bamako passenger train service was abandoned in 2009.
- Auto, bus and airplanes are the three dominant modes of market share, even in modern countries like France.
- Projections of future railway passenger traffic should assume no more than a 10% to 15% market share versus the other modes.
- Any rail passenger service should be coordinated as part of an integrated local regional rail-bus transfer ticking service. The bus (or taxi and autos) will be used to distribute rail passengers to their final destination.

THE LONG RUN MARKET

Over a thirty-year period, a pattern of industrialization and manufacturing sector growth is likely to occur within Mali. There was no official government forecast found for such sector growth. But it is logical to assume that given a three-decade horizon, some such growth will occur.

Table 2 identifies the normal growth without mine export traffic being added.

Table 2
Market Projections for Mali Using Import/Export 2010-11 as Base Year
No Mine Traffic Projected in these figures

	Metric Tons	Rail Share	Rail Tons/Yr		Rail Share	Rail Tons/Yr
Base Year	2,500,000	20.0%	500,000		20.0%	500,000
CAGR	5.4%			6.6%		
Year 5	3,097,062	33.0%	1,022,030	3,126,418	33.0%	1,031,718
Year 10	3,971,274	55.0%	2,184,201	4,281,936	55.0%	2,355,065
Year 15	5,092,252	65.0%	3,309,964	5,836,870	65.0%	3,793,966
Year20	6,560,744	70.0%	4,592,520	7,993,641	70.0%	5,595,549
Year 25	8,412,655	70.0%	5,888,858	10,947,356	70.0%	7,663,149
Year 30	10,787,308	70.0%	7,551,116	14,992,492	75.0%	11,244,369

Note:
Risk anaylsis includes provision for 6 recession years
Two year recovery from each recession
Lowest typical growth rate is 5.5% per year; Highest range is 7.5% per year

Until an industrial development forecast is available from official ECOWAS sources, this high growth rate of import/export traffic (higher than the GDP rate) can be used as a surrogate for the railway related freight traffic growth.

Finding railway transportation demand for very large-scale bulk commodities (such as iron ore, coal, manganese and petroleum based commodities) would provide these two railway corridors with additional prospects for becoming self-sufficient.

Proposed Bamako to Ivory Coast as a New Railway

Task # 3 was to examine the feasibility of a new rail line south of Bamako. The line was to connect to an existing railway in The Ivory Coast. The team evaluated two options for this new route: a new meter gauge and a new standard gauge. The UEMOA Rail Work Shop in October 2012 selected a meter gauge designed for later easy conversion to standard gauge.

Table 3 is a summary of the approximate $1.45 billion capital costs if built as an international meter gauge railway – available for later standard gauge conversion. It would be built to wider formation width and use longer concrete sleepers pre-fabricated to switch later to a new 1435 mm steel rail spacing as standard gauge.

Track and structure costs for the initial meter gauge design are estimated at $1.35 Billion.

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The southern Mali proposed rail corridor to Ouangolodougou is shown in Figure 6.

Figure 6
Map Shows Proposed Southern Mali – Ivory Coast Rail Connection via Sikasso
The dotted line shows the Zeta Tech suggested shorter direct connection to Sitarail

Table 3
PROPOSED BAMAKO TO IVORY COAST NEW RAILWAY
Estimated Meter Gauge – Phase 2 Std. Gauge Convertible Capital Costs – In $ Millions

Cost Items	Bamako-Border	Ivory Coast Section	Total Project
Track	$ 1,1490	$197	$1,346
Train Operations			
& Train Sets	67	2	69
Planning & Training	1		1
TOTAL	$ 1,251	$ 201	$ 1,452

Zeta Tech recommends a minimum rail weight of 65 to 68 kg as having longer life cycle as traffic grows beyond the 10 to 20 million ton annual range.

Zeta Tech also recommends within this estimated project cost a budget for training, regulatory oversight, and special marketing studies in order that the local West African population can become proficient in operating this new railway.

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The Existing Bamako to Dakar Corridor

Task # 4 was to examine the existing railway between Dakar and Bamako and assess the feasibility of improving that existing corridor.

The Harsco Rail Zeta Tech team examined the costs of modernizing the existing 1233 kilometer (766 miles) operating rail corridor that today connects Dakar and Bamako. Zeta Tech examined four cost options and a base case.

- The Base Case is the existing TransRail operation
  1) One option was Emergency Safety Repairs
  2) A second option was Limited Market Growth Meter Gauge Repairs
  3) A third option was for a High Traffic Growth Meter Gauge Modernization
     i. Convertible at later incremental cost to Standard Gauge
  4) A fourth option of immediate conversion to High Traffic Modern Standard Gauge

Table 4 identifies the resulting capital costs going forward to repair this corridor.

