"THE CHALLENGES OF SUSTAINABLE DEVELOPMENT, WHICH RAILWAYS FOR TOMORROW?"
Basic rules for using / Comment utiliser

• Turn off your mic when not speaking / Coupez votre micro si vous ne parlez pas

• Speakers: to advance to the next slide please say “next slide” / Orateurs: pour passer à la diapositive suivante merci de dire “diapositive suivante”

• Please use the chat functionality to write a message to everyone (for example to ask a question after a presentation). / Veuillez utiliser le chat pour envoyer un message à tous ou poser une question.

• Click on the language button located at the bottom right of your screen, and select the language you want to listen to during the meeting / Cliquez sur le bouton ‘traduction’ en bas à droite de l’écran pour sélectionner une langue

• You can mute the “original language” to listen only to English, French, etc. / Vous pouvez couper l’audio original pour écouter seulement en français ou en anglaise

• This meeting will be recorded / Cette réunion sera enregistrée.
<table>
<thead>
<tr>
<th>AGENDA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OPENING</strong></td>
</tr>
<tr>
<td>10h-10h20</td>
</tr>
<tr>
<td>• President of the UIC African Region, Mr Mohamed Rabie Khlie</td>
</tr>
<tr>
<td>• UIC Director General, Mr François Davenne</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>PANEL N°1</strong></td>
</tr>
<tr>
<td>10h20-11h</td>
</tr>
<tr>
<td>Sustainable mobility at the heart of international and regional challenges</td>
</tr>
<tr>
<td>• Initiatives and projects developed by UIC</td>
</tr>
<tr>
<td>• Speaker: Lucie Anderton, UIC, Sustainable Development Manager</td>
</tr>
<tr>
<td>• Rail Transport and Urbanisation In Africa: Prospects and challenges</td>
</tr>
<tr>
<td>• Speaker: Debashish Bhattacharjee, UN-Habitat, Regional Office for Africa</td>
</tr>
<tr>
<td>• Connecting African railways: challenges and opportunities</td>
</tr>
<tr>
<td>• Speaker: Placide Badji, Infrastructure and Energy Department, AU</td>
</tr>
<tr>
<td>• Q/A Session</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Finance innovative modes and mechanisms at the low-carbone mobility service in Africa</td>
</tr>
<tr>
<td>• African Bank of Development</td>
</tr>
<tr>
<td>• World Bank Group</td>
</tr>
</tbody>
</table>
Welcome Message of the President of the UIC African Region

Mohamed Rabie Khlie
SD, an ambition for a resilient growth

Developing, transforming, adapting territories without simultaneously designing the flow of goods and people, amounts to bypassing a significant part of climate commitments!
SD, policies to mitigate the impact of transport

Limit the increase in global warming to less than 2°C at the horizon of 2100
Africa, strong SD challenges and a constant commitment

- Efforts made at several levels, but the achievement of the SDGs will have to be supported, among other things, by making up for the deficit of investments in infrastructure, in particular to establish sustainable mobility.

- Infrastructure investment needs have reached $130 to $170 billion per year, with a funding gap of $68 to 108 billion.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Annual Basic Infrastructure Investment Needs (Billions of $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water and sanitation</td>
<td>56 - 66</td>
</tr>
<tr>
<td>Energy</td>
<td>35 - 50</td>
</tr>
<tr>
<td>Transport</td>
<td>35 - 47</td>
</tr>
<tr>
<td>TIC</td>
<td>4 - 7</td>
</tr>
</tbody>
</table>

Loss of 25% of cumulative economic growth over the past two decades.
Africa, the rail backbone of sustainable mobility

- **MASS TRANSPORT**
  - 1 passenger train = 160 cars
  - 1 freight train = 50 to 60 trucks

- **LOW EXTERNAL COSTS**
  - 5 times less than a car
  - 6 times less than a truck

- **ENERGY SAVING**
  - 6 times less than the road

- **SPACE SAVING**
  - 2 times less than the highway for
  - 4 times more traffic

- **LESS POLLUTING**
  - Rail: 2 to 4%
  - Road: 96 to 98%

- **SAFER**
  - Rare accidents: non-compliance with the railway rights-of-way by local residents
Significant progress has been made:
- improvement of living conditions,
- facilitation of access to basic services,
- infrastructure development,
- environmental sustainability,
- and renewable energies,
- etc., as part of the deployment of sector strategies.

