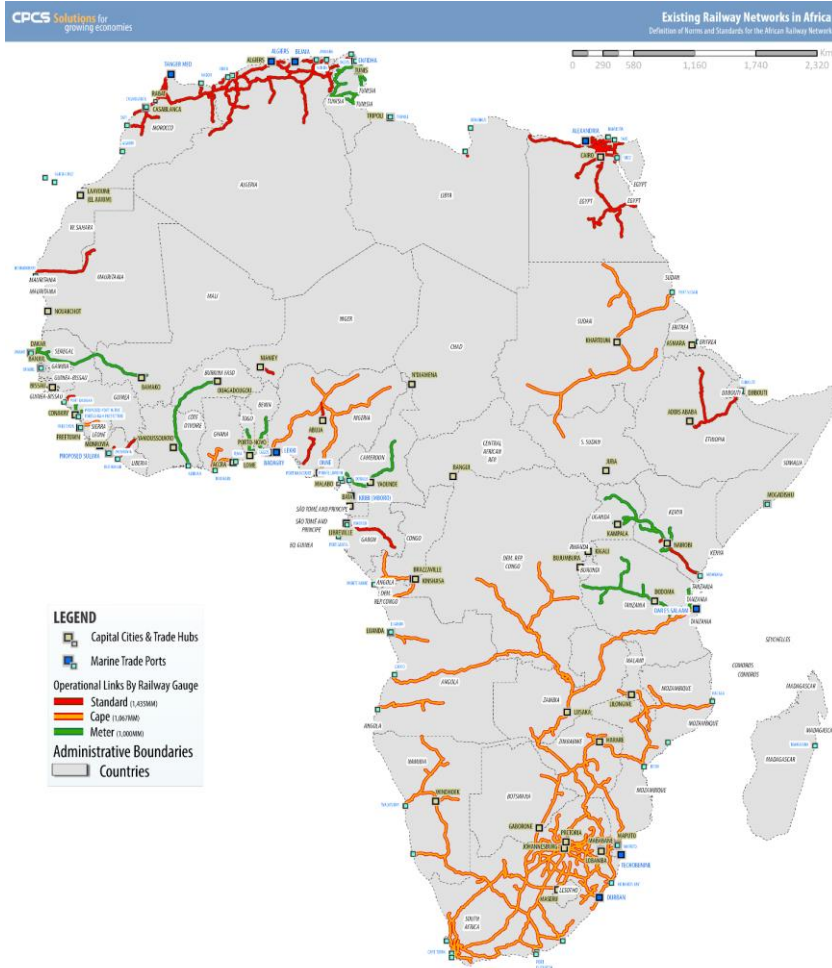


Defining technical specifications for the African Rail Network: possible methods and associated effects