Table 4
Costs in Millions – Estimate by Zeta Tech

Summary of July 2011 Capital Costs Options for Dakar to Bamako Rail Line
Costs in estimated year 2011 Dollars — Rounded to Nearest Million

	Safety Case Meter Gauge	**Minimum Growth Meter Gauge**	**High Growth Meter Gauge**	**High Growth Standard Gauge**
Track & Bridge/Culvert Structures	$112	$181	$1,006	$1,369
Train Equipment & Operations Support	$29	$93	$274	$225
TOTAL PHYSICAL REHAB	$141	$274	$1280	$1,595
Skills & Regs Preparation and Training	$3	$5	$6	$6
TOTAL with Contingencies and Engineering Design	$144	$280	$1286	$1,601

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The shaded cost data represents revised estimates in November 2012. The cost numbers submitted in this final November 2012 version reflect changes in standards requested at the UEMOA Rail Forum by the West African participants. Those participants desired to have a railway upgrade that would not close the existing meter gauge railway during construction. They adopted an interim conversion as meter gauge towards a standard gauge.

Details of the UEMOA Preferred Meter Gauge Convertible Capital Plan

The UEMOA sponsored October 2012 railway workshop adopted a set of standards that they as a group felt comfortable with. Harsco Rail Zeta Tech then reran our railway physical cost tables to meet those UEMOA workshop "preferred" standards.

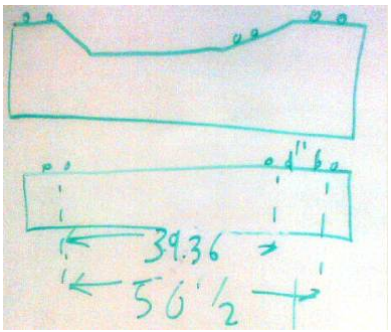
High growth is not being guaranteed by the Harsco Rail Zeta Tech team. The total expected project cost (including train equipment, training, and infrastructure) is estimated at $1.29 Billion. This is based upon the reasonable possibility that traffic in the next decade or more could grow to exceed a range of 8.5 million or more annual net tons **if mine traffic is developed and a modern Senegal bulk cargo port facility are developed as an integrated package**.

The cost of modernizing just the physical track and bridge structures is approximately $1,006 million. The track and structures cost per kilometer is $816,000 compared to the low growth estimated supporting repairs at $147,000 per kilometer.

The estimates include standard costs for project engineering and an estimated contingency cost.

The conversion allowance for a 2nd phase standard gauge shift is allowed by INSERTING LONGER LENGTH CONCRETE SLEEPERS (2.6 meters) as part of the meter gauge upgrade. The longer sleeper can then accommodate a later three steel rail gauge configuration. This approach is used because the UEMOA Railway Work Shop local participants want to avoid shutting down the existing meter gauge railway during modernization construction. This local policy decision, if unchanged, will increase the project costs.

The image below shows how the special design longer dual gauge mono-block concrete will be inserted with dual rail fastener fittings (based upon an engineer's conceptual drawing by Zeta Tech's Don Holfeld).



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Note: this is not a widely used concrete sleeper design. There will have to be some tests to make sure the final design for production manufacturing is suitable for the job. Additional details as to alternative modernization procedures and the different costs are available in the full report.

Given the low level of existing meter gauge traffic (2012 levels), Zeta Tech still recommends the choice of an immediate conversion to standard gauge even if that results in a short term trucking substitute market. Ultimately, the choice is up to UEMOA, its stakeholders, and the investors who will have to be negotiated with to finance the project.

Financials and Economics of the Possible West African Railway Revitalization in Task #5

Feasibility studies try to use a chain of logic and science to rationally set up a plan that is based upon an analysis of BOTH the strengths and weaknesses of the existing and future business. That logic process evaluates the opportunities and the threats (competition) in the environment. It examines the different resources required to carry through the commercial venture. The feasibility is an attempt to measure the "prospects for success".

On a financial platform, the feasibility study needs to estimate the criteria of 1) the costs and 2) the value to be obtained from executing the project.

A solid feasibility study should provide a financial estimate of the "accounting results" or Pro Forma Statements of the resulting commercial operations.

The Pro Forma process models the anticipated results of the transaction, with particular emphasis on net revenues and the ability to pay off debt. Pro Forma statements summarize the projected future status of a company, based on the current view of the future business.

Lenders and investors require such statements to assess the company's ability to comply with planned debt service.

When a new corporation is envisioned, its supporters will prepare pro forma financial statements for the information of prospective investors.

Given the markets that were identified with selected shipper interviews, this financial assessment is built on perceived customer demand for rail service in this specific corridor. The Zeta Tech

team concludes that with the correct shipper and railway planner negotiations for service "market demand" and services that a railway can supply to the market, a proposed modernized standard gauge railway for this part of West Africa can be right sized to serve that market at a reasonable profit projection.