**Case of MOROCCO, a significant progress in achieving SD**

<table>
<thead>
<tr>
<th>Commitments for 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 32% reduction of GHG emissions</td>
</tr>
<tr>
<td>• 52% carry the national electric capacity</td>
</tr>
<tr>
<td>• 82% reduction in energy dependence</td>
</tr>
<tr>
<td>• 20% Energy saving</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transport Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 38% of national energy consumption</td>
</tr>
<tr>
<td>• 23% of GAS emissions</td>
</tr>
<tr>
<td>• 30 billion € in investments for 20 years</td>
</tr>
<tr>
<td>• 70 billion € in investment by 2035</td>
</tr>
</tbody>
</table>
Case of MOROCCO, a railway at the service of sustainable mobility

**ENVIRONMENTAL DIMENSION:**
- ISO 14001 & 50001 certifications
- Impact studies of major projects
- Annual Carbon Report
- Photovoltaic installation in stations
- Responsible Purchasing Charter

**ECONOMIC DIMENSION:**
- Annual investments: 700 M
- €90% purchases from national companies
- Emergence of a railway ecosystem
- Gain for local authorities / year: 250 million €
- Circular economy (46000T of materials)

**SOCIETAL DIMENSION:**
- Accessibility plan for disabled people
- Edition of CSR reports
- Labeled "Tobacco Free Company"
- National award for quality and safety at work
- Memorandum of understanding: social partners
Rail in Africa, tomorrow as of today

Ten initiatives of the African rail networks for a better involvement in the UIC commitment:

- Carbon neutrality of African railways by 2050

1- Strengthen territorial integration
2- Ensure a high level of safety and security
3- Accelerate digital transformation
4- Innovating low-carbon solutions
5- Valorizing recoverable energy

6- Renforcer l'intégration territoriale
7- Assurer un haut niveau de sécurité et de sûreté
8- Accélérer la transformation digitale
9- Innover des solutions à bas carbone
10- Valorisant l’énergie récupérable
Rail in Africa, tomorrow as of today

The time for stakeholder to allow the rail mode to help mitigate climate change

- Rethinking the African rail space
- Accelerate the realization of investment projects
- Allocate a share of climate funding to sustainable mobility
- Adopt regulatory and tax incentives

- Promote standardization
- Structure the modal shift
- Promote multi-modality
- Internalize externalities "polluter pays" principle
A united and committed appeal towards the institutions and negotiators during COP26

AFRICAN GREEN DEAL RAILWAY
FOR SUSTAINABLE MOBILITY
Welcome Message of the UIC Director General
Sustainable mobility at the heart of international and regional challenges
Initiatives and projects developed by UIC

Lucie ANDERTON
The UIC Sustainability Platform

- Set the vision
- Provide the tools
- Convene the community

To empower the global railway community to be a driving force in a green recovery through collaborative knowledge and advocacy.
A railway that supports a green recovery as the **backbone of sustainable mobility**. Connectivity that contributes to healthy and sustainable lifestyles and economies on every continent – that is zero emissions, a community hub, accessible for all, and is both biodiverse and a good neighbour.
Advocacy and International Coalitions

https://www.itf-oecd.org/rail

https://www.iea.org/reports/rail

https://www.ukcop26.org/


https://www.sum4all.org/

31 May - 5 June 2021
Sustainability Platform

-Sustainability taskforce

Sustainability Unit – UIC’s technical secretariat

Sustainability Platform Steering Group

Noise and Vibration Sector

Air Quality Sector (multi regional)

Sustainable Land Use Sector

*Circular Economy Sector

Energy and Carbon Sector

Linking to other working groups on:
- Weather resilience and CC adaptation
- Inclusive Stations
- Covid 19 new normal working group
- Sustainable procurement
- Finance and carbon taxation
Circular Economy