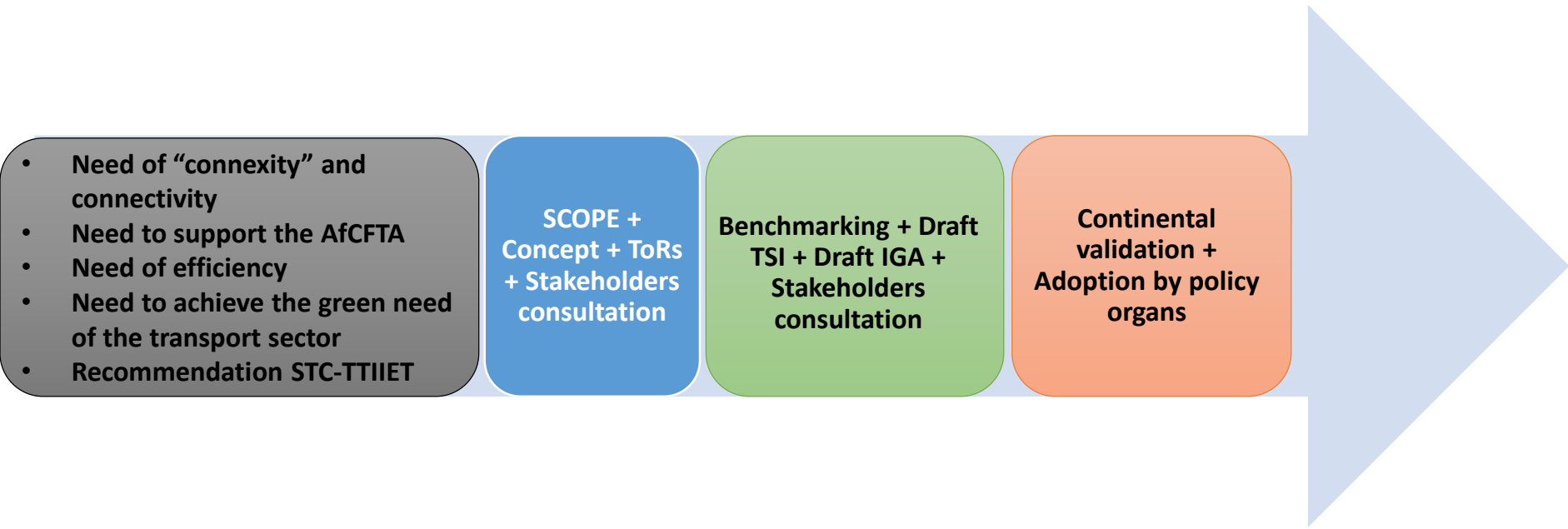
Placide Badji, AUC

Outline

- Background
- African rail network
- Proposed technical specifications
- Intergovernmental agreement



- 85,000 route-km and uses multiple standards
- Gauge:
 - ✓ 61% of OL : cape gauge (1,067 mm),
 - ✓ 20% of OL: standard gauge (1,435 mm).
- Electrification:
 - ✓ 15% with 3kV direct current (DC) the most common standard,
 - ✓ 25 kV alternating current.
- Majority: Rolling stock: Association of American Railroads (AAR) (Janney) type couplers
- Axle load: new railways \geq 22.5 t per axle.



- **Need of “connexity” and connectivity**
- **Need to support the AfCFTA**
- **Need of efficiency**
- **Need to achieve the green need of the transport sector**
- **Recommendation STC-TTIIET**

**SCOPE +
Concept + ToRs
+ Stakeholders
consultation**

**Benchmarking + Draft
TSI + Draft IGA +
Stakeholders
consultation**

**Continental
validation +
Adoption by policy
organs**

Level of Standardization:

Examples of Legally-Binding Standard-Setting Documents

WHY

are we standardizing

Intergovernmental Agreements and Conventions, Multi-National Treaties, International Resolutions, EU Directives
Inter-Railway Agreements

WHAT

are we standardizing

WHO

is responsible

National Legislation
Implementation Regulations
Establishing Standard-Setting Bodies and Regulators