A latent but realistic demand for import cargo (mainly high value goods in containers plus fuels and chemicals bound for the growing consumer and industry inland markets) is the underlying market demand. To this general cargo is added the as of yet unfulfilled "latent" demand for resource export cargoes like iron ore, manganese, and perhaps coal.

One additional plan element is essential to fully complete this feasibility study. The flag client (prime cargo customer) for the railway may, for example, be iron ore from Mali to which ores from deep in the southwest section of Senegal can be added.

That added business volume from steel companies like ArcelorMittal have not been factored in yet as additional profitable cargo volume in this chapter).

HOWEVER, a new bulk cargo port must be built as part of this railway system plan. The existing Port of Dakar is not capable of handling the necessary very large ocean bulk ships. Discussions have been opened up between possible new port planners about integrating their plans with this railway corridor plan. However, those discussions are only at a preliminary stage.

The railway project needs to fully integrate those plans in order to proceed with this otherwise "feasible" railway Bamako to Dakar corridor plan.

The rail project needs the mines and the ports as a total logistics solution for shippers (customers).

While the mines and the rail and the port may each result in separate enterprises or organizations, their future economic performances have to be linked as commercial customers with one another.

ZETA-TECH calculated possible 5 to 8 Year initial rail freight growth as a Business Case and used this to project financial Pro Forma results for the Dakar-Bamako Corridor.

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These are the highlights of the high volume case study.

1) A Market Cargo Assessment of up to 10,000,000 tons of captured rail freight is possible.

2) This annual freight train volume was then converted into trains operated, loaded train kilometers and empty train kilometers, fuel costs, crew costs and equipment train sets requirements.

3) Annual revenues for the Bamako to Dakar railway organization were then calculated using a best fit "low cost rate for shippers" that would attract business away from trucks.

4) Zeta Tech used internal and proprietary models to estimate the annual costs of running trains, paying train crews, purchasing and using train diesel fuel, paying for operating leases of wagons and locomotives, and then maintaining the locomotives and wagons.

5) Zeta Tech included as continuing steady state maintenance the expenses of maintaining track, bridges, culverts, signals, and similar "infrastructure" assets required to run the railway trains. This maintenance is calculated using a steady state maintenance business model.

6) Track Rehabilitations (Modernization & Repairs) capital costs were also estimated by using Zeta Tech data files from the field inspections in May of 2011. The revenue rates were adjusted to make sure that these costs could also be captured in the Income Statement as a continuing financial requirement for the enterprise.

7) Locomotive and Wagon train set capital costs were included in the Income Statement as if they were annualized financial equipment leases (expenses).

The completed financial projections that are shown in the following pages use the Zeta Tech Team proposed practical business VOLUME and REVENUE projection for the Dakar to Bamako railway freight corridor.

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An Estimated Pro Forma for the existing 2011 Dakar to Bamako Railway

Table 5
(See 5-1 in Final Report)
Base Case Current Estimated Pro Forma
No Safety or Other Rehab Work

Total MGT	700,000 Net Tons
Total Ton-Kilometer	863,507,400
Per Ton-Kilometer Cost	$0.0400

REVENUES		$34,540,296
EXPENSES		
Locomotive Lease & Maintain cost		$2,879,505
Wagon Lease & Maintain cost		$1,497,405
Fuel & Crew costs		$3,174,655
Sub total Train Operating costs		$7,551,564
Track Main cost		$6,781,500
Bridge/Signal Communicate		$1,576,637
Sub total Structure costs		$8,358,137
G&A & other Overhead costs		$14,318,731
Direct Management Operate costs		$30,228,432
Contingency costs		$3,107,610
TOTAL COSTS before capital debt		$33,336,042
Operating Lease to the State		$6,150,000
Capital debt per year		$0
TOTAL OPERATIONS COSTS		$39,486,042
NET OPERATING INCOME		-$4,945,746
Revenues minus Costs		
Operating ratio		114%
Efficiency as Op Exp/Revenues		
Tax on Operating inc	25%	$0
After tax Net Income		-$4,945,746
Net as % Revenues		-14%

This Pro Forma is not an audited set of figures. It is an estimate based upon computer simulation and strategic planning rules based procedures used because an audited set of figures was not available. A representative informed Zeta Tech during the October 2012 Rail Workshop that the estimate was "reasonable".

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Test as High Volumes Meter Gauge-Dakar to Bamako Railway "convertible later in a Phase 2 to a Standard Gauge"

Table 6

Analysis as an Improved Meter Gauge Freight Service based upon technical standards "preferred" by UEMOA 2012 Rail Work Shop participants

The test results shown are the result of "solving" for the same target 70% operating ratio as in the alternate full conversion to standard gauge.

