Success-Factors for

urban ropeways in Africa

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Summary

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1 Towards Sustainable Transport in Africa

All over the world, unsustainable mobility and urban planning increasingly becomes a limiting factor for socio-economic development. European and U.S cities suffer their self-imposed planning paradigm, which leads into a vicious circle of a very-hard-to-escape vehicle-culture. In simplified terms one could say that more vehicle traffic generates more demand for infrastructure, and more infrastructure generates more vehicle traffic.

Not only does new road-infrastructure generate more vehicle traffic, it also induces new urban developments further away from the city centres with their main economic areas and work-spaces, generating - again - more and longer trips.

Africa should not loose time importing obsolete strategies from Europe and the U.S. but concentrate on generating a multicentric and internal urban growth, based on proximity, density and short distances, in order to avoid trips instead of generating them.

In Africa urban growth is faster than anywhere else and traffic is growing at least at an equal speed. The gridlock of road-based transport already paralyzes many cities for hours every day. Public transport is the only alternative these cities have in order to achieve an environmentally, economically and socially sustainable urban development. Transport infrastructure needs to be able to adapt to the rapidly changing urban environment.

No other infrastructure with comparable capacities is as adaptable as Ropeways. Possible changes reach from extensions or intermediate stations to the complete dismantling of an entire system. Ropeways need very little urban space and are therefore better adapted to dense neighbourhoods.

In a new planning paradigm of multicentric cities with dense, mixed use centres, they may be an interesting way to link those centres to each other in an efficient way, silent, accident-free, without direct emissions, independent from road-traffic, and without waiting times.

2 Public Transport in Africa: Ropeways as competitor or complement?

The paradox of many African cities is that, on one hand, a large proportion of the population already depends on public transport for their daily mobility. On the other hand, most cities lack the traditional high capacity mass transit systems. In order to understand the reasons for this paradox, this study analyses four transport modes (para-transit, BRT, rail, ropeway) in a SWOT analysis and discusses the crucial issues of governance and financing of these modes.

SWOT	*Internal*	*External*
Positive	Strength	Opportunity
Negative	Weakness	Threat

Para-transit

Para-transit	Internal	External
Positive	Ability to operate with little and inexpensive dedicated infrastructure	Ability to respond to demand quickly and independently from infrastructure
Negative	Inefficient use of parking and road space in high density environments	Competition for road capacity with other road users may lead to drastic outcomes

Para-transit is the most space consuming mass transit mode. It generates considerable externalities, such as heavy air pollution, poor road safety, traffic jams and even complete breakdowns. Still, in most African cities taxis and mini-buses are the dominant public transport mode. They are privately owned and operated, but publicly regulated. Para-transit is not subsidized, the sector pays taxes and fees as well as dividends to the fleet owners, at the expense of staff's wages, working conditions, passengers' fares, transport conditions and road safety.

As the relatively numerous group of operators is able to generate a very considerable opposition, it is risky to plan at the expense of para-transit. Any new transport project should not attempt to replace it, but to complement it by taking over functions it can serve in a more sustainable way.

BRT

BRT	Internal	External
Positive	Provide high performance public transport with infrastructure and vehicles similar to existing ones.	Opportunity to restructure and improve capacities of the road transport sector.
Negative	Risk of « falling back » to para-transit type operations.	Requires high densities of demand in the vicinity of large avenues and close cooperation with feeder services operated by competing para-transit and taxi companies.

BRT is comparably easy to implement on existing infrastructure. It is difficult to implement anywhere where road width is a problem. BRT needs a very wide corridor and priority over other road users. Pedestrians and cyclists can not only not use the dedicated lanes, they also have difficulties crossing them, except at rare, specifically designed flyovers, tunnels or crossroads. BRT creates a considerable barrier within urban public space.

BRT infrastructure and operations require constant attention and investment. Without it, services will gradually decline, due to loss of service quality, safety, operating speed and life expectancy of vehicles.

Rail

Railway	Internal	External
Positive	Existing corridor on likely main development axis	Railway revival, also for longer distance passenger traffic
Negative	Cost of refurbishment and immense difficulty to create additional corridors	Competition with long distance and freight traffic for limited infrastructure capacity

Most rail infrastructure in African cities date back to the colonial era and were not designed as an urban transport system. A strength of this heritage is that these railway lines most likely still form corridors of high interest for mass public transport, because they pass by important traffic generators.

This provides the opportunity for the development of a high capacity mass transit line along one corridor that is likely to coincide with the longest and densest axis of urban development.

