

The Malawi Priorities Project

Cost-Benefit Analysis of Upgrading Road Infrastructure for Tourism in Malawi - Technical Report

National Planning Commission Report with technical assistance from the Copenhagen Consensus Center and the African Institute for Development Policy



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Malawi Priorities: Background

Malawi Priorities is a research-based collaborative project implemented by the National Planning Commission (NPC) with technical assistance from the African Institute for Development Policy (AFIDEP), and the Copenhagen Consensus Center (CCC) to identify and promote the most effective interventions that address Malawi's development challenges and support the attainment of its development aspirations. The project seeks to provide the government with a systematic process to help prioritize the most effective policy solutions so as to maximize social, environmental and economic benefits on every kwacha invested. Cost-benefit analysis is the primary analytical tool adopted by the project. Cost-benefit analysis will be applied to 20-30 research questions of national importance. Research will take place over the course of 2020 and 2021.

Research questions were drawn from the NPC's existing research agenda, developed in September 2019 after extensive consultation with academics, think tanks, the private sector and government. This sub-set was then augmented, based on input from NPC, an Academic Advisory Group (AAG) of leading scholars within Malawi, and existing literature, particularly previous cost-benefit analyses conducted by the Copenhagen Consensus Center. The research agenda was validated and prioritized by a Reference Group of 25 prominent, senior stakeholders. The selection of interventions was informed by numerous consultations across the Malawian policy space, and one academic and two sector experts provide peer review on all analyses.

Cost-benefit analyses in Malawi Priorities consider the social, economic and environmental impacts that accrue to all of Malawian society. This represents a wider scope than financial cost-benefit analysis, which considers only the flow of money, or private cost-benefit analysis, which considers the perspective of only one party. All benefit-cost ratios (BCRs) reported within the Malawi Priorities project are comparable.

The cost-benefit analysis considered in the project is premised on an injection of new money available to decision makers, that can be spent on expanding existing programs (e.g. new beneficiaries, additional program features) or implementing new programs. Results should not be interpreted as reflections on past efforts or the benefits of reallocating existing funds.

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1. Summary

Tourism contributes 7.7% to Malawi's GDP, and sub-optimal capacity utilization of tourism facilities and services indicates that there is opportunity for growth. One of the main barriers, which keep Malawi from increasing its share of regional tourism receipts, is its comparably high transport costs. The intervention proposed is to reduce two drivers of transport costs (vehicle operating costs and traveler time) by upgrading certain sections of the road network to and around strategic tourist sites, totaling 1407 kilometers. The benefits include a level increase in international tourist receipts, a reduction in vehicle operating costs and time spent travelling for existing road users, and increased consumer surplus for new road users. Our estimates suggest that with the proposed road upgrade, international tourism would attract around 15,500 additional international arrivals annually. Roughly two-thirds of these arrivals would be residents from Europe and the US, who spend more on vacation and are more sensitive to improvements in paved roads than tourist arrivals from Africa. While this increase would bring in MWK 9,700 to MWK 12,000 million (\$13-\$16 million) per year in additional receipts, this is only a modest share of the benefits from the road intervention. The largest benefit by far, at 84% of the total, are the avoided vehicle operating costs associated with the paved roads which are estimated at MWK 79,200 million (\$106 million) per year. The costs of the project include the direct costs of bituminization and periodic maintenance and cost overruns stemming from delays. The benefit-cost ratio is 2.8. The intervention provides benefits higher than costs which are relatively large in absolute terms, equal to 0.9% of projected GDP until 2036. However, meeting the aim of doubling Malawi's tourism share of GDP will require a larger suite of investments than just paved roads.

Reconstruction of paved roads becomes necessary when periodic maintenance and rehabilitation activities are neglected. Sub-optimal allocations to the road maintenance fund have resulted in gradual declines of the road network classified as 'good', necessitating the complete reconstruction of roads. To demonstrate the importance of continued maintenance, the cost of regular maintenance of the newly asphalted 1407 kilometers was compared to the benefits of avoided future reconstruction costs. The benefit-cost ratio is 5.2, meaning that for every kwacha spent on regular maintenance there are 5.2 kwacha saved in avoided reconstruction costs and deterioration of benefits.

2. Background and Context

There are geospatial and climatic challenges to realizing Malawi's full development potential: it is land-locked; its lakes are experiencing declining water levels; time series analysis reveals both increasing variation in rainfall patterns and, in some areas, shortened rainy seasons, and the majority of its road network is unpaved. Poverty, population pressure and natural disasters have and continue to contribute to urban migration and food insecurity. Despite this, oil and mineral deposits, forestry, fisheries and an attractive topography remain relatively untapped sources of wealth creation. One of the keys to unlocking the country's potential in any of these sectors is investment in transport infrastructure.

2.1 Tourism in Malawi

Tourism contributes 7.7% to Malawi's GDP and is considered an important growth catalyst. From an African perspective, according to the 2019 Travel and Tourism Competitiveness (TTC) Index, there were 37.4 million tourists to the continent, generating \$24.7 billion in receipts, representing 7.1% of global tourism arrivals in 2019 (World Travel and Tourism Council). Travel and Tourism contribute 30% to regional (Malawi was classified in the TTC Index as Eastern Africa) GDP, and 28% of tourist arrivals were international. Malawi's score in the TTC Index was 2.9, just below the average for sub-Saharan Africa (SSA) - 3.1. The top performers were Mauritius, South Africa and Seychelles, all admittedly with impressive coasts. However, there were two landlocked countries in the top ten in the SSA classification: Botswana and Rwanda. Malawi's lowest scores were attributed to poor air, ground transport and port infrastructure, as well as inadequate tourist services.

According to the AFDB (2017b), compared to other countries in the Southern African (SADC) region, Malawi is ranked 10th out of 14 countries in tourism arrivals, with an average regional tourism arrival market share of 3.7% between the years 2011 and 2014. The Republic of South Africa (RSA) tops the list with a 40.9% share followed by Zimbabwe (9.4%), Mozambique (8.9%) and Botswana (8.7%). In terms of tourist receipts, the country ranked 12th out of 14 with a market share of 0.4%. South Africa ranks on top with a 60.6% share of receipts followed by Mauritius (9.7%), Tanzania (9.2%) and Zimbabwe (4.9%).

In Malawi, the number of international tourists has increased steadily since 2010, but revenue has stagnated over the same period, as indicated by Table 1.

Table 1: International tourist arrivals and receipts, 2010-2019

| Year | International tourist arrivals | International tourist receipts, USD |
|------|--------------------------------|-------------------------------------|
| 2010 | 746,100 | 45,000,000 |
| 2011 | 767,000 | 36,000,000 |
| 2012 | 770,300 | 35,000,000 |
| 2013 | 795,000 | 33,000,000 |
| 2014 | 819,200 | 36,000,000 |
| 2015 | 804,900 | 39,000,000 |
| 2016 | 823,500 | 30,000,000 |
| 2017 | 837,200 | 35,000,000 |
| 2018 | 871,000 | 43,000,000 |
| 2019 | 886,109 | 47,000,000 |

Source: World Bank, Malawi Department of Tourism

This table suggests international tourist receipts per arrival are relatively modest averaging \$36 to \$60. Top arrivals predominantly come from the surrounding region: Mozambique, Zambia, and Zimbabwe are 31%, 14%, and 13% of total arrivals, respectively. The United Kingdom and Ireland account for 14% (World Travel and Tourism Council, 2020). A more detailed list of country of origin of international arrivals to Malawi may be found in Table 2.