INCOME STATEMENT		**NORMALIZED**
REVENUES	Per ton/km	$0.0355
		$372,233,369
EXPENSES		
Locomotive Lease & Maintain cost		$26,557,036
Wagon Lease & Maintain cost		$17,650,681
Fuel & Crew costs		$34,912,188
Sub total Train Operating costs		$79,119,905
Track Main cost		$17,262,000
Bridge/Signal Communicate		$9,775,953
Sub total Structure costs		$27,037,953
G&A & other Overhead costs		$39,500,000
Direct Management Operate costs		$145,657,858
Contingency costs		$3,000,000
TOTAL COSTS before capital debt		$148,657,858
Operating Lease to the State		$6,165,000
Operating cost with Lease		$154,822,858
Capital debt per year		$104,350,216
TOTAL OPERATIONS COSTS		$259,173,074
NET OPERATING INCOME		$113,060,295
Revenues minus Costs		
Operating ratio		70%
Efficiency as Op Exp/Revenues		
Tax on Operating income	25%	$28,265,074
After tax Net Income		$84,795,221
Net as % Revenues		23%

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Test as High Volumes Standard Gauge-Dakar to Bamako Railway -- A Strategic Option

Table 7

Future Near-Term High Growth Business Case Estimated Pro Forma

Conversion to Standard Gauge Track is assumed as "Completed" using Concrete Sleepers and 60 kg steel rails

N.B. An estimated $1.370 Billion Capital Investment Financed over 35-Years @8%

INCOME STATEMENT		NORMALIZED
REVENUES	Per ton/km	$0.0291
		$358,972,362
EXPENSES		
Locomotive Lease & Maintain cost		$22,317,277
Wagon Lease & Maintain cost		$16,222,586
Fuel & Crew costs		$28,458,757
Sub total Train Operating costs		$66,998,620
Track Main cost		$17,262,000
Bridge/Signal Communicate		$9,268,668
Sub total Structure costs		$26,530,668
G&A & other Overhead costs		$32,000,000
Direct Management Operate costs		$125,529,288
Contingency costs		$3,107,610
TOTAL COSTS before capital debt		$128,636,898
Operating Lease to the State		$6,165,000
Operating cost with Lease		$134,801,898
Capital debt per year		$117,505,211
TOTAL OPERATIONS COSTS		$252,307,109
NET OPERATING INCOME		$106,665,253
Revenues minus Costs		
Operating ratio		70%
Efficiency as Op Exp/Revenues		
Tax on Operating income	25%	$26,666,313
After tax Net Income		$79,998,940
Net as % Revenues		22%

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ENGLISH EXECUTIVE SUMMARY

Test of the Proposed NEW Southern Mali Line between Bamako and the Ivory Coast as a low initial volume Meter Gauge –

- ***Convertible later to a Standard Gauge***

Table 8 Pro Forma Financial Projections at 2 Million Tons
Design estimate Requested by UEMOA Rail Planner Work Shop

PRO FORMA AS Meter Gauge		
Net Tons per year in Millions		2 Million
INCOME STATEMENT		**NORMALIZED**
FREIGHT REVENUES	Per ton/km	$0.0255
PASSENGER REVENUES		$0.0000
ESTIMATED TOTAL REVENUES		$28,574,280
EXPENSES		
Locomotive Lease & Maintain cost		$4,811,437
Wagon Lease & Maintain cost		$2,044,200
Fuel & Crew costs		$3,530,910
Sub total Train Operating costs		$10,386,548
Track Main cost		$2,258,780
Bridge/Signal Communicate		$1,011,626
Sub total Structure costs		$3,270,406
G&A & other Overhead costs		$4,097,086
Direct Management Operate costs		$17,754,040
Contingency costs		$3,107,610
TOTAL COSTS before capital debt		$20,861,649
Operating Lease to the State		$6,165,000
Capital debt per year		$38,466,820
TOTAL OPERATIONS COSTS		$65,493,469
PASSENGER SUBSIDY payment		$0
NET OPERATING INCOME (or Loss)		-$36,919,189
Revenues minus Costs		
Operating ratio		229%
(Efficiency as Op Exp/Revenues)		
Tax Paid on Operating income	25%	$0
After tax Net Income (or Loss)		-$36,919,189
Net as % Revenues		-129%

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Regulatory & Implementation Issues

The Harsco Rail Zeta Tech team reviewed as Task #6 the regulatory and legal issues relevant to the Project in order to recommend structures for implementation of the rail projects.

The most interesting suggestion from Task 6 is a proposal calling for the use of a Railway Authority mechanism as a means of making the railway project more attractive to private financing.

The Zeta Tech team conclusions are that under the right conditions, a well designed railway with secure volumes of traffic could be created and mostly privately financed in specific corridors – thus reducing the need for so called "donor" capital[1].

The 8.5 million ton meter gauge and the 10 million ton standard gauge Pro Forma Income Statement projections shown in Chapter 5 is evidence of possible non-donor rail project execution.

However, a necessary condition is that there needs to be a better means of securing project flexibility and reducing project risks. That process improvement requires a new regulatory and legal concessioning method. For this enabling approach, the Zeta Tech team turned to a law firm that had experience in West Africa. The firm is Peter C. Hansen, LLC of Washington DC. The firm's principals have experience throughout West Africa.