As a PPP model of implementation and operation is very likely, the critical element of urban rail governance are the terms of the PPP agreement which largely depend on the functional success of the rail corridor in the metropolitan transport market and the entire urban system. Urban rail's line of business requires very large numbers of paying passengers, which again requires impeccable service and an inter-modal transport system as to make the best use of urban rail in inter-modal trip chains.

Aerial Ropeway

Ropeway	Internal	External
Positive	Totally independent corridors	Create connections that are otherwise impossible
Negative	Specific planning constraints Practical line length limited due to speed limits	Operate only under fully compliant conditions

Ropeway infrastructure is absolutely minimal and inexpensive, yet utterly effective. The fundamental advantage of the ropeway, is that all moving parts form an independent closed systems and traction depends on a single, stationary electric engine. As a result, all mechanical risks can be tightly controlled and effectively excluded.

An ambivalent aspect are the relatively big and expensive stations, which have to be carefully introduced into urban space. If this is achieved however, they can even provide additional economic or cultural functions within their neighbourhoods. The corridor must be straight between two stations.

The aerial ropeway can fly over many obstacles that block terrestrial modes, but its corridor cannot easily go around physical obstacles such as high rise buildings, chimneys or terrestrial property owners reluctant to aerial traffic.

The aerial ropeway travels at lower speeds than BRT and rail. In urban areas, this difference is more than compensated by the absence of traffic interference, straight travel lines and absence of waiting time. As a result, aerial ropeway trips are actually faster than alternative services. On longer, suburban corridors, however, BRT and rail are likely to make full use of their higher travel speeds, making ropeways increasingly uncompetitive, due to its speed limits.

Aerial ropeways offer low technical risks, high probability for balanced books and great opportunities of stimulating additional business for other transport services.

Life cycle Costs

Generally speaking, aerial ropeways are far less costly to build and operate than BRT or Rail corridors. A good proportion of the aerial ropeway investment is linked to extremely high safety and reliability standards. The physical set-up of the system makes it easier to protect against vandalism and natural deterioration. As a result, the aerial ropeways' life cycle costs are not only lower, but can be calculated and guaranteed more solidly than those of any other transport mode.

Market success

The market success of any transport project depends on the corridor it is designed to serve. If the aerial ropeway creates an entirely new transport corridor that is needed, but cannot be provided by other modes of transport, its competitive advantage is paramount. As a result, the number of customers will be high. In addition, they will be willing to pay a substantial fare per trip or km travelled, because the alternative solution would cost them much more in terms of travel time and multiple tickets for successive "cheap" transport services. Hence, if the aerial ropeway is properly installed on an important corridor where other modes are less effective, market success is almost guaranteed and instant.

TOD strategies applied in growing urban agglomerations can provide necessary residential space directly in the big transport corridors. It can be a useful tool to create the ridership needed to make a transport mode work economically viable. This is especially true for ropeways, who need a lower degree of capacity utilization than other comparable transport modes, because of their lower life-cycle costs.

Governance

As pointed out above, for their technical characteristics as independent, integrated and closed systems, aerial ropeways are particularly well suited for Public Private Partnerships, where the private partner is in a position to take on all technical risks on a relatively tight calculation. The public partner will be able to concentrate on providing good and stable operating conditions: urban integration of the ropeway stations, inter-modal transfer facilities, compensation of concessionary fares, etc.

As a result, a properly designed aerial ropeway offers a unique combination of:

- predictability of life cycle costs and market success
- favourable cost/revenue ratio
- the clear distribution of precisely defined responsibilities of a limited number of stakeholders

These are criteria of highest importance for public and private financial institutions and make aerial ropeway projects particularly interesting for them.

3 Touristic potential of urban Ropeways

« Aerial ropeways are only for tourism » is a judgment often heard when this technology is proposed for the solution of daily urban mobility problems.

Many sightseeing buses around the world are double decker buses. However It would be wrong to conclude that double decker buses can only serve tourist purposes. In London, Berlin, Hong Kong, etc. they serve very successful as vehicles in regular public transport, that additionally offer a more attractive trip-experience than other vehicles.

The same applies to urban ropeways: they are excellent for tourist purposes, and even when on “ordinary duty”, they offer an enchanting experience.

4 Energy supply

Power supply is a critical issue in most African cities. The electric grids are often vulnerable to interruptions. Every activity that depends on constant electric power supply therefore must have a contingency plan. As a matter of fact the aerial ropeway can operate without energy supply from the electric grid for days or indefinitely, provided a robust generator and a large fuel- reservoir exist.