The 2020 Statistical Yearbook confirms that most visitors arrive from Africa (79%), followed by Europe and USA (15%). By 2027, international tourist arrivals are forecasted at 1,898,000. Seventy-five per cent of expenditures are classified as business spending (World Travel and Tourism Council, 2020).

The majority of international arrivals to Malawi have declared business as their main purpose of travel. The 2017 Tourism Statistics shows that 68.5% visited Malawi for business reasons (Department of Tourism communication). This is acknowledged in the National Tourism Policy (2019), one of the potential niches that Malawi could occupy is that of a MICE destination: Meetings, Incentives, Conferences, and Events. There is potential for growth without putting pressure on other resources, as the majority of hospitality and accommodation providers consulted have confirmed an average occupancy rate of less than 40% in a given year, suggesting that facilities are not being

Table 2: International arrivals, by country of origin

| Top ten source countries | 2016 | 2017 | % change |
|--------------------------|---------|---------|----------|
| Mozambique | 248,158 | 253,025 | 2.0 |
| South Africa | 82,645 | 83,929 | 1.6 |
| Zimbabwe | 108,462 | 110,740 | 2.1 |
| Zambia | 136,220 | 139,000 | 2.0 |
| Tanzania | 77,777 | 78,810 | 1.3 |
| United Kingdom | 36,619 | 36,814 | 0.5 |
| United States of America | 23,218 | 22,822 | -1.7 |
| Kenya | 12,963 | 13,181 | 1.7 |
| Netherlands | 8,833 | 9,022 | 2.1 |
| Germany | 9,626 | 9,833 | 2.1 |

Source: 2017 Tourism Tables, Malawi Department of Tourism

used to their full potential (Malawi National Transport Master Plan - NTMP).

2.2 Tourism as a driver of economic development

Multidisciplinary and multidimensional in nature, the tourism industry has a definitive multiplier effect on the wider economy: it requires accommodation, arts and entertainment, food and beverages, textiles and furniture, specialized labour, security, among other things. Many, if not all, of these products and services have the potential to be locally sourced. Fayissa et al (2007) evaluate the effect of tourism on the economies of African countries. They conclude that tourism has a positive and statistically significant effect on the GDP per capita (at 1% significance) of African countries. Specifically, they calculate that a 10% increase in the tourism receipts of a typical African economy would result in a 0.25% growth in the GDP per capita. Makochehanwa (2013) found that a 1% increase in tourism-related investment would result in a 0.29% rise in economic activities of SADC member country as represented by GDP per capita. Finally, according to a World Bank (2010) study of the travel and tourism sector in Malawi, US\$1 of real GDP (in year 2000 US\$) in the Travel and Tourism sector led to an average US\$1.08 of increased economic activity in the wider economy (2000–08). In contrast, the figures for Zambia, sub-Saharan Africa and the world were \$2.17, \$1.77 and \$1.81, respectively.

In a specific example from the African Parks 2018 Annual Report, the private consortium which operates four parks¹ in a PPP arrangement with the Government of Malawi, there is potential for increased tourism revenues and community development. Tourists (50% are local) are attracted to the rehabilitated forests and wildlife life, which has been steadily introduced in Malawi. The surrounding communities have seen revenue from non-timber forest products like bamboo, grass, and mushrooms, valued at around \$11,000 per year. They have also benefited from improved essential services, as well as schools and medical clinics and employment. African Parks has also noted that tree survival in the protected areas has increased from 64% in 2017 to 71% in 2018.

2.3 High transport costs affect tourism

Most visitors (83%) to Malawi in 2017 (the latest year for which data is available) arrived by road (2017 Tourism Tables). Landlocked, Malawi has three neighbours (Mozambique, Tanzania, and Zambia), with 14 recognized international land border posts with Immigration/Emigration and Customs facilities. According to the 2017 Tourism Tables, most international visitors (67%) used one of four ports of entry to exit Malawi: Kaporo/ Songwe (Tanzania), Dedza and Mwanza (Mozambique), and Mchinji/Chimaliro (Zambia).

One of the keys to unlocking Malawi's potential in tourism and other sectors like mining and forestry is investment in passenger transport infrastructure. Due to the fact that it is landlocked, transport costs in Malawi are among the highest in the region. Furthermore, road infrastructure is poor and below internationally accepted standards. Earlier analyses, as in Magombo (2011), cite the poor conditions of roads as being impediments to attracting more international visitors. In fact, some of the key tourist attractions were deemed inaccessible due to road conditions in Magombo's review of post-independence tourism planning. The Ministry of Tourism in 2007 attempted to address this by upgrading the access roads to certain resort areas.

To address this challenge, Government of Malawi will mainstream tourism in the transport sector to ensure provision of appropriate infrastructure to support the sector (National Tourism Policy, 2019). Malawi has 15,451 km of road network (National Transport Master Plan), and only 30% are paved (Malawi Vision 2063).

A World Bank value-chain analysis found that transport costs are often the highest single cost category (26% of total expenditures), especially when including transfers and moving guests on excursions and game viewing. The costs include capital costs of vehicles for transfers, vehicles and boats for game viewing and excursions, maintenance costs and fuel. Poor quality roads increase maintenance bills and decrease average operational lifespan of vehicles (World Bank, 2010). The NTMP cites the costs of oil, time spent at border crossings and road quality as being the main cost drivers.

¹ Majete Wildlife Reserve, Liwonde National Park, Mangochi Forest Reserve, and Nkhotakota Wildlife Reserve.

Local enterprises (suppliers to the tourism sector) are also affected by transport costs. According to the Fifth Integrated Household Survey (IHS5), 39% of households were operating non-farm enterprises; up from 27% in the IHS4; 11% selling forest-based products (like furniture). Among non-farm enterprises, 11.3% of total expenditures were reported to be on freight and transport, a 1% increase nationally since the IHS4, but a 4% increase for households in the Northern region.

2.4 Migration to urban areas

Malawi's urbanization is in its infancy and is occurring at a modest rate. The share of the national population residing in urban areas has increased steadily since independence from 6.4% of the national population in 1966; 10.1% in 1977; 10.7% in 1987; 14.4% in 1998; 15.3% in 2008; and 16% in 2014 (Government of Malawi, 2015). It is still estimated at 16% in the 2018 Malawi Population and Housing Census.

The urbanization pattern is concentrated. According to the 2018 Population and Housing Census, urban growth rates range from 2.0% to 3.9%. However, 75 percent of the urban population is concentrated in 4 cities: Lilongwe, Blantyre, Mzuzu and Zomba, and they form the economic core of the national economy, with their contribution to national GDP (33%) far in excess of their population share (13%) (World Bank, 2017). Furthermore, the municipalities of Mangochi (3.9%), Machinga (3.4%), and Mwanza (3.4%), all in the South, have seen the highest growth rates between 2008 and 2018 (2018 Malawi Population and Housing Census).