A proposed treaty process would redistribute rights and responsibilities, and thereby simplify the railway's legal administration. This change will increase the rail project's attractiveness to bond investors that want to help both Mali and Senegal.

The final report gave UEMOA and the railway stakeholders both an English and a French language version of the proposed treaty text. That suggested Rail Authority treaty of course has to be reviewed and debated by the proper West African authorities.

The Proposed Solution

The draft Treaty sets out a path for the States of Mali and Senegal to extricate the railway system from the present arrangement in a lawful manner, and to put it on a much more solid footing for the future. It does so by restoring ultimate ownership and control of the railways to the States Parties, and by establishing means for the parties to exercise their rights through a bi-national authority.

[1] "Donor capital" implies that the recipient nation has a project that cannot generate sufficient income to pay off the necessary capital to build the project – in this case a railway. The assumption is made that the normal annual operating revenues projected may cover annual operating expenses, but NOT the annual principle and interest on the capital loan to build it.

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The proposed Treaty grants this rail agency broad powers to administer the railways, and to engage and manage concessionaires effectively without ceding ultimate control over the fate of this critical infrastructure. This allows both Mali and Senegal to set the stage for more fruitful bi-national cooperation, and a far more stable legal and business framework for the economy.

In the long run, a series of such bi-state or multi-state Railway Authorities could be created by similar treaty process within the full ECOWAS states, if they wished.

Today: An Unattractive Legal Arrangement Exists for the Creditors

The joint Concession Agreement has rendered the railways' credit-worthiness exclusively dependent upon the Concessionaire's business success. At the same time, it has prevented the Concessionaire's independent use of railway assets as collateral, and prevents repossession except in the extreme case of total replacement of the Concessionaire.

Without significant security, any investment or loan approaches the status of a debenture. Such a level of risk is difficult to market even in a developed economy.

HOW LONG WILL THIS TAKE & WHAT ARE THE LOGICAL PROCEDURAL STEPS FOR ORGANIZERS TO FOLLOW?

The following steps are an example of a logical series of critical path work items that cover about 90% of the fundamental process of moving from a Rail Feasibility Report to the first running of trains. There are more than sixteen (16) major critical path steps before you will see the first trains running on modernized railway tracks between Dakar and Bamako.

CRITICAL PATH STEPS AND TIMELINE SUGGESTIONS

---

1 - The PUBLIC INFORMATION PROCESS BEGINS – (1 to 4 months)

1) Political, Commercial, and Public Policy Choices are Discussed
2) Revisions to the Proposed Plan are Considered
3) Pro & Con Debate

2 - FUNDAMENTAL DESIGN PUBLIC CHOICE DECSIONS ARE MADE (1 to 3 months)

1) How to coordinate and integrate projects
2) Movement to make the necessary legislative and policy changes
    - Create a 2-nation Railway Authority
    - Some other process is chosen
3) Decisions about what to do with the existing railway concession

ENGLISH EXECUTIVE SUMMARY

3 - A SECOND PUBLIC INFORMATION PROCESS IS HELD (1 to 2 months)

1) Tender proposal specifications are announced and debated
2) Alternatives are considered
3) Project integration such as with Port Plans are "integrated"
4) Key railway customers that absolutely need rail freight service are negotiated with

4 - TENDER DOCUMENTS ARE PREPARED (1 to 2 months)

1) Expressions of Interest are Solicited by Advertisement
2) A short list of qualified builders is prepared
3) Build – Operate – Maintain concession process is considered
4) PPP approaches
5) Other approaches to obtaining financing and construction are presented
6) A "proposed Mitigation" plan is laid out if using ADB or similar funding sources

5 – A FINAL TENDER METHODOLOGY IS APPROVED (1 to 2 month)

1) Select between a State by State approach
2) Bi-Nation Railway Authority approach
3) Other mechanisms such as an ECOWAS wide approach
4) Criteria for bid award decision making is established and published

6 - TENDER IS ISSUED (1 month)

1) Tender Hearings and Q&A process is open to all bidders
2) Possible multiple tenders
    - One for construction
    - A second for an operator
    - A third for vendors of train set equipment
    - A fourth for an independent construction audit and oversight firm

7 - BID PREPARATION PERIOD by the Pre-Qualified Bidders (6 to 8 months)

1) They are given legal access to the railway property for their own inspections
2) They conduct their own Route Surveys
3) They prepare their own detailed Track and right-of-way engineering Plans
4) They lay out their input & output project managing plan
5) They get price quotes from different materials vendors for steel, ballast, etc.
6) They determine their manpower & training plan
7) They estimate the project risk – mark up a profit margin
8) They submit their bid with a contingency estimate

8 - TENDER EVALUATION PERIOD (1 to 3 months)