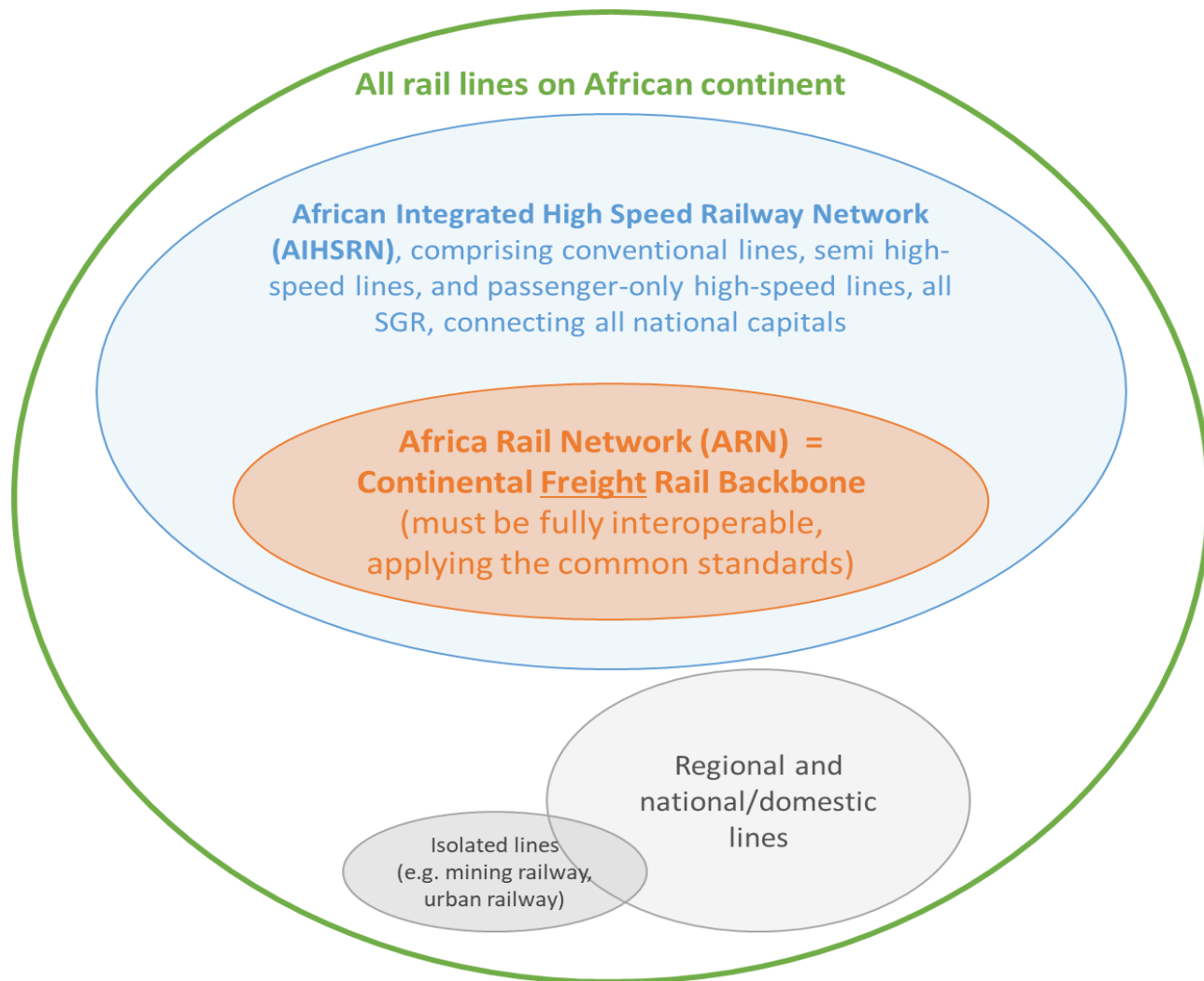
HOW

are we standardizing

Standards
as set by standards-setting bodies (national and international) and industry associations



African Rail Network (Continental Freight Rail Backbone) and Its Relationship with AIHSRN and Other Rail Lines



Benchmarking: Recent SGR Projects in Africa - Standards

Railway	Dar es Salaam - Kigali (Tanzania to Rwanda)	Mombasa - Nairobi (Kenya)	Addis Ababa–Djibouti (Ethiopia to Djibouti)	Benin City - Obudu (Nigeria)	Trans-Maghreb (Morocco-Algiers-Tunisia)
Stage	Under construction (part) Feasibility Study (part)	Operational	Operational	Feasibility assessment complete	Under Construction
Track gauge	Standard	Standard	Standard	Standard	Standard
Passenger Design (or maximum operating) speed (km/h)	160	120	120	120	120-160
Freight Design (or maximum operating) speed (km/h)	120	80	80	80	80-120
Permissible (design) axle load (tonnes)	35	25	25	25	22.5
Kinematic envelope to permit double-stacked containers	Yes	Yes	yes	yes	No
Traction	Electric - Overhead 2x25 kV AC Auto-transformer	Diesel-electric with provisions for future electrification.	Electric - Overhead 25 kV AC / 50 Hz	Diesel-electric	Electric 25 kV AC 50 Hz
Signalling	Centralized Traffic Control (CTC) with ETCS/ERTMS based systems	Automatic Block System (ABS)	Semi-automatic and Automatic Block and ETCS Level 2	"Colour Light" Signalling System	CTC with ETCS/ERTMS
Control & Communications	Railway (GSM-R) base stations and Signaling system with continuous Fiber Optic system	Microwave backbone	Fibre optic based; Fixed Line and mobile telephones.	Microwave Backbone System with on-board computer system	GSM-R
Crossing loops length / Design length of trains (m)	2,000	880	880	2,500	880
Couplers	Janney (AAR)	Janney (AAR)	Janney (AAR)	Janney (AAR)	UIC
Freight Train Brakes	Compressed Air	Compressed Air	Compressed Air	Compressed Air	Compressed Air
Design standards	AREMA	National standards for PRC; China Railway Class I	National standards for PRC; China Railway Class II	TBD	Similar to EU/France