Depending on length, charges and types, aerial ropeways require a power supply between 100 kW and 1000 kW, 500 kW being a reasonable approximation for a typical urban aerial ropeway of about 3 km. Simple Industrial back-up power generators can easily provide this level of energy supply.

In comparison, a single light rail vehicle carries 4 engines of about 100 kW. The power requirements for a light rail system with several vehicles operating simultaneously are much higher than for aerial ropeways, mainly because of peaks of power demand during acceleration after each stop. Fluctuating demand and power peaks make it virtually impossible to operate a light rail network depending on an ordinary industrial diesel generator.

5 Examples from Latin America

Barrio Santo doming Savio
http://blog.educastur.es/bibliotecabaudilio/files/2010/03/santo_domingo_savio.jpg

Since currently there are only very few working urban ropeway examples in Europe and the U.S., and since the conditions in Africa are in many ways more comparable to the conditions in Latin America, the full version of this study uses examples from Latin America, in order to show how ropeways have started to play a mayor role in urban transport.

In Medellin and Caracas cable transit started in 2009/10, when the cities started to connect informal settlements in very inaccessible terrain to their mass-transport networks.

As a side-effect the areas often transformed from crime hot-spots to attractive parts of the cities just by making them easily accessible. Other cities like Rio de Janeiro followed the examples.

After the success of Medellin and Caracas, where the ropeways are mainly used as feeders to a higher capacity urban mass transit network, the example of Bolivia´s capital La Paz marks another step ahead in the development of ropeway networks. Here the urban ropeways will become the backbone of the urban public transportation system and a long awaited regular connection to the city of El Alto, located on a plateau above La Paz. The resulting metropolitain area has over 2,5 Million inhabitans.

6 Ropeways in Africa - yesterday, today and tomorrow

The history of cable cars in Africa began as a transport mode for freight. The Massawa – Asmara Cableway in Eritrea started working in the 1930s to carry freight from the red Sea up to the Eritrean and Ethiopian highlands.

Not very long after the introduction of Cable transit for goods on the African continent, French engineers built a first urban cable-car in Algiers in 1956. After its independence Algeria went on, developing urban cable cars, mainly used to make accessible new settlements in the growing city of Algiers.

In the new millennium a new generation of urban cable-cars started to work as a part of integrated and multimodal urban transport-systems. In Africa the start for the new generation ropeway systems was marked by the city of Constantine, where a cable-car connected the upper and the lower part of the city entering in service in the year 2008. Almost at the same time systems were installed in Algiers, Tlemcen, and Oran. All of them were, entirely integrated into the public transport system and immediately brought a big improvement for the accessibility within these cities.

Quet-Koriche, Algiers – Foto: Doppelmayr

Currently in Algeria there are 11 cable cars in use and 12 at some stage of planning or construction.

At the moment the urban cable cars of Algeria are the only ones in service on the African continent but this is about to change, which is the main reason for this study.

The full version analyses in detail the conditions and the state of planning of ropeway projects in the following sub Saharan cities.

City	Country	State of planning or implementation
Addis Ababa	Ethiopia	• Potential Feeder System for BRT and Light Rail • Various Workshops conducted, first signs of interest
Abidjan	Ivory Coast	• Potential Feeder System for BRT and Light Rail • Potential crossing of the Lagoon. • No official interest until to date but huge potential, because of the geographic location in the lagoon.
Mombasa	Kenya	• Access to Mombasa Island from the south • Feasibility-study conducted
Lagos	Nigeria	• Access to Lagos Island from three sides • Corridors identified • Feasibility study conducted, • start of construction due 2015
Dar es Salaam	Tanzania	• Feeder for BRT • Potential Pilot Corridor identified • Ministry of Transport in favour of the project • No progress expected before the next national elections in Autumn 2015
Kampala	Uganda	• Feeder for BRT • Pilot Corridor identified • Feasibility study due 2015
Lusaka	Zambia	• Government is Interested in potentials of Ropeways
Harare	Zimbabwe	• Access to the CBD from Minibus-holding bays • Pilot corridor identified, Administration convinced, • Search for potential investors

7 An ideal planning process for African public transport projects

This chapter briefly introduces Eurist´s vision of an ideal Nine-Step-planning process for any new transport mode or infrastructure in Africa. Essential criteria in the process are a broad support amongst the transport stakeholders, their long-term integration in the process and possibly even the operation of the new system, and the well organized and steady movement forward, avoiding an interruption of the process.