- ✓ Possibility of no acceptable bid being received

9 - BID WINNER ANNOUNCED (1 to 2 months)

1) Begins round of final negotiations as to "any possible negotiated terms"

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2) Could possibly result in a change of the award to the next best bid

10 - CONCESSION COMPANY (or multiple companies) IS LOCALLY FORMED (1 to 3 months)

This is legal formation process

11 – ESTABLISHMENT of a TWO-NATION RAILWAY AUTHORITY

-- This should precede the Financing Agreement
-- Requires legislative debate and procedure within Senegal and within Mali

12- FINANCING AGREEMENTS IN PLACE (1 to 4 months)

Establishment of rules and process for funding passenger train services & any likely passenger operating losses

13 - LEGAL DOCUMENTS BETWEEN THE STATE(S) & THE CONCESSION ORGANIZATION ARE SIGNED (1 to 3 months)

The above process could take realistically between 18 and 30 months

Someone or some agency has to manage this entire process

14 - THE CONSTRUCTION TIME LINE

(2 to 5 years based upon the Final Defined Tender and the physical complexity of the design and build final accepted project)

Rehabilitation just for basic safety would take the least time
- Perhaps 12 to 24 months

Tasks

1) Mobilization of construction forces
2) Ordering supplies that have to be imported
   -Steel rails; sleepers; bridge parts, signaling; communications
3) Relocation of local companies, residences, etc, within the planned track
4) Hiring & Training of local workers
5) Construction camp are set-up
6) Import of basic construction machines
7) Logistics of importing the necessary supplies and materials on the same schedule as construction work
8) Track construction or reconstruction begins
9) Ordering of train sets
10) Ordering of track maintenance equipment and signal & communication supplies
11) On –site construction inspections
12) Track “settlement” takes place after repairs or upgrade are completed
    -Track has to be stabilized before normal speed train operations
13) Train operations testing

14) Train crew testing
15) Initial trains are placed into service to supply the railway construction crews
16) Business organization begins employee hiring and training
17) Negotiations with Port are completed as to integrated operations service plan
18) Negotiations with key shippers as to service, volume, rates and possible contracts
19) Certification of train operating crews and a railway safety plan
20) Possible phase in of operations as construction of track proceed past year 1
21) Normalized Track inspection & maintenance begins as railway links are placed into service

15 – ENVIRONMENTAL & POPULATION "MITIGATION" REQUIREMENTS DURING CONSTRUCTION

1) Population relocation or resettlement using ADB requirements
2) Spill prevention & control
3) Solids and liquids pollution control procedures
4) Vegetation control procedures
5) Fire Safety controls
6) Emergency & Hazards response Plan and controls
7) Endangered species mitigation plan and controls
8) Construction workers health and welfare management

16 – Full RAIL FREIGHT SERVICE BEGINS

Development Impact Assessment as Task #7

These are four classes of development benefits determined for the West Africa region as rail projects are executed include:

- Infrastructure improvements that can use US technology;
- Human capacity building and job creation opportunities from the project;
- Adoption of market-oriented reforms and de-regulated railway business practices;
- Technology transfers.

Safety improvement is one of the core development deliverables as the railways are modernized. Zeta Tech is so concerned about safety that a special short description of safety issues along the tracks between Dakar and Bamako was sent as part of the USTDA project Task 4 progress report. Zeta Tech recommends an immediate focus on track and infrastructure safety improvements as minimum safety standards.

Human Capacity Building

Zeta Tech recommends setting a minimum bid requirement for the training of a large percentage of local work forces with long term technical skills in construction and railway management.

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Here are four of the metrics Zeta Tech suggests UEMOA consider as contract terms.

- General laborer ratio of 2 to 1 local to foreign could be mandated as a condition for winning the construction tender;
- Managerial supervision of 10% to 20% local managers or trainees to supervise all construction project work;
- Consider a minimum managerial supervision ratio of 30% for train;
- Railway local labor content for train operations expands to 60% by the year.

Zeta Tech recommends TRAINING the TRAINERS to become Regional TEACHERS
Zeta Tech recommends TRACK INSPECTION AND MAINTENANCE TRAINING

Zeta Tech projects the following USA to WEST AFRICA RAILWAY TECHNOLOGY TRANSFER

The Harsco Rail Zeta Tech team recommends the following current advanced technologies for West African consideration. These project technologies are now proven in day-to-day operations. They are not test lab prospects.

1) **Stronger couplers,** (pulling up to 100 wagons is the global standard);
2) **Heavier steel rails** in the 68kg range;
3) **Deeper ballast depth** (200mm to 300mm are the global standards);
4) **Longer trains** (80 to 115 wagons as the global standard);
5) **Heavier axle loadings** (23 to 33 metric tons as current world standards);
6) **Higher net-to-tare ratio** (4.0 to 5.5 as the global standards) of equipment design;
7) **DOUBLE STACK TRAINS** – the most recent US gold standards for railways;
8) **High adhesion wheel slip technology** (35% to 40% higher tractive effort);
9) **Positive train control systems** (PTC) (using GPS satellite and moving block technology)
10) **REVENUE & OTHER Management Skills SOFTWARE;**
11) **RAIL Freight Advance Braking Technology ;**
12) **Deployment of Wheel Impact** and other US Auto Fault Detection Systems.