REUSE Project

- “state of the art” report
  ballast, rail & concrete

*Launch new Circular Economy Sector

2022 project – ZeroWASTE

- Annual best practice webinar

- Online toolkit/resources
Noise & Vibration

NOVITÀ
Sustainable Land Use
Air Quality

Clean Air Trains

Participants required to sign the NDA

Priority Topic in 2021

Railway system wears - brakes, pantograph/catenary, wheel/rail
Energy efficiency & CO2 emissions
Mobility as a Service digital platforms guidelines

Look out for a webinar to communicate the findings this year
24 Quantitative & Qualitative scored KPIs

- **Level** | **Score %** | **Score band**
- **Beginner** | 1-20 | D-
  | 21-30 | D
- **Pursuer** | 31-46 | C-
  | 47-55 | C
- **Manager** | 56-70 | B-
  | 71-82 | B
- **Leader** | 83-90 | A-
  | 91-100 | A

- **SDG 13** - Take urgent action to combat climate change and its impacts
  - 13.1.1 - CO2 emissions direct and indirect
  - 13.1.1.2 - Green Bond
  - 13.1.3 - Board-level oversight of climate-related issues
  - 13.1.4 - Emission targets
  - 13.2 - Integrate climate change measures into national policies, strategies and planning
  - 15.2 - Collaborating with governments

**Table:**

<table>
<thead>
<tr>
<th>Unit of measure</th>
<th>2019</th>
<th>2018</th>
<th>2017</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total direct CO2 emissions (scope 1)</td>
<td>tCO2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total indirect CO2 emissions (scope 2 - location based)</td>
<td>tCO2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total indirect CO2 emissions (scope 2 - market based)</td>
<td>tCO2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
New Sustainability reporting
The UIC Sustainability Platform

- Sign up to the extranet ‘Sustainability’ Group and Subscribe to the UIC E-news for the latest articles, events and publication
- Join the online webinars
- Contribute to the sector meetings and projects
- Test the SDG Rail Index tool
Stay in touch with UIC:

www.uic.org

#UICrail

Environnement2@uic.org

Thank you for your attention.
Rail Transport and Urbanisation In Africa: Prospects and challenges

Debashish BHATTACHARJEE
RAIL TRANSPORT AND URBANISATION IN AFRICA: PROSPECTS AND CHALLENGES

Debashish Bhattacharjee
UN-Habitat
1. Urbanisation and Rail: An Intertwined History

2. Value and benefits of rail transport

3. Urbanisation and Transport: Challenges and Opportunities

4. A perspective on the way forward
Railway Development and Urbanisation in Kenya

Alignment of Mombasa – Kisumu Railway

Constructed 1896-1901

Followed “least cost path” of construction

Source: Jedwab et al., 2016

[https://voxeu.org/article/how-colonial-railroads-defined-africa-s-economic-geography]
Value and benefits of rail transport

❖ Highly beneficial for long-distance regional connectivity

❖ High load carrying capacity – reduces road congestion and road wear and tear

❖ Highly energy-efficient, and possibly fully electrified

❖ High initial investment, but low long-term costs

❖ Reduces costs for freight transit
Value and benefits of rail transport

❖ Potential for decarbonising passenger and freight transport; lowest emissions per passenger on long distance

❖ Can help achieve the UN Sustainable Development Goals and the 1.5°C stabilisation pathway in the Paris Agreement on Climate Change

❖ Ensuring that Public Transport becomes more affordable, convenient, attractive and efficient than personal cars can incentivise a shift towards sustainable mobility
Concerns of rail transport

- Railroads can represent physical barriers and cause environmental disruption. Environmental impacts need to be considered and addressed.
- Due to the large initial investment, railroads may not be the most viable option within urban areas of developing countries.
International interconnectivity

❖ Greater inter-country and cross-country uniformity leads to greater connectivity

❖ Use of different gauge tracks require the use of expensive variable gauge systems