Migration could positively affect tourism services. As most of Malawi's visitors are business in nature, an increasingly more skilled workforce in the above urban areas will be needed. Also, the migration to urban centers, and thus higher incomes, would also stimulate domestic tourism.

3. The Project

The National Planning Commission (NPC), with technical assistance from AFIDEP and the Copenhagen Consensus Center (CCC) are conducting the Malawi Priorities project across 2020 and 2021. The project is a research and advocacy exercise to identify the most effective ways to address the nation's challenges using the framework of cost-benefit analysis. The aim is to inform both short and long term development priorities for the country, acknowledging that there are insufficient resources to address all of Malawi's challenges and that maximizing outcomes requires careful, evidence-based consideration of the costs and benefits of all policies.

The starting point of all research questions is the NPC's existing research agenda, structured around the six thematic areas of Sustainable Agriculture, Sustainable Economic Development, Human Capital and Social Development, Sustainable Environment, Demography, Governance, Peace, and Security, and Human Capital and Social Development.

The NPC's research agenda was developed by the Commission in September 2019 after extensive consultation with academics, think tanks, the private sector and government. Consequently, the Commission's research agenda, prima facie, contains questions of national importance.

This paper seeks to address the question:

What are effective strategies for managed urban population growth so that it is a catalyst for sustained economic growth, is at pace with growth of basic and social services and ensures rural areas are not left behind in economic transformation?

The National Tourism Policy (2019) cited inadequate supporting infrastructure as one of the main challenges to a fully-developed tourism sector. Specific mention is made of road quality and non-road transport options (air and rail). Recently, the Malawi Vision 2063 was unveiled, with Urbanization, Industrialization and Agriculture as its central pillars. Secondary cities, urban centers which have as their focal point an activity, such as tourism (business and leisure) have the catalytic potential to create both downstream and upstream industries. One of the main challenges also mentioned in the Vision 2063, as well as other sectoral strategies, is the need to rehabilitate roads and in some cases upgrade them.

The 2020 Malawi Tourism Development Strategy has its objective to ensure comfortable and safe access to Malawi's most recognizable attractions by upgrading and maintaining roads; specifically to Cape Maclear, Liwonde National Park, Nyika National Park, Lake Chilwa, and Mulanje Mountain Forest Reserve. In a bid to improve accessibility of tourism facilities, the Ministry of Tourism, Culture and Wildlife currently implements a PISP-funded Access Roads to Resorts project in conjunction with the Roads Authority. A number of roads, under 5km long have been constructed since the project started. These include connecting lakeshore lodges in Mangochi (Makokola Retreat, Sunbird Nkopola, Sunnsand Holiday Resort, Boadzulu Holiday Resort, Mulangeni among other in the south, in Salima a total of 4.8km road stretch from MAFCO to Wheel house (1.6km) and Salima -Sengabay turnoff to Mimiza-Kukuza Lodge (3.2km) and in Nkhatabay improved access from ADMARC to lodges (Chikale Lodge, Mayoka, Njaya lodges). This has greatly improved tourism traffic to the area and occupancies of the facilities. The annual budget on the access roads project is usually MWK 1.5 billion.

Consultations with the Ministry of Transport and Public Works and the National Planning Commission resulted in the identification of improvements in road infrastructure, specifically those routes around selected tourist sites, as a means to stimulate economic growth. The Road Sub-sectoral Master Plan of the Ministry of Transport and Public Works, in alignment with the Tourism Department, identifies the upgrading of all earth roads within strategic protected areas of Nyika, Vwaza, Kasungu, Nkhotakota and Liwonde parks. The Malawi National Transport Master Plan, based on the identification of national parks and game reserves, selected 1407 kilometers of road to upgrade. This analysis focuses on these roads, and descriptions can be found in Table 5.19 of the NTMP.

Therefore, this report conducts cost-benefit analysis on the upgrading of roads around strategic tourist sites, with a view to increasing tourism receipts. This analysis assumes maintenance budgets are met, to give a full picture of the obtainable benefits. We also demonstrate the importance of regular maintenance by conducting a supplementary cost-benefit analysis on meeting regular maintenance needs, conditional on the road already being built.

4. Intervention to Upgrade Routes around select tourist sites

Given the critical role of road infrastructure in realizing the potential of selected tourist hubs, we undertake a cost-benefit analysis of upgrading of 1407 kilometers of mostly rural roads. These roads have been identified by the Malawi-NTMP (2018) as being essential to the development of certain tourist attractions. Tourism and the related services in these areas will be affected by the road upgrades but also other economic sectors, for which transport is both an essential and costly component. Improvements in the road infrastructure would also contribute to meeting the Malawi Vision 2063 goal of having 45% of the road network bitumised by 2030; 57.5% by 2040. The proposed upgrading of 1407 kilometers of road represents approximately 9% of the total network (paved and unpaved) and would increase the % of paved roads by 9pp, a 30% increase on current levels.

Construction is assumed to be started in 2021 and completed by the end of 2022. Due to uncertainties around the return to normal tourism behavior globally after the COVID-19 pandemic, we simply assume that tourism returns to normal in 2023. This is potentially a simplified assumption, but predicting the course of the pandemic over the next two years is out of scope for this analysis. Given the relatively modest share of tourism receipts in the overall cost-benefit analysis, alternative assumptions around the re-establishment of tourism are unlikely to change the results significantly.

4.1 Evidence of the impact of road infrastructure on tourism

In general, a tourist destination's accessibility can be improved by developing the transportation infrastructure network or by improving connectivity between entry points and tourist facilities. (Seetanah et al., 2011; Truong and Shimizu, 2017). According to Odeku (2020), tourism needs a good road transport network to flourish and also that good roads will attract tourism investment and spur development of surrounding communities. Building of highways, and motels and restaurants for resting for travelling tourists, will spur development of tourism in a country (Mammadov, 2012).

Signe (2018) noted that Governments of Ghana, Kenya and Zimbabwe embarked on improving their road networks to promote their domestic tourism. Further, Signe (2018) also found that future rapid economic growth would go to countries that invest heavily in their transport services and utilities. According to the 2020 Malawi Tourism Development Strategy, development of tourism in Malawi can only realise its potential if there is corroboration with the transport sector among others.

Where it relates to tourism, cost is a major consideration determining the demand for a destination. The cost of travel to the destination and the time spent traveling are important factors upon which vacation and/or business trip decisions are made (Truong and Shimizu, 2017). Accessibility improvements can reduce both travel costs and travel times.

Khadaroo and Seetanah (2007) investigate the importance of transport capital in the overall tourism attractiveness of Mauritius. The effect on tourism was measured by tourist arrivals, which was regressed on relative tourism prices, tourism infrastructure measured by the number of rooms, and distance from origin to destination and transport infrastructure capital. The authors concluded that transport capital has a positive effect on total arrivals: a 10% increase in the stock of transport capital yields a 3.6% increase in arrivals on the island overall. However, there was important differences in the impact by origin of arrivals. The coefficient on arrivals from the US and Europe was roughly three times as large as the coefficient on arrivals from Asia and Africa, suggesting that US and European visitors were more sensitive to the presence of transport capital.