DIRECT RAILWAY JOB CREATION IMPACTS

While the average job wage in the US economy is $66,000, the average wage in the US railway industry is more than $100,000 a year. Railways require higher skill employees. Every US railway job has the economic impact of supporting 4.5 jobs in the overall economy.

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The US business model provides an opportunity for West Africa to adopt one of the most productive business models in the world.

- ✓ The US Governments do not pay the freight railways a subsidy
- ✓ Instead, the US freight railways pay profit taxes to the government
- ✓ The private sector generally "funds" all of their capital investment privately

Environmental Impacts as Task #8

The report provides a plan outline for managing the identified environmental issues in 1) the Planning or Design Phase, 2) the Construction Phase, and 3) the initial Operational Phase.

The environment recommendations cover the following specific topics:

1. Temporary disturbance of land during railroad upgrade and construction activities;
2. Clearing vegetation for the new railroad;
3. Occupation of land surface with new railroad;
4. Extraction of rock/crushed stone from surface mines/quarries;
5. Groundwater withdrawal for construction activities;
6. Soil disturbance creating dust and emission of exhaust gases;
7. Employment of workers for construction and operation of the railroad;
8. Clearing activities and structures that have encroached upon;
9. Displacement of residents and/or farm/garden plots along new railroad;
10. Mitigation tactics for each.

Constructing a new railroad from Bamako south to Côte d'Ivoire would displace residents and would change existing land use where the new track is to be constructed. Therefore, a Resettlement Action Plan that relocates and compensates people affected by the project would be required.

Upgrading the existing railroad (Dakar to Bamako) would have significant positive socioeconomic effects. There will only be minor negative environmental, social, and health impacts because the infrastructure for that railway line is already in place.

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MAJOR DECISIONS FOR RAIL SUCCESS & SELF SUSTAINABLILITY

The following a major conclusions from the Team.

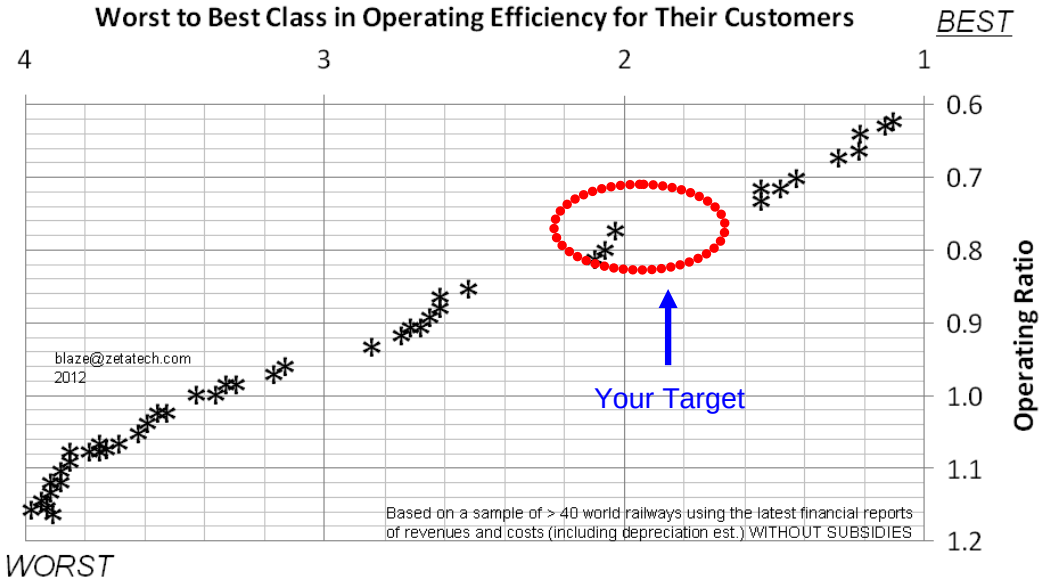
Collectively, policy planners need to pick an efficiency level for your rail project. West Africa does not need to have the best railway in the world, but you should aim for no less than top of **the second tier** carrier railways in efficiency terms.

Figure 7 gives UEMOA planners a visual template to consider where you want your future railway to be as an efficient enterprise.

Please, pick wisely.

Figure 7

WHERE DOES YOUR WEST AFRICA RAILWAY NEED TO BE FOR FUTURE GROWTH?
Leaders need to build for the future performance



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A Strategic Quiz

Using science instead of geo-politics, how would you answer the following questions

1) What are **measurements of** Best Railway Practices?