1. Identify local partners and stakeholder groups
2. initial workshop on the potential of urban ropeways, including first discussions amongst the stakeholders.
3. If the workshop reaches general agreement on a common objective, a task-force is formed out of the different stakeholder groups to keep the process moving
4. Initiate a study tour, taking them to visit a very good international ropeway example.
5. If the key-decision makers are convinced, the next step would be the establishment of an official steering committee in order to develop the terms of the feasibility study, get high level commitment for the planning process and take the necessary steps to include the new mode into the different levels of transport planning.
6. As soon as the funds for the feasibility study are secured it is extremely important to perform it quickly in order to keep the process moving.
7. Involve public and the media in order to disseminate the results of the study.
8. Produce and publish a tender for the construction of the infrastructure, carefully evaluate the offers, and contract the implementation phase.
9. The last step is the actual implementation phase, with the construction and the hand-over of the actual infrastructure.

At the moment, there is no country in sub-Saharan Africa which has gone through all of these steps. The most mature process is certainly the one in Lagos, entering in the construction phase soon. Kampala will perform a feasibility study within the next months. The examples in Tanzania, Zambia and Zimbabwe all find themselves in a crucial phase prior to the feasibility study. The examples in Mombasa and Nairobi are in a similar stage but have been developed along another methodology.

8 Different notions of success

Functional versus political values

As judged from a political standpoint two different ways to evaluate many measures or actions have been adopted. There is a functional side evaluating the benefits of the actuations to society. These values often are not immediately recognized or even noticeable, but in the long term they are normally more important than little short term improvements.

On the other hand there is the political value of the actions. It measures the political benefit a governing party can draw out of a decision in the polls. Both evaluations may differ substantially in their results.

Functional approach

When a ropeway for an African city is discussed or considered it is most likely to find near catastrophic traffic conditions in the city. Solutions have to be very effective and fast.

African cities need solutions for all parts of their society, not only for the few that can afford them.

The systems in question must be able to solve the pressing transport problems like road accidents, or air pollution. They need to be able to adapt to the fast urban development and they need to be implemented quickly in order to avoid the threatening functional collapse of the city. The change in the transport system should stimulate the economy and not charge it with even higher debts for a long time.

Political approach:

For politicians and decision-makers in Africa and anywhere else on the world, political will does not only depend on the above mentioned functional criteria. Decisions must help conserve the political power of the decision-makers generating short-term benefits, which can easily be explained to the voters. Creation of permanent jobs during construction and operation or the modernization of urban infrastructures and services at a relatively low cost could be such benefits.

Ropeway systems offer a number of arguments, that may make them interesting from a political standpoint. The stations can be especially attractive to their neighbourhoods, if additional functions are introduced. In case of a private or a PPP project, they increase tax income and will possibly even generate concession fees for the further operation when they are finally controlled by the government after an initial phase of operation by a private entity.

A barrier to overcome with new transport systems is that it normally makes some jobs obsolete or at least insecure. The best way of facing this issue is to include the informal transport operators into the planning process at an early stage, and ideally give them a certain level of property of the new system.

A very interesting feature is the possibility to implement the system during a single political term, which enables the governing politicians to make and keep a short term promise.

Moreover ropeways will often become urban landmark installations and have the potential to initiate an urban space-making process around them, improving the character of public space in the city.

9 Success-Factors

In African cities, public transport is extremely important. A big percentage of the population already depends on it. Improvements in the urban transport system are urgently needed and are likely to have very wide spread impacts, beyond the sole improvement of the way people move.

As a result, the success of a new transport mode can not only be measured in transport data, It is important to differentiate between different fields of impact.

The fields of implementation and operations are directly linked to the infrastructure and the service provided by the transport mode, whereas the other two fields measure impacts that are generated beyond pure transport needs from a social and an urban development point of view.

All these factors should be closely monitored, both in existing and new systems. Reliable data is urgently needed in order to evaluate the success of any transport infrastructure, and to make different systems comparable and able to learn from each other.

Implementation:	Operations:
• Affordability of infrastructure • Low construction cost and initial investment • Short implementation time • Potential for subsidy-free operation • Attractiveness for PPP or even private operations • Potential to adjust to a changing urban environment.	• Service quality • Safety • Security • Accessibility • Integration with other urban transport systems • Independence from ground-based transport • Reliability
Social sector:	**Urban development:**
• Social integration / affordability of fares • Creation of Jobs • Integration of informal transport • Public identification • Public appropriation (investment options)	• TOD-Strategy • Usability for the whole society • Integration of other functions beyond transport • Integration of active transport infrastructure • Reclaiming of public space • High quality public space • Showcase for the positive effects of liveability

Full study: http://www.eurist.info/index.php/projects/urban-ropeways

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