System Standardization Parameters

Rail System Parameter	Impact where not interoperable	Importance to System Interoperability
Track gauge	Rolling stock cannot pass between lines	Critical
Axle load	Possibility that locomotives and loaded freight wagons cannot pass onto line with lower permissible axle loads	Moderate
Structure gauge/ kinematic envelope	Possibility that locomotives, double-stacked wagons and passenger coaches cannot pass onto line with more restrictive structure gauge. Most critical are tunnels and overpasses, which cannot be easily changed.	Moderate
Signalling, Control & communication systems	Possibility that locomotives and operating employees (unless trained on both systems) cannot pass between lines	Moderate
Traction/Electrification	Locomotives from electrified line will not be able to pass onto line that is not electrified	Moderate
Overhead line and pantograph	Locomotives cannot pass between lines with different overhead and pantograph systems	Moderate
Couplers	Rolling stock cannot pass between lines with different coupler systems unless a transition wagon (wagon with different couplers at each end) is used.	High
Brakes	Rolling stock cannot pass between lines with different braking systems.	High



- **44 links proposed links**
 - ✓ East-West Links;
 - ✓ North-South Links;
 - ✓ *North-South Spine*

- **Numbering**

- ✓ The network numbering system ensures that any additional lines that are added may be incorporated in the line numbering system.

- ✓ Line numbers may range from 1 to 100. Each line may have one or more segments, appended to the line number by a decimal point (e.g. “1.1” means line 1, segment 1)
- ✓ North-south lines: end in odd numbers (e.g. 1, 3, 5, 7, and 9).
- ✓ East-west lines: end in even numbers (e.g. 0, 2, 4, 6, and 8).
- ✓ The continent will be roughly divided into 10 sections, so that the line numbers will increase by 10 as they move 10% across the continent.

- ARN will be a freight-focused network:
 - Fully interoperable freight backbone network for the continent
 - Does not include any passenger-only lines.
 - Interconnects different regions of the continent and provide seaport access to landlocked countries
 - Subject to common standards to ensure interoperability
 - Scope: lines of continental importance
- Transition/applicability period
 - New Lines: at time of entry into service
 - Existing lines: 30 years
- Exceptions for some lines (southern Africa)
- While ARN standards **DO NOT APPLY** to lines that are not part of the network, use of these standards is encouraged