❖ Non-comparable gauges cause delays and added costs in freight transit

Source: CIA Factbook railways

Source: Wikimedia commons
World urbanisation trends


❖ Rapid global urbanisation:
  From 37% in 1995 to 68% in 2050

❖ Africa and Asia are urbanising fastest:
  90% of total by 2050
CURRENT SITUATION: CAR BASED TRANSIT CORRIDORS

Outcomes: Resource-Inefficiency, Segregation, Congestion, Road Fatalities

- Low density, urban sprawl, mono-functional use
- **Car-based** transit corridors contributing to traffic congestion, emissions, air pollution
- No Integration between separate mobility systems
- **NMT users forgotten** even though they are the majority
FRAGMENTED URBAN FORM

Weak urban fundamentals for public transport

- Often unplanned city expansion/ lack of public transport connectivity and affordability
- Rapidly growing secondary cities that merge with large cities to form large urban agglomerations
- Urban structure and movement networks not combining in a functional urban system
- In most African cities, the land use systems have not been able to provide access through proximity
Transitioning to a system of public transport

Matatus in Nairobi
- Financially unviable formal public transport
- Fragmented Institutions
- No relation to proximity to BRT and land use intensity

Dar Es Salaam’s Bus Rapid Transit System
- Comprehensive planning approach
- Efficient operations
- Managed by Dar Rapid Transit Agency
Integration of regional connections with urban transport

❖ Need for integration between regional connections and various modes of transport within cities, including good Public Transport and Non-motorised transport

❖ Ensure central position of train stations in the city and linking them with key points of interest

❖ Avoid traffic congestion around train stations and surrounding streets

❖ Ensure surrounding streets have adequate, inclusive street designs

Source: Leeds City Council
EXAMPLE ADDIS ABABA

CHALLENGE

Urban Population Growth 1950-2035
Addis Ababa

Existing Street Pattern, Addis Ababa

88% of greenhouse gas emissions

60% Lack safe foot paths & Side walk
AN EXAMPLE FROM ADDIS ABABA

Light Rail

✓ High Passenger Demand
X Low Capacity (maintenance issues)
X Physical access barriers
X Reduced property prices – leading to higher debt burden
EXAMPLE ADDIS ABABA: SUSTAINABLE MOBILITY

Target 2028

Cycle & NMT Network

Inclusive pedestrian routes

Public Space & Greenways

200KM 10,000 Bike Sharing

600KM (Inclusive walkways) Safe access to all schools

56KM River Front Rehabilitations to add 4m2 of green space per capita Improving other public spaces also undergoing

10 Years

31.6 KM (SINCE 2015) 2 LINES 200,000 P. DAILY EXPANSION TO START

2,000 M2 NEGATIVE SPACES (Reclaimed)
BRT can act as a backbone around which to transform and redevelop the city to further increase sustainability and functional effectiveness.
Making the Right Choice: Balancing Passenger Demand, Investment and Speed

Source: GRHS 2013 Planning and Design for Sustainable Urban Mobility (UN-Habitat/Hidalgo)
Conclusion and a Perspective on the Way Forward

- Sustainable Urbanisation & intercity/interregional connectivity are both essential for Economic Development in Africa
- Rail is key for intercity and regional connectivity
- Rail more optimal beyond 30,000 passengers/hour/direction (large metropolis)
- Operations, Maintenance and Sustainable Business Models (debt servicing) very important for all Mass Transit Modes
Thank you!
Connecting African railways: challenges and opportunities

Placide BADJI
The future of African rail: a sustainability-oriented policy

Placide Badji (PhD), AUC
Outline

• Background
• Transport and sustainability
• Railway and electrification
• Benchmarking: Recent SGR Projects in Africa – Electrification
• Conditions for a better future for railway transports
• Toward an African Railway market
- 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 >= 22.5 t per axle.
Transport and sustainability

- **Economic aspect:**
  - cost and speed,
  - reliability and flexibility

- **Social aspect:**
  - access, congestion and safety

- **Environmental aspect:**
  - energy intensity, carbon dioxide emission and air pollution.
Transport and sustainability: environmental considerations

➢ Overconsumption of energy and the impact of greenhouse-gas (GHG) emissions are the signature challenges of this century.