In a subsequent analysis, Khadaroo and Seetanah (2008), analyzing the panel data of 28 countries including 6 African countries, from 1990-2000, affirm that transport infrastructure is a significant determinant of tourist inflows into a destination. The coefficient for roads (the length of paved roads/size of the country) indicates that a 10% increase in the paved road network yields a 1.3% increase in international arrivals. As before, the impact varied substantially by origin of the visitor. Arrivals from Europe increased 3.8% for every 10% increase in the paved road network, while arrivals from Africa only increased 0.06% (statistically insignificant).

Seetanah et al. (2011) examine international tourist arrivals into Mauritius over a twenty-year period to understand the contribution of different determinants in explaining the success of the island as an international tourism destination. Inversely with Malawi where it relates to the origin of international tourists, the majority of tourists coming to Mauritius are from Europe (67%), followed by Africa (25%) and Asia (8%). They construct a demand function for international tourism using time series of tourist arrivals, a proxy for their spending capacity, a proxy for relative tourism prices in Mauritius, tourism infrastructure represented by accommodation capacity, distance travelled, and infrastructure (not limited to transport). A 10% increase in the stock of infrastructure capital yields a 3.2% increase in tourist arrivals in the island. A 10% decrease in distance travelled (travel costs) yields a 6.1% increase in tourist arrivals.

In the case of Tanzania, Kweka (2004) identifies two avenues of benefits resulting from improvements in infrastructure. Firstly, given the distant location of Tanzania's main tourist attractions an improvement in infrastructure may cut down the price of holidays as costs of transport, marketing and distribution decrease; such an improvement will increase real consumption and hence welfare. Secondly, infrastructure improvement will improve access of tourists to the attractions, thus encouraging further growth of tourism. He shows that for a 10% transport infrastructure improvement, the price of tourism falls (by 3%) more than in the base scenario, hence increase in both the tourist consumption and tourism exports; both by 0.4%.

The Tourism Road Infrastructure program in the Philippines, supported by USAID, was created in 2012 to increase government investments in roads to support tourism development. Local roads made up close to 85 percent of total road length, but less than 20 percent were paved. Between 2010 and 2016, 2080 km of road were added nationally based on criteria that favored tourism sites: the city of Palawan benefited from 151 kilometers of upgraded road from the program; that of San Vicente, 23 kilometers. In the province of Palawan tourism arrivals grew on average 9.7% annually between 2012 and 2016, a net increase of 109,000 arrivals. It is also interesting to note that in 2012, 23% of tourists were international; whereas, in 2016, the proportion of international arrivals of all tourists increased to 36%. In a second case study of San Vicente, tourist arrivals grew on average 11% annually between the same period, a net increase of 18,500 arrivals attributed to the program (USAID, 2016).

Mustafa (2019), in examining the impact of infrastructure on tourism in Sri Lanka, between 2005 and 2017, also using road and railway kilometers as explanatory variables, concludes that a 1 km increase in roads increases tourist arrivals by 1307 (5% significance). Golemski and Majewska (2018) also find a significantly positive relationship for Poland, a 6.9% increase in tourist arrivals after a 10% increase in road infrastructure expansion.

More recently, Namibia, which has as among its strategic objectives the promotion of wildlife tourism, also sought to improve connectivity with targeted tourist sites. A survey of the tourism sector in Namibia showed that investment in a transport corridor in the Zambezi region, specifically the tarring of roads, was positive for tourism. The road improvements did lead to an increase in investment, as evidenced by the increase in accommodation establishment, which numbered 24 in 2005, increasing to 47 in 2018 (Kalvelage et al., 2021).

4.2 Expected benefits

The benefits of the proposed road works include an increase in tourism revenues, a reduction in travel times and vehicle operating costs (VOC) of existing users, and the consumer surplus of induced demand.

4.2.1 Increase in international tourist receipts

The Malawi Vision 2063 targets a 100% increase in tourism in terms of its contribution to GDP, from its current baseline of 7.7% to 14.4% in 2040. According to the World Bank, there were 871,000 arrivals in 2018. This intervention is expected to attract new tourists. Table 3 summarizes the evidence in the literature on the impact of road/transport infrastructure investments on the tourism sector.

Table 3: Evidence of impact of transport infrastructure on tourism

| Country | Intervention | Effect on tourism | Source and description |
|---------------|--|--|--|
| Poland | 10% increase in road network | 0.69% on international arrivals | Golemski and Majewska (2018) |
| Mauritius | 10% increase in transport capital | 3.6% (tourist arrivals overall) 4.2% (tourist arrivals from Europe or USA) 1.3% (tourist arrivals from Africa) | Khadaroo and Seetanah (2007): demand function to capture impact of transport (air, land, sea) capital stock on tourist arrivals using panel data (1978-2003). Ninety per cent of tourist enter and exit by road. The proposed road upgrade of 1407 km represents 9.1% of the total road network. |
| International | 10% in paved road network | 0.8% (international tourist arrivals to African destinations) 3.8% (arrivals from Europe) 0.06% (arrivals from Africa) | Khadaroo and Seetanah (2008): the impact of an increase in road network as measured by the length of paved roads/size of the country on international tourist arrivals using panel data of 28 countries, from 1990-2000. The proposed road upgrade of 1407 km represents a 30% increase in the proportion of the total road network that is paved (4635.3 km), increasing the effect size to 2.4%. |
| Mauritius | 10% increase in infrastructure stock | 3.2% (tourist arrivals) | Seetanah et al. (2011): tourist arrivals into the small island of Mauritius over the period 1985 – 2006 from 26 major origin countries |
| Mauritius | 10% decrease in distance (measured in air miles) | 6.1% (tourist arrivals) | Ibid. |