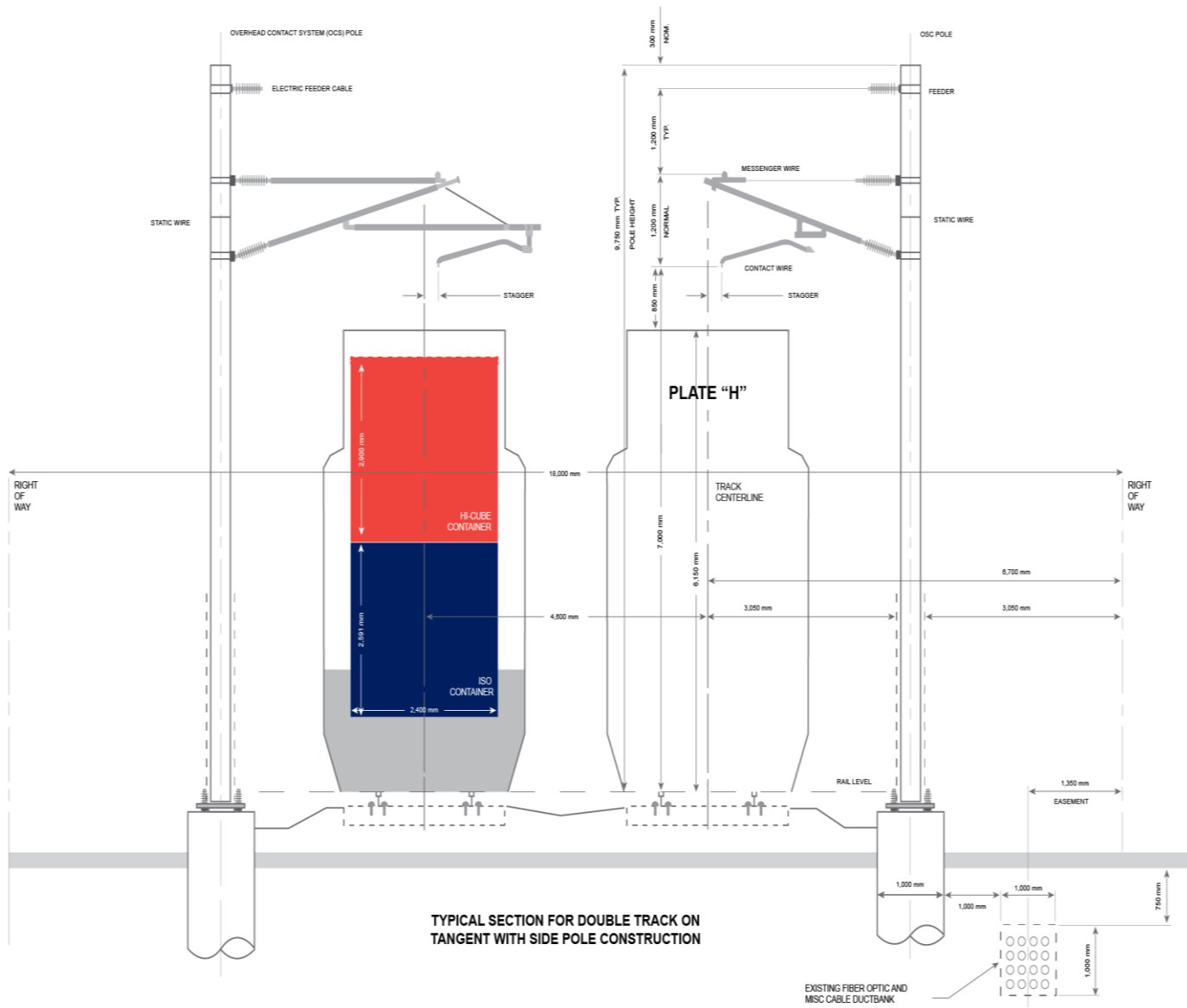


Proposed Common Technical Standards

Parameter	Recommendation	Exception or further consideration	Importance for Interoperability
Design Standards	AREMA or UIC	With consideration given to China Railway Class I standards	High
Design Speed	Freight: 120 km/h Passenger: 160 km/h	Reduction to 80 km/h and 90 km/h, respectively, is possible provided that a cost-benefit analysis is carried out to justify the reduction in initial investment costs vs. lifetime operating costs	High
Track Gauge	Standard	With the possibility of dual gauge track on some lines	High
Loading Gauge, relevant Structure Gauge	AAR plate H (double-stacked container transport)	The goal is to transport double-stacked containers. This may be lowered to AAR plate F on existing lines where upgrade not possible.	Very High
Axle load	30 tonnes per axle	Could be greater on lines expected to have high levels of bulk traffic. May be lowered to 25 tonnes per axle on existing lines where upgrade is not feasible.	High

Proposed Common Technical Standards (2/2)

Parameter	Recommendation	Exception or further consideration	Importance for Interoperability
Passenger Platform Height	High: 760 mm Low: 550 mm	Existing platforms should be upgraded to 550 mm or 760 mm, depending on the type of rolling stock used.	Medium
Passenger Train Length	600 metres	-	Medium
Freight Train Length	2,000 metres	-	High
Diesel versus Electric Traction	Case-by-case basis	If a decision is made to opt for diesel operation from the outset, certain provisions should be made to implement electrification in the future. Line design should not preclude electrification (e.g., loading gauge)	Medium
Electric Traction Voltage	25 kV 50 Hz AC	In the event there is a decision to opt for electrification	Medium
Signalling & Control System	ETCS with the level determined by the specific operating requirements and environment	-	Medium
Communications System	GSM-R and its subsequent upgrades	-	Medium
Couplers (Freight trains)	Janney (AAR) couplers	-	High
Train Brakes (Freight trains)	Compressed Air	-	High



- Vision
 - Standardized Network
 - Framework for regulating safe, efficient, effective and seamless operation
- Standards (as set out previously)
- Transition Period
- African Railway Network Standards Committee –governs standards
- Annexes
 - Enumeration of the baseline network
 - Enumeration of the standards
 - Enumeration of transition period
 - New Line: entry into service
 - Existing line: 30 years after entry into force of agreement
 - Exception: Southern African Network

Thank you
Merci
شكرا
Obrigado

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