➢ Oil and transport are interdependent:
  ▪ 90% of transport fuels are oil-based
  ▪ 50% of oil produced worldwide is consumed by the transport sector.

➢ In many geographies, 40% of GHG emissions are associated with transportation.
# Sustainability of Railway

<table>
<thead>
<tr>
<th>Cost</th>
<th>Speed</th>
<th>Reliability</th>
<th>Flexibility</th>
<th>Access</th>
<th>Congestion</th>
<th>Accident</th>
<th>Energy intensity</th>
<th>Carbon dioxide emission</th>
<th>Air pollution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>Moderate</td>
<td>Very good</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Low</td>
<td>Moderate</td>
<td>Good</td>
<td>Low</td>
<td>Medium</td>
<td>Minimal</td>
<td>Low</td>
<td>Low</td>
<td>Electric: Lowest Diesel: High</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>Slow</td>
<td>Good</td>
<td>Low</td>
<td>Low</td>
<td>Minimal</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Very high</td>
<td>Very good</td>
<td>Medium</td>
<td>Low</td>
<td>Minimal</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>
Share of activity on electric trains for selected countries and regions, 1995-2016

- 2016
  - North America: 76%
  - Europe: 80%
  - Japan: 97%
  - Korea: 90%
  - Russia: 86%
  - China: 75%
  - India: 54%
  - South America: 49%
  - Africa: 28%

1995
- North America: 69%
- Europe: 74%
- Japan: 85%
- Korea: 48%
- Russia: 79%
- China: 21%
- India: 43%
- South America: 42%
- Africa: 19%

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**Benchmarking: Recent SGR Projects in Africa – Electrification**

<table>
<thead>
<tr>
<th>Railway</th>
<th>Stage</th>
<th>Track gauge</th>
<th>Passenger Design (maximum operating) speed (km/h)</th>
<th>Freight Design (maximum operating) speed (km/h)</th>
<th>Permissible (design) axle load (tonnes)</th>
<th>Traction</th>
<th>Signalling</th>
<th>Control &amp; Communications</th>
<th>Crossing loops length / Design length of trains (m)</th>
<th>Couplers</th>
<th>Freight Train Brakes</th>
<th>Design standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dar es Salaam - Kigali (Tanzania to Rwanda)</td>
<td>Under construction</td>
<td>Standard</td>
<td>160</td>
<td>120</td>
<td>25</td>
<td>Electric - Overhead Diesel-electric with provisions for future electrification.</td>
<td>Centralized Traffic Control (CTC) with ETCS/ERTMS based systems</td>
<td>Railway (GSM-R) base stations and Signaling system with continuos Fiber Optic system</td>
<td>2,000</td>
<td>Janney (AAR)</td>
<td>Compressed Air</td>
<td>AREMA</td>
</tr>
<tr>
<td>Mombasa - Nairobi (Kenya)</td>
<td>Operational</td>
<td>Standard</td>
<td>120</td>
<td>80</td>
<td>25</td>
<td>Electric - Overhead 2x25 kV AC Auto-transformer</td>
<td>Automatic Block System (ABS)</td>
<td>Microwave backbone</td>
<td>880</td>
<td>Janney (AAR)</td>
<td>Compressed Air</td>
<td>PRRC, China Railway Class I</td>
</tr>
<tr>
<td>Addis Ababa - Djibouti (Ethiopia to Djibouti)</td>
<td>Operational</td>
<td>Standard</td>
<td>120</td>
<td>80</td>
<td>25</td>
<td>Electric - Overhead 2x25 kV AC / 50 Hz</td>
<td>Semi-automatic and ETCS Level 2</td>
<td>Fibre optic based; Fixed Line and mobile telephones.</td>
<td>880</td>
<td>Janney (AAR)</td>
<td>Compressed Air</td>
<td>National standards for I</td>
</tr>
<tr>
<td>Benin City – Obudu (Nigeria)</td>
<td>Feasibility assessment complete</td>
<td>Standard</td>
<td>120</td>
<td>80</td>
<td>25</td>
<td>Diesel-electric</td>
<td>&quot;Colour Light&quot; Signalling System</td>
<td>Microwave Backbone System with on-board computer system</td>
<td>2,500</td>
<td>Janney (AAR)</td>
<td>Compressed Air</td>
<td>National standards for II</td>
</tr>
<tr>
<td>Trans-Maghreb (Morocco-Algeria-Tunisia)</td>
<td>Under Construction</td>
<td>Standard</td>
<td>120-160</td>
<td>80-120</td>
<td>22.5</td>
<td>Electric 25 kV AC 50 Hz</td>
<td>CTC with ETCS/ERTMS</td>
<td>GSM-R</td>
<td>880</td>
<td>—</td>
<td>—</td>
<td>TBD</td>
</tr>
</tbody>
</table>