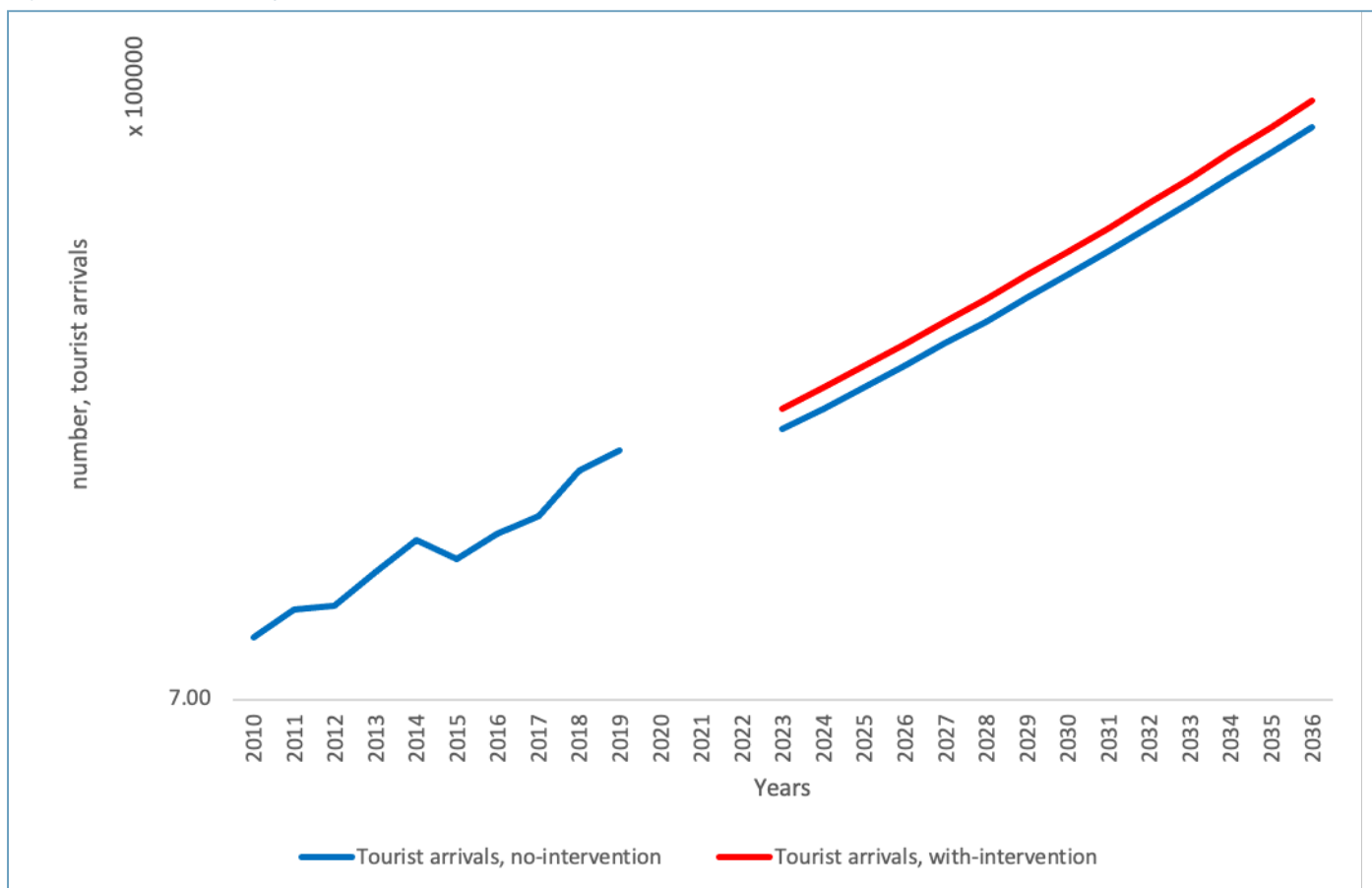
The Khadaroo and Seetanah studies of 2007 and 2008 appear the most pertinent to measuring the impact of an increase in road network on tourist arrivals in Malawi. Importantly, those papers show differential impacts based on continent of origin. This is important because Europeans and Americans likely spend more on vacation than Africans, on average. Using the continent specific coefficients from both papers and noting that the % change in transport capital and paved roads is 9.1% and 30% from the intervention respectively we arrive at very similar estimates for the number of expected arrivals due to the intervention: 15,361 using Khadaroo and Seetanah (2007) and 15,564 using Khadaroo and Seetanah (2008). We take the average of these figures as the point estimate of new arrivals, stratified by origin and note an expected 10,116 new arrivals from Europe and 5,436 from Africa due to the intervention (other origin continents are ignored for parsimony since they make up ~5% of total arrivals). This results in an additional 242,660 international

arrivals over a 15-year period. This figure is a modest 1.7% increase on expected arrivals over the time period. The reason for this low figure is because a) the impact of roads on tourism arrivals is relatively weak, with elasticities generally below 0.5 b) arrivals from Europe and the US are most sensitive to the presence of paved roads, and they currently represent only a small proportion of total arrivals c) arrivals from Africa, which make up the vast majority of tourist arrivals to Malawi, are relatively insensitive to the presence of paved roads.

Arrivals from Europe are assumed to spend MWK 931,250 (\$1250) per arrival based on pre-COVID data from the EuroStat,² while arrivals from Africa are assumed to spend MWK 39,485 (\$53) based on the latest available data from World Bank (see Table 1).

The intervention will stimulate over 15,462 additional tourist arrivals in 2023, reaching 19,336 in 2036. Correspondingly, receipts begin at MWK 9,632 million (\$13.0 million) in 2023 and reach MWK 12,045 million (\$16.2 million) in 2036.

Figure 1: Effect of road improvements on tourism arrivals.



Note: For simplicity, the analysis assumes normal tourism activities return in 2023 with zero tourism in the years 2021 and 2022.

4.2.2 Reduction in travel time of existing users

The intervention is expected to reduce travel times for existing road users. It is assumed that:

- Current travel time on a poor road is 90 minutes per 50 kilometers (AFDB, 2020).
- On average, existing users travel 80 kilometers (the distance from Blantyre to Mulanje) per day.
- The sum of the targeted routes see just under 30,400 vehicles, of all sorts, daily. The latter was projected backwards from the Malawi-NTMP’s forecast of 38,665 motorized vehicles in 2036, having used an average annual increase of 1.6%. The average vehicle on these trips has 2 people.
- Of all trips, 84% are for domestic users, 14% are for tourist arrivals from Africa and 2% are tourist arrivals from Europe / US. This is based on an assumption that each tourist arrival makes two trips on these roads, with the remainder being attributed to domestic users.

According to the AFDB (2020), paving a road reduces travel time to 40 minutes per 50 kilometers. This leads to time savings of about 29.5 million hours per year across the 1407km road network. The saving is monetized using a weighted average of income per capita from Malawi (\$630), sub-Saharan Africa (\$1623) and Europe (\$35,678). The time savings are equivalent to MWK 6,054 million (\$8.1 million) in 2023 and grow to MWK 8,782 million (\$11.8 million) by 2036.

4.2.3 Reduction in vehicle operating costs of existing users

The intervention is also expected to reduce the vehicle operating costs of existing users as roads that are in poor condition typically increase the maintenance and/or repair costs of vehicles. The AFDB (2020) estimates the VOC of a passenger vehicle on a poor

² Refer to Expenditure per trip, Long, outbound: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Key_figures_of_trips_of_EU_residents_aged_15_and_over_2019.png

quality road at MWK 365 (\$0.49) per kilometer, which declines to MWK 275 (\$0.37) on a paved road. Essentially each 80km trip on the road costs MWK 22,000 instead of MWK 29,000. The intervention results in the savings of MWK 79,244 million (\$106 million) every year.

