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At the end of the feeder road: Upgrading rural footpaths to motorcycle taxi-accessible tracks in Liberia[☆]

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ABSTRACT

Access to transport is essential for agrarian development in isolated rural areas. Over the last 20 years, most countries in Sub-Saharan Africa have seen a dramatic change in farm-to-market transport following the introduction and spread of motorcycle taxis. So far, this has been a spontaneous and market-driven phenomenon. What kind of infrastructure development is needed to further support this local revolution in farm transport? Our study uses a technographic frame to describe and assess the socio-economic and technical impact of upgrading inter-village footpaths to render them usable by motorcycle taxis in off-road rural northern Liberia. We gathered pre-intervention baseline data and post-intervention impact data over a three-year period in villages benefitting from the intervention and in control villages. The quantitative data were supplemented with qualitative data gathered prior, during and after the intervention. We found that upgrading rural footpaths to motorcycle taxi-accessible tracks promotes market integration, improves access to education and health facilities, and creates jobs for rural youth, with few negative consequences. Since most motorised transport in deep rural areas takes place by motorcycle taxi in any case, track construction can complement or serve as an alternative to expensive feeder road improvement or construction.

1. Low surplus agricultural production and low transport infrastructure investments: a catch 22 situation?

The proportion of the world's population in extreme poverty is currently estimated at 10 %, down from 36 % in 1990, with four-fifths of those 736 million people living in South Asia and Sub-Saharan Africa (SSA) (UNDP, 2019). Chronic poverty is often concentrated spatially, as shown by most national household survey data, in more remote, weakly integrated or conflict-affected areas (Bird et al., 2010). These so-called 'spatial poverty traps' are often characterised by location-specific factors, such as poor agro-ecology, weak institutions/organisations, political isolation, and poor infrastructure (Bird et al., 2010).

The time and distance of travel to and from remote rural areas on non-existent or poor quality roads reduces demand for and access to goods and services, limits the use of markets, and reduces organisational development, especially the capacity to attract and retain quality staff

(Bird et al., 2002). Transportation costs in moving agricultural produce from farm to market is a significant – but not the only – element in peasant farmers' decisions on the extent to which they produce for the market economy (Bird et al., 2002).

In off-road areas, much of the transport burden of moving crops to market falls to women and children, who take on the time-consuming task of carrying produce to the roadside as a headload. Each load can weigh as much as 40 kg, depending on type and distance (Porter, 1997). The provision of sufficient local rural infrastructure should be an important concern for governments and donors, as it not only allows semi-subsistence farmers to increase productivity and to participate more in markets, but also improves access to essential services including schools and (maternal) health facilities.

However, it can be difficult to justify budgetary allocations for the construction and maintenance of rural roads (Bird et al., 2002). While urban and inter-urban roads serve the high transport demand within and

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between towns, rural roads are nearly always low volume/demand, resulting in unfavourable cost-benefit analyses (Starkey et al., 2017). This represents a classic Catch 22 situation: even though farmers may be willing to produce more for markets, better road infrastructure is a pre-condition for this, but this is not forthcoming in the light of the small volumes actually traded.

In Liberia – the focus of this study – just 60 % of the country's classified network is in good to fair condition, compared to 80–86 % in benchmark countries (African Development Bank, 2013). Large sections of the road network have not received any rehabilitation work since the end of the civil war in 2003 (African Development Bank, 2013). Two million people, out of a total population of 5 million, live in rural communities which are “off-road”, meaning they are not connected to the road network by anything more than footpaths (Starkey et al., 2017). The challenge faced by the Liberian government and its donors is not only to rehabilitate and maintain its existing road network, but to extend coverage to the nation's many isolated communities. However, if current road rehabilitation efforts and budget allocations are any indication, this could take many decades to achieve (Jenkins and Peters, 2016).

But perhaps the recent spontaneous and market-driven introduction and rapid spread of the motorcycle taxi across rural SSA can help to break this Catch 22 situation? Given the now pivotal role of the motorcycle taxi in providing access to markets and essential services to millions of rural Africans, a re-examination of what constitutes the most appropriate and cost-effective form of remote rural road infrastructure is required.

In 2016, we hypothesised that upgrading existing farmstead to village to roadhead footpaths to motorcycle-accessible tracks would be a cost-effective intervention, as compared to feeder road rehabilitation or construction, in order to allow farmers interested in expanding their marketable crop production to do so (Jenkins and Peters, 2016). While such an infrastructural intervention seems a straightforward one – and not particularly novel in Asia – there were, to our knowledge, no purposively upgraded tracks for the quickly expanding rural motorcycle taxi sector in SSA, let alone any data available on the socioeconomic impact of such interventions within the region. Below, we present the findings of a three-year study (2015–2018) assessing the impact of two clusters of footpaths upgraded to tracks in rural northern Liberia.

2. The rise of motorcycle taxis in sub-Saharan Africa

Conventional vehicles, for example shared car taxis and minibuses, have long been in wide use in SSA, but are necessarily confined to roads. The most dramatic recent change in rural transport services for the many off-road communities has been the expansion of motorcycle taxi services (Porter, 2013).