- **Feasibility Study (part)**
- **Operational**
- **Feasibility assessment complete**
- **Under Construction**
- **Electric** - Overhead 25 kV AC / 50 Hz
- **Diesel-electric**
- **Electric** - Overhead 2x25 kV AC Auto-transformer
- **Centralized Traffic Control (CTC) with ETCS/ERTMS based systems**
- **Automatic Block System (ABS)**
- **Semi-automatic and ETCS Level 2**
- **"Colour Light" Signalling System**
- **Microwave Backbone System with on-board computer system**
- **GSM-R**
- **AREMA**
- **National standards for I**
- **National standards for II**
- **TBD**
- **Similar to EU/France**
## Benchmarking: Recent SGR Projects in Africa

<table>
<thead>
<tr>
<th>Countries</th>
<th>Line</th>
<th>Length (km)</th>
<th>Gauge (mm)</th>
<th>Electrification</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Namibia and Botswana</td>
<td>Trans-Kalahari Railway (TKR)</td>
<td>2,000</td>
<td>TBD</td>
<td>TBD</td>
<td>Early Planning</td>
</tr>
<tr>
<td>Tanzania</td>
<td>Dar es Salaam-Morogoro</td>
<td>200</td>
<td></td>
<td></td>
<td>Under Construction</td>
</tr>
<tr>
<td></td>
<td>Morogoro-Dodoma</td>
<td>300</td>
<td>1,435 (standard)</td>
<td>25 kV AC</td>
<td>Under Construction</td>
</tr>
<tr>
<td></td>
<td>Makutopora-Isaka</td>
<td>435</td>
<td></td>
<td></td>
<td>Various Stages of Planning</td>
</tr>
<tr>
<td></td>
<td>Isaka-Mwanza</td>
<td>220</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tanzania and Rwanda</td>
<td>Isaka, Tanzania-Kigali, Rwanda</td>
<td>571</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tanzania</td>
<td>Dar es Salaam-Morogoro</td>
<td>200</td>
<td>1,435 (standard)</td>
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<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>Dar es Salaam-Morogoro</td>
<td>200</td>
<td>1,435 (standard)</td>
<td>25 kV AC</td>
<td>Under Construction</td>
</tr>
<tr>
<td></td>
<td>Morogoro-Dodoma</td>
<td>300</td>
<td></td>
<td></td>
<td>Under Construction</td>
</tr>
<tr>
<td></td>
<td>Makutopora-Isaka</td>
<td>435</td>
<td></td>
<td></td>
<td>Various Stages of Planning</td>
</tr>
<tr>
<td></td>
<td>Isaka-Mwanza</td>
<td>220</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>Malaba-Kampala</td>
<td>215</td>
<td></td>
<td></td>
<td>Early Planning</td>
</tr>
<tr>
<td>Ethiopia and Djibouti</td>
<td>Addis Ababa, Ethiopia-Djibouti</td>
<td>759</td>
<td>1,435 (standard)</td>
<td>25 kV AC</td>
<td>Operational</td>
</tr>
<tr>
<td>Cameroon</td>
<td>Mbalam-Atlantic Coast</td>
<td>500</td>
<td>1,435 (standard)</td>
<td>TBD</td>
<td>Early Planning</td>
</tr>
<tr>
<td>Cameroon and Chad</td>
<td>Ngaoundere, Cameroon-N'Djamena, Chad</td>