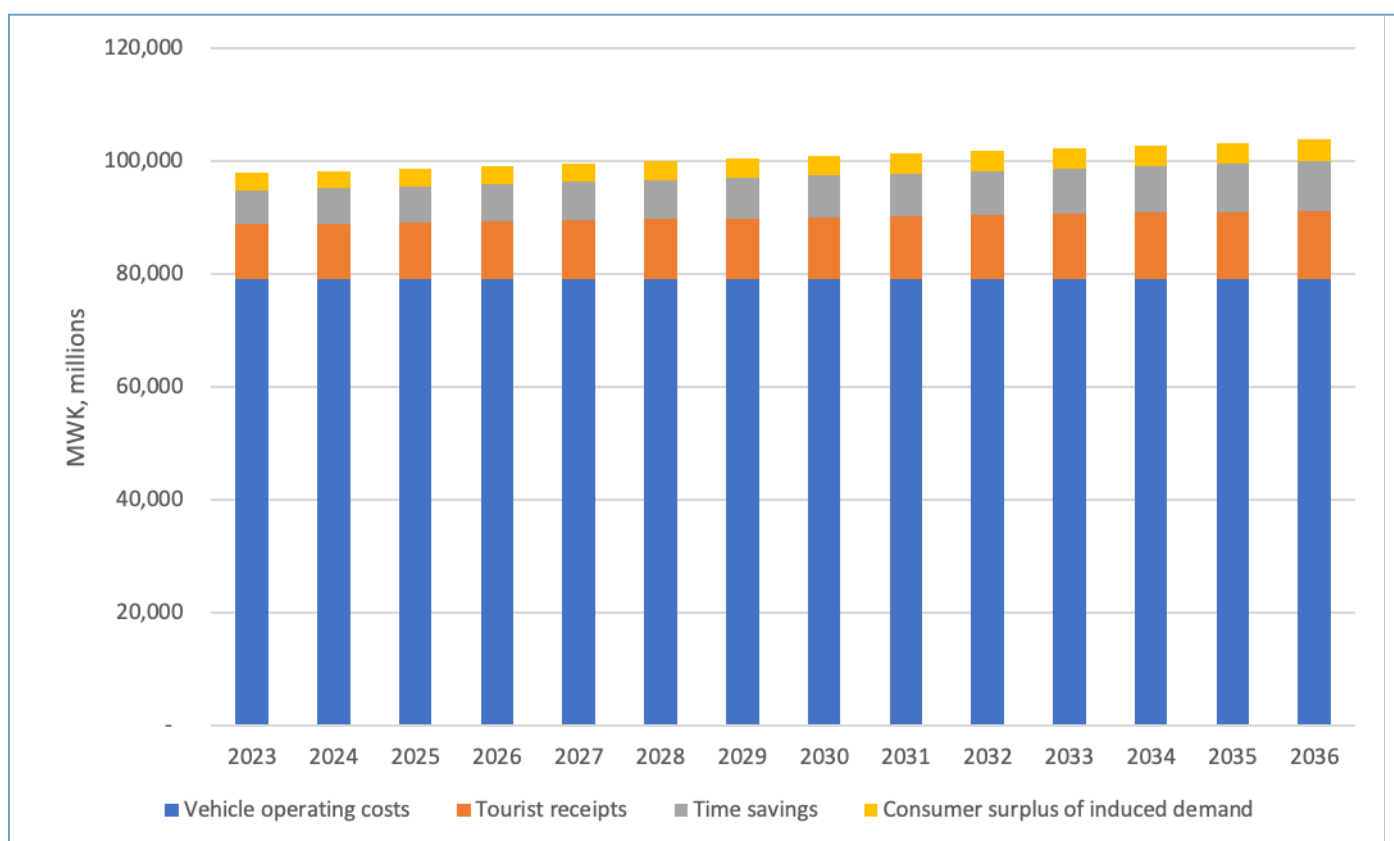
4.2.4 Consumer surplus of induced demand

The intervention is expected to attract new (domestic) users. Following standard transport economics principles, these new users experience a benefit known as a consumer surplus (essentially the difference between what they were willing to pay to take the trip, and what they actually pay to take the trip). This is approximated by taking the product of new users and ‘cost savings’, and multiplying this by 50%. The new network is expected to reduce the costs of trips by 24%. Litman (2021) suggests an elasticity of demand with respect to costs of -0.3 (see page 12 of that report). This means for the 24% reduction in costs, the network should see an increase in people-trips by 7.3% or 1.6 million in the first year. The value of the consumer surplus is MWK 3,021 million (\$4.1 million) in the first year, rising to MWK 3,787 million (\$5.1 million)

4.2.5 Summary and benefits not included

A benefit not included in the analysis is the residual value of the newly paved roads. Without knowing the exact lifespan of the roads (which depends on many factors like climate, maintenance, and use intensity), it is difficult to estimate their value and the benefits accrued by users. Due to lack of data, another benefit not included in the analysis is the reduction in road accidents attributed to inferior road surface quality. However, this would be offset by the increase in accidents that is normally attributed to increased speeds on paved roads. Lastly, it is recognized that there are additional benefits associated with the improved connectedness of rural residents: better and faster information, delivery of goods and agricultural commodities, access to social services, etc.

Figure 2: Benefits from the road improvement intervention



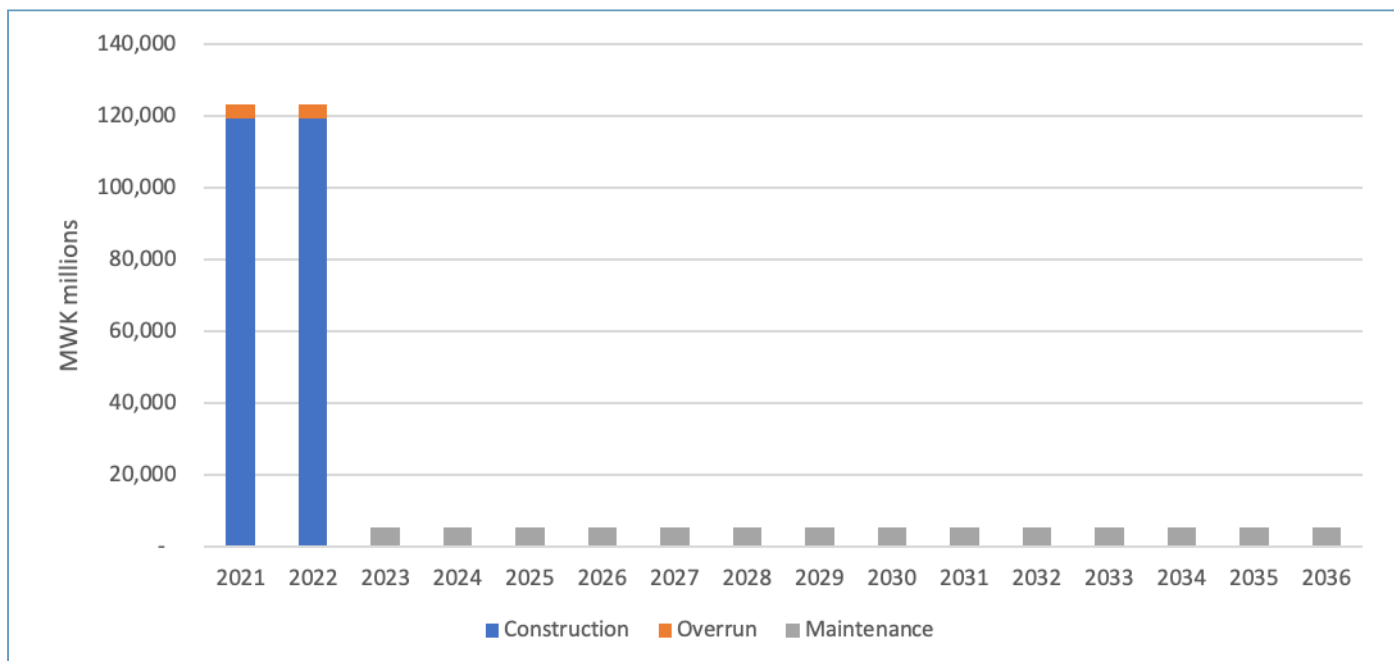
In total, the benefits equal MWK 97,951 million in 2023 and rise to MWK 103,858 million in 2036. Eighty percent of the benefits are due to vehicle operating costs. The total benefits average to 0.9% of projected GDP over the time period, a non-trivial amount. The net present value of benefits at an 8% discount rate is 764,893 MWK million (\$345 million).