2) How Long will It Take to Reach Success? When you achieve success how will you measure it -- -- as a set of numbers?

3) Who is Your Competition?

You Have To Make Choices

Even with geo-politic rules, which of these Metrics Is the Most Efficient Freight Railway if the Volume is the Same? Why does it Matter?

OPTION A.	OPTION B
700 meters Train Length	1,400 meter Train Length
2,000 tonnes Train Weight	4,500 tonnes Train Weight
23 tonne Axle Loads	33 tonne Axle Loads
110,000 Pounds Tractive Effort/Loco	190,000 Pounds Tractive Effort/Loco
< 5.5 meter Height Clearance	6.5 meter (6.1 minimum) Clearance
40 Wagons per Train	90 to 130 Wagons per Train
70 Main locomotives @ 30 mil tons	< 30 Locomotives @ 30 mil tons

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Big Train Technology will be the next global pattern for improving railway productivity

- 1,400 meter or longer freight trains with 28 to 33 metric ton axle loads
  - Like in Canada and in Mexico…
  - **<25 MT is simply NOT competitive**
- A design standard of 6.1 meters height clearances…
  - 6.5 meter is recommended for strategic cargo
- Adopt these changes, and your railway productivity can make you a high second tier to low first tier railway company in global markets

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Does it Matter if you have these "TRUCK KILLERS"…

With this technology, you can take perhaps 70% of long distance trucks off the roads

❑ **WHY?** Between this technology is 25% and 40% cheaper than highway trucking

Physically for this to happen, you need what axle loads? 28+ MT
& how much height clearance above the top of the rails? 6.1 +Meters

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Business reporters recently stated that approximately $35 billion in railway capital funding had been announced as available for Africa's railways.

That is a huge number and an indication that with the right market mix, railways are attractive investments. To put this into perspective, the annual capital budget for North American railways just to maintain plant with perhaps a margin of 10% for traffic growth projects is in the $10 to $12 billion range per year.

While project risks do exist, there is a demonstrated body of evidence that supports African railway investment. West Africa planners need to focus on their execution of market strategy in order to secure investor interests by making strategic choices as to markets to exist and markets to enter.

Not every corridor can be a "winner".

There will be competition. Some corridors will definitely compete against one another if built by struggling to divert a slice of a small density market to their corridor route. That may be the case for the Abidjan to Bamako proposed line which would definitely compete against the Dakar – Bamako line for a share of a current small market volume estimated at less than 4 million tons a year for all modes[2].

Creation of competing railway corridor competition in the face of truck dominance and small traffic volume opportunities is a high risk market strategy. Private investors will see that has a deal breaking criteria although some public and donor investors may not.

One of the ways to build the proposed new Bamako to Ivory Coast railway is to make it a so called "skinny railway". The term means a railway that has a minimum amount of railway tracks and yards and wagons. That design minimizes the amount of required capital investment but still allows for later expansion of yard tracks and double tracking of main lines as the business volume builds up to critical density mass over a long timeline.

This is why the initial cost estimates for the **USTDA Task 3** report covering the new southern Mali railway project is built upon a single track construction with only a small number of yard tracks. That is also why in Task 4, the rehabilitation of the existing Dakar – Bamako rail line, Harsco Rail Zeta Tech recommends closing many of the secondary tracks and yard tracks. It is to reduce the needed capital investment until such time as future heavy traffic volumes can be developed.

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[2] The European Union is financing a railway feasibility study managed by a company named Typsa . The study will examine the objective of rehabilitating the Sitarail line, perhaps to standard gauge, and extending the line into Niger. The project award to consultant was just announced on June 23rd 2011. The study cost is about €1·1million and may take a year or more to complete. At some point a coordination between the USTDA funded project and the European funded project would be desirable and is expected to occur at some point. There is always a danger that some railway investors may see the possibility of two competing studies rather than a coordinated approach.

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- *Keeping the scale (size) of the proposed railway capital assets small can increase the prospects for attracting investors willing to accept some project risks*

- *Part of the conclusions of the market study was to make ECOWAS planners aware that the expected railway passenger strategy for West Africa may not deliver the hoped for economic benefits. There are choices. Bus is one of the choices. Rail passenger trains are not always the best solution.*

> The new emerging American private bus operators in 2011 have effectively taken a 100-year-old technology, and adapted it seamlessly to the market needs of the 21st century.

- *The conclusion from global evidence is that a passenger train subsidy will be equal to about 25% to 50% of the fare box collected revenues*

PORT COMPETION will occur:

It is important to note that there are alternative routes for a number of inland points from coastal ports. This is evidence of the competition among the UEMOA states and the ECOWAS states. Each of the coastal ports is searching for a competitive advantage. In the face of this creative tension among port competitors, only a few of the alternative railway corridors will have a chance to be "strategic winners" of sufficient market size to justify the capital and operational investment they require.

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