<td>700</td>
<td>TBD</td>
<td>TBD</td>
<td>Early Planning</td>
</tr>
<tr>
<td>Nigeria</td>
<td>Lagos-Ibadan</td>
<td>156</td>
<td>1,435 (standard)</td>
<td>None</td>
<td>Under Construction</td>
</tr>
<tr>
<td></td>
<td>Ibadan-Abuja</td>
<td>2,052</td>
<td></td>
<td></td>
<td>Early to Advanced Planning</td>
</tr>
<tr>
<td></td>
<td>Abuja-Kaduna</td>
<td>187</td>
<td></td>
<td></td>
<td>Operational</td>
</tr>
<tr>
<td></td>
<td>Kaduna-Kano</td>
<td>305</td>
<td></td>
<td></td>
<td>Advanced Planning</td>
</tr>
<tr>
<td>Cote d’Ivoire- Ghana-Togo- Benin-Nigeria</td>
<td>West Coast High-Speed Rail Project</td>
<td>1,174</td>
<td>1,435 (standard)</td>
<td>TBD</td>
<td>Early Planning</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>Awash-Weldiya- Mekelle</td>
<td>608</td>
<td>1,435 (standard)</td>
<td>25 kV AC</td>
<td>Under Construction</td>
</tr>
<tr>
<td>Morocco</td>
<td>Tangier - Kenitra HSL</td>
<td>323</td>
<td>1,435 (standard)</td>
<td>25 kV AC</td>
<td>Operational</td>
</tr>
<tr>
<td></td>
<td>Kenitra-Casablanca HSL</td>
<td>150</td>
<td>1,435 (standard)</td>
<td>25 kV AC</td>
<td>Under Construction; to be operational by end of 2020</td>
</tr>
<tr>
<td></td>
<td>Casablanca- Marrakech-Adagir HSL</td>
<td>475</td>
<td>1,435 (standard)</td>
<td>25 kV AC</td>
<td>Early Planning</td>
</tr>
<tr>
<td>Morocco- Algeria-Tunis</td>
<td>Trans-Maghreb Line</td>
<td>1,500</td>
<td>1,435 (standard)</td>
<td>Varies</td>
<td>Existing Line Upgrades, New Line between Algeria and Tunisia</td>
</tr>
<tr>
<td>Egypt</td>
<td>Alexandria-Aswan</td>
<td>500</td>
<td>1,435 (standard)</td>
<td>TBD</td>
<td>Early Planning</td>
</tr>
</tbody>
</table>
Countries that have electrified parts of their rail systems include Algeria, Djibouti, Ethiopia, Morocco, Senegal, South Africa, Tunisia and Zimbabwe. A total of 12,882 km or approximately 15% of the total rail network on the African continent is electrified. The most common electrification systems are 3 kV DC and 25 kV AC.

**Figure: Length (in km) of Electrified Track in Africa, by Electrification Type**

<table>
<thead>
<tr>
<th>Electrification Voltage and Current</th>
<th>Total Electrified km</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 kV AC</td>
<td>861</td>
</tr>
<tr>
<td>25 kV AC</td>
<td>4,922</td>
</tr>
<tr>
<td>3 kV DC</td>
<td>7,099</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12,882</strong></td>
</tr>
</tbody>
</table>

Source: CPCS analysis of multiple data sources
The future of rail will be determined by how it responds to both rising transport demand and rising pressure from competing transport modes.