4.3 Costs

The costs of upgrading the 1407 kilometers of road include:

- direct costs of construction, estimated at MWK 170 million (\$228,000) per lane kilometer (AFDB, 2014)
- annual maintenance, valued at 2.2% of the road asset value (NTMP)
- cost overruns associated with delays. Here we assume that the project has a 1 in 5 chance of experiencing an overrun as per the experience across Africa and that conditional on an overrun, the value is 15% of the project’s appraisal value (AFDB, 2014).

Figure 3: Costs of upgrading 1407km of road



Expected costs are MWK 123,135 million in the first two years and then MWK 5,258 million thereafter.

Several costs have not been included, owing to difficulty of measurement. They include the negative externalities like noise and landscape changes associated with road construction and increased traffic flows; environmental changes to flora and fauna, and road accidents attributable to asphalted surfaces.

4.4 Cost-benefit analysis

The results of the analysis are summarized in Table 4. The intervention has a central BCR of 2.8.

Table 4: Summary of results of upgrading 1407km of road

| Discount Rate | Costs, MWK millions | Benefits, MWK millions | BCR |
|---------------|---------------------|------------------------|-----|
| 5% | 289,974 | 946,491 | 3.3 |
| 8% | 277,286 | 764,893 | 2.8 |
| 14% | 258,831 | 525,699 | 2.0 |

5. Complementary analysis: Intervention to fully finance road maintenance

In the absence of any extreme force of nature, an asphalted road has a lifespan of at least 15 years, with regular maintenance. That is, a road project does not end with its construction. In order to preserve its value (and to minimize the costs of its users), periodic maintenance and rehabilitation are required throughout its expected life. Resource-challenged countries like Malawi typically have difficulty setting aside the required funds for road maintenance when the competing national needs are more 'evident'. However, the future costs of reconstruction of a road that is not appropriately or sufficiently maintained are considerable. A concrete example is illustrated in an AFDB (2005) project completion report of road works in Malawi, in which the rehabilitation of the Chikwawa-Bangula Road cost \$115,000 per km, whereas the resurfacing of several roads cost \$27,000 per km. The economic costs of poor road maintenance are borne primarily by road users. It costs more to maintain vehicles and users spend more time on the roads. There is also the consideration of the timely delivery of agricultural output, as well as other sectors which depend on roads, e.g. minerals and petroleum products, as additional beneficiaries of regular maintenance. To underscore the importance of setting aside a budget for maintenance we conduct a complementary analysis from the perspective of the planner after the 1407km of road is constructed.

5.1 Counterfactual

There are multiple entities involved in roads maintenance. The Roads Fund Administration, which reports both to the Ministry of Finance and the Ministry of Economic Planning and Development, is an autonomous administration, established by the Roads Fund Administration Act No. 4 of 2006, with the main responsibility to raise, administer and account for funds for the construction, maintenance and rehabilitation of Malawi's public roads. The Roads Fund Administration is also responsible for monitoring the efficient and effective use of funds disbursed to implementing agencies in the road sector. The Ministry of Transport and Public Works (MTPW) is responsible for overall policy formulation and monitoring of the transport sector. The Roads Authority (RA) of Malawi was constituted through an Act of Parliament No.3 of 2006 to be the implementing agent of the Ministry of Transport and Public Works. The purpose of the Authority is to ensure that public roads are constructed, maintained or rehabilitated at all times.

The Board of the Roads Fund has among its responsibilities, as mandated by the Roads Fund Administration Act, to recommend to the Minister fuel levy and other road user charges and tariffs as required; to allocate financial resources for the construction, maintenance and rehabilitation of roads based on a percentage of the approved annual work programs of the Roads Authority, and for traffic and road safety management; to arrange for the collection of monies assigned to the Roads Fund; to identify other sources of funding. To this end, it has the power to raise funds which it does in the form of road user charges and toll levies. The Roads Fund's income has risen substantially from MK 15,400 million in 2014 to MWK 42,000 million in 2019. Over the same period, road works expenditure increased by 402%.

Despite fuel levies at 11% of pump price (and accounts for 85% of the Road Fund's revenue), road access fees on saloon vehicles, and the introduction of toll roads, there is a road maintenance funding gap of nearly 80%. The Malawi-NTMP (2018) notes that roads maintenance is currently funded at MWK 22,350 million (\$30 million), whereas the need is closer to MWK 104,300 million (\$140 million).

In its completion report of the Road Maintenance and Construction Project (1991-1999), the AFDB (2005) evaluated the multi-component project that included the upgrading of gravel roads, the resealing of bituminous roads, and the rehabilitation of roads. Among its recommendations were that efforts should be undertaken to rectify defects observed during the field inspection of the completed project to preserve the investment and that there should be intensive regular maintenance activities (routine and periodic) for the gravel roads to minimize the deterioration. Nonetheless, according to the Malawi NTMP (2018), the last two Roads Condition Surveys (2007 and 2014) reveal that the proportion of roads in 'good' condition fell from 58% (about 1700km) to 31% (910km) of total paved network, a deterioration rate of approximately 3.9% per year.

The 2018 Annual Report of the Roads Fund reveals that just under MWK 3 billion were spent on routine maintenance, while MWK 16 billion was spent on rehabilitation. The Roads Fund Administration, in its Strategic Plan (2019-2024) identifies the need to reallocate funds towards maintenance. The under-financing of road maintenance is reflected by the premature deterioration on many sections. It cites that all main roads and almost all secondary roads are paved, although most of them are in poor condition due to poor maintenance, unpaved shoulders and improper construction of roadside drainages and some unpaved sections are almost impassable during the rainy season. It cites as among its impediments to greater effectiveness, the limited sources for financing leading to over dependence on the fuel levy as the main source of revenue and the decreasing returns in revenue collections.

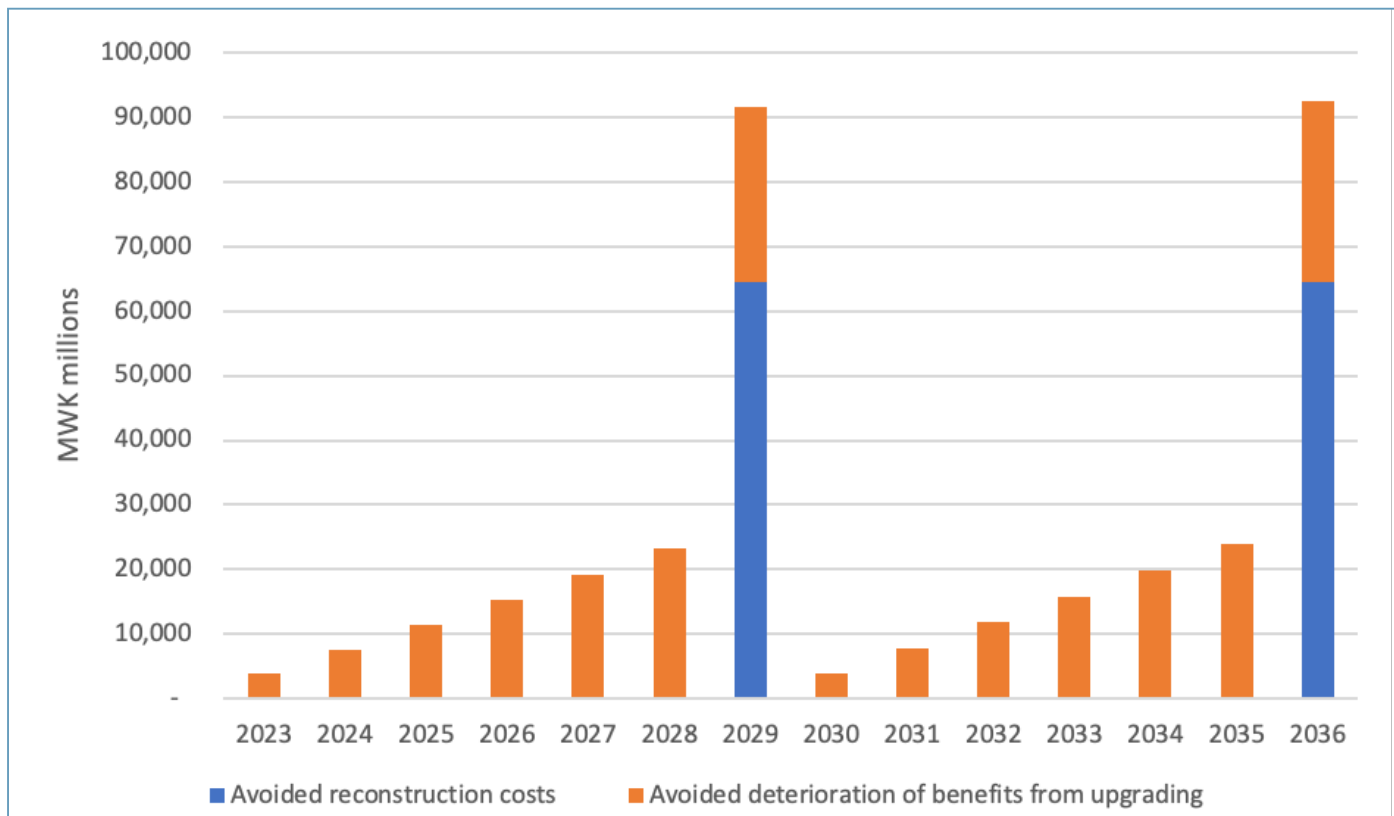
The counterfactual assumes that maintenance funding is provided at historical levels i.e. 21.4% of total need. This leads to 3.9% rate of deterioration of the roads. The roads are assumed to require a major reconstruction every 7 years.

5.2 Benefit

The benefit of sufficiently funding the routine and periodic maintenance of the newly paved road network is the avoided long-term rehabilitation costs, estimated at the same price as the upgrade MWK 170 million (\$228,000) per kilometer. If the 1407 kilometers of road are allowed to deteriorate, there will be two major reconstruction efforts required between 2021 and 2036. The avoided reconstruction costs are MWK 86,614 million in 2029 and 2036.

A second direct benefit of regular maintenance is the avoided deterioration in the time savings, vehicle operating cost savings, tourism receipts and induced demand identified above in Section 4. Here we assume that the reduction in benefits is proportional to the stock of deteriorated road, which climbs every year by 3.9% until the reconstruction effort.

Figure 4: Benefits of full maintenance of 1407km road



5.3 Costs

The costs are annual maintenance expenditure, which should be costed at 2.2% of the roads’ asset value, as per the Malawi-NTMP (2018). The annual maintenance needs of the newly upgraded roads is just under MWK 5,259 million (\$7.1 million). At a funding gap of 78.6%, the outstanding maintenance need is valued at MWK 4,098 million (\$5.5 million) annually.

5.4 Results

The results indicate that the intervention would cost 36,769 million at an 8% discount rate. Ensuring continuous maintenance would yield benefits of MWK 192,097 million in terms of avoided reconstruction and avoided deterioration in benefits from upgrading the road in the first place. The BCR is 5.2. This provides a strong case for ensuring adequate budget for continual maintenance once the road once is built.

Table 5: Summary of results of ensuring continued maintenance on 1407km of road, 2023 to 2026

| Discount Rate | Costs, MWK millions | Benefits, MWK millions | BCR |
|---------------|---------------------|------------------------|-----|
| 5% | 42,953 | 236,244 | 5.5 |
| 8% | 36,796 | 192,097 | 5.2 |
| 14% | 28,277 | 133,377 | 4.7 |

6. Conclusion

Tourism is a non-trivial contributor to Malawi's GDP, and sub-optimal capacity utilization of tourism infrastructure indicates that there is opportunity for growth. The tourism industry has a definitive multiplier effect on the wider economy: it requires accommodation, arts and entertainment, food and beverages, textiles and furniture, specialized labour, security, among other things.

One of the main barriers to increasing its share of regional tourism receipts are its comparably high transport costs. Besides increasing the cost of travel, the amount of time that international travelers spend in transit from and between tourist sites is significant.

The intervention proposed to reduce two drivers of transport costs (vehicle operating costs and traveler time) and, presumably to increase tourism revenues, was the upgrading of routes around strategic tourist sites, totaling 1407 kilometers. The benefits include a level increase in tourism revenue, road user time savings, a reduction in vehicle operating costs, and consumer surplus from induced demand. The costs include the direct costs of bituminization, periodic maintenance and cost overruns stemming from delays. The benefit-cost ratio is 2.8.

While tourism is a function of a host of other factors (e.g. marketing efforts, weather patterns, among others), the analysis isolates the contribution of road infrastructure in the tourism sector and demonstrates the inverse relationship between the cost of travel and international arrivals.

Reconstruction of paved roads becomes necessary when periodic maintenance and rehabilitation activities are neglected. Sub-optimal allocations to the road maintenance fund have resulted in gradual declines in road quality, necessitating the complete reconstruction of roads. The costs of regular maintenance of the newly asphalted 1407 kilometers of road were compared to the benefits of avoided future reconstruction costs and deterioration in benefits. The benefit-cost ratio is 5.2.

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