- minimising costs per passenger-kilometre or tonne-kilometre moved,
- maximising revenues from rail systems, and
- ensuring that all forms of transport pay not only for the use of the infrastructure they need, but also for the adverse impacts they generate.
Proposed African Railway Network (ARN)

- **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.
Proposed ARN: Other considerations

- 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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Recommendation</th>
<th>Exception or further consideration</th>
<th>Importance for Interoperability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Standards</td>
<td>AREMA or UIC</td>
<td>With consideration given to China Railway Class I standards</td>
<td>High</td>
</tr>
<tr>
<td>Design Speed</td>
<td>Freight: 120 km/h, Passenger: 160 km/h</td>
<td>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</td>
<td>High</td>
</tr>
<tr>
<td>Track Gauge</td>
<td>Standard</td>
<td>With the possibility of dual gauge track on some lines</td>
<td>High</td>
</tr>
<tr>
<td>Loading Gauge, relevant Structure Gauge</td>
<td>AAR plate H (double-stacked container transport)</td>
<td>The goal is to transport double-stacked containers. This may be lowered to AAR plate F on existing lines where upgrade not possible.</td>
<td>Very High</td>
</tr>
<tr>
<td>Axle load</td>
<td>30 tonnes per axle</td>
<td>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.</td>
<td>High</td>
</tr>
</tbody>
</table>
## Proposed Common Technical Standards (2/2)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Recommendation</th>
<th>Exception or further consideration</th>
<th>Importance for Interoperability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Platform Height</td>
<td>High: 760 mm Low: 550 mm</td>
<td>Existing platforms should be upgraded to 550 mm or 760 mm, depending on the type of rolling stock used.</td>
<td>Medium</td>
</tr>
<tr>
<td>Passenger Train Length</td>
<td>600 metres</td>
<td>-</td>
<td>Medium</td>
</tr>
<tr>
<td>Freight Train Length</td>
<td>2,000 metres</td>
<td>-</td>
<td>High</td>
</tr>
<tr>
<td>Diesel versus Electric Traction</td>
<td>Case-by-case basis</td>
<td>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)</td>
<td>Medium</td>
</tr>
<tr>
<td>Electric Traction Voltage</td>
<td>25 kV 50 Hz AC</td>
<td>In the event there is a decision to opt for electrification</td>
<td>Medium</td>
</tr>
<tr>
<td>Signalling &amp; Control System</td>
<td>ETCS with the level determined by the specific operating requirements and environment</td>
<td>-</td>
<td>Medium</td>
</tr>
<tr>
<td>Communications System</td>
<td>GSM-R and its subsequent upgrades</td>
<td>-</td>
<td>Medium</td>
</tr>
<tr>
<td>Couplers (Freight trains)</td>
<td>Janney (AAR) couplers</td>
<td>-</td>
<td>High</td>
</tr>
<tr>
<td>Train Brakes (Freight trains)</td>
<td>Compressed Air</td>
<td>-</td>
<td>High</td>
</tr>
</tbody>
</table>
### Toward an African railway market

<table>
<thead>
<tr>
<th>No.</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adopt a roadmap for the Market</td>
</tr>
<tr>
<td>2</td>
<td>Draft and adopt the African railway network as well as adequate numbering/codes and routes</td>
</tr>
<tr>
<td>3</td>
<td>Establish and adopt technical standards of interoperability at a continental level for the continental network</td>
</tr>
<tr>
<td>4</td>
<td>Define general governance rules (infrastructure development, operation and maintenance)</td>
</tr>
<tr>
<td>5</td>
<td>Launch a collaborative platform on railway for Africa, for experience and best practices sharing - Governance and concession</td>
</tr>
<tr>
<td>6</td>
<td>Revive the African Union of Railways (AUR) as implementing agency to monitor the implementation of adopted standards</td>
</tr>
<tr>
<td>7</td>
<td>Establish an independent railway regulator, who will be tasked with setting and enforcing safety, market and interoperability regulations in each state</td>
</tr>
</tbody>
</table>
| 8   | Adopt a market scheme for the entire continent - regulatory frameworks:  
  - Core document with rationale, and terms and conditions  
  - Annexes: consumer protection rules; fare rules; railway rolling stock identification  
  - Regulation on competition, dispute settlement mechanism  
  - Regulation on the governance architecture of the market. |
| 9   | Action plan for the implementation of the Single market |
| 10  | Adopt railway market structure into national legislation |
| 11  | Define specific aspects of industry structure and update rail standards |
Thank you
Merci
شكرا
Obrigado

badjia@africa-union.org
Q&A