Motorcycle taxis have spread rapidly across the African continent over the last 20 years or so (Starkey, 2016). A recent (2018) transport diagnostic study conducted in Liberia's neighbour Sierra Leone found that between 60 % and 95 % of transport of people and goods in rural areas now takes place by motorcycle taxi (Mustapha et al., 2017). This study looked at unpaved rural roads readily accessible to conventional modes of transport, so these percentages are likely to be even higher (approaching 100 %) for off-road communities. In the most remote rural areas motorcycle taxis may be the only mode of motorised transport available (Ehebrecht et al., 2018). Porter (2013) describes the expansion of motorcycle taxi services as the most dramatic development in rural transport services since the introduction of motorised vehicles in the early 20th century, since for the first time, many rural dwellers – even the very poor – are able to summon transport whenever they need it. It is important to stress that this ‘revolution’ in rural mobility has been a purely market-driven development, made possible through the availability of cheap Indian and Chinese made motorcycles, rather than the result of government or donor development interventions.

In Sierra Leone, motorcycle taxis filled the gap left by the widespread

war-induced destruction or looting of more conventional modes of public transport. The motorcycle taxis first appeared in the capital city and the main regional towns before spreading to rural areas (Peters, 2007). In Liberia, the rapid upward trajectory in the use of motorcycle taxis in the post-war period mirrors that of neighbouring Sierra Leone. In both countries, the early entrants to the new motorcycle taxi profession were ex-combatants from all armed factions who sought to make a living in the larger towns. Menzel (2011) notes that the pull of the motorcycle taxi profession broadened fairly quickly after the immediate post-war period, drawing in new riders who were not ex-combatants, but who simply resorted to the profession due to a lack of other employment opportunities. In 2012, the number of young people working in Liberia as motorcycle taxi riders, or in an auxiliary capacity as mechanics, bike washers, fuel sellers, etc.) was estimated at 500,000 (Czeh et al., 2012).

Motorcycle taxis are highly valued because they depart immediately as the passenger turns up, and run door-to-door (or farm-to-market). In contrast, four-wheeled taxis and minibuses generally do not depart before the vehicle is full and drive on fixed routes, requiring passengers to walk to the nearest road to wait for a vehicle that has room inside for themselves and their produce (Peters, 2007). Motorcycle taxi services are also often well-integrated with mobile phone services wherever these are available, allowing rural dwellers to call motorcycles on demand to a precise pick-up location. This is particularly appreciated for (night-time) medical emergencies. A further benefit is that they are able to travel to places that conventional four-wheeled taxis and minibuses cannot, including along some footpaths to remote settlements, and along unpaved roads during the height of the rainy season. The motorcycle taxi's price per kilometre is generally 1.5–2 times higher than the per person cost of a shared car taxi or minibus (Mustapha et al., 2017). However, their popularity – even in locations where conventional means of public transport do operate – shows that rural dwellers are willing to pay this premium. It seems that motorcycle taxis have – at least partly – broken through our vicious Catch-22 cycle. Due to the market-driven introduction of a new mode of transport – with a much smaller passenger and freight payload capacity – access to markets has significantly improved without the need to wait for the prior and expensive up-grade of road infrastructure.

3. Expanding rural motorcycle taxis' reach: a footpath-to-Track upgrading intervention

53 % of Liberia's population live in villages and small towns in rural areas, with almost 10,000 villages (home to two million people) connected to the road network solely by footpaths (Starkey et al., 2017). Of these 10,000 villages, 3000 are situated further than 2 km from a road with motor traffic (Starkey et al., 2017). While motorcycles fare much better than car taxis on un-surfaced roads, they are nevertheless unable to reach most off-road villages. Footpaths connecting farmsteads to villages and villages to roadheads, tend to be narrow and can become very muddy during the rainy season. Motorcycles generally cannot cross deep or wide water crossings. Even if there is a bridge, these tend to be locally made stick or log-bridges which are too fragile or dangerous to be crossed by a motorcycle. Steep gradients, stones and boulders or even a fallen tree across the footpath, all make it impossible for motorcycles to reach off road villages. With no access to motorised transport, those who live in off-road rural communities are forced to transport agricultural produce as a head-load to a place where they can secure motorised transport. The level of cash income is therefore limited by the amount of produce that can be carried on the head, even if producers are able to increase their level of production. Insufficient transport infrastructure also limits the access of the rural poor to essential services such as primary healthcare, including difficulties experienced by community health workers trying to reach remote villages. This became clear in the 2014/15 Ebola Virus Disease outbreak during which more than 11,000 people in Liberia, Sierra Leone and Guinea lost their lives.

While the need for better transport infrastructure is obvious, the

problem faced by governments of LICs, including the Government of Liberia, is in financing infrastructure projects. Liberia's Ministry of Public Works (MPW) is responsible for overseeing the rehabilitation and construction of roads and requires all roads to be built to the ministry's strict international standards. As a result, infrastructure projects come at considerable cost. For example, a feeder road rehabilitated to MPW standards must be five metres wide, with water crossings that can accommodate cars, minibuses and trucks, and as a result costs approximately USD \$50,000 per kilometre (Jenkins and Peters, 2016).

However, with the market-driven spread of rural motorcycle taxis there may be a cheaper and quicker opportunity to connect off road communities to the main road network and to facilities and services often located in more urban areas.

Upgrading existing footpaths, which make up a significant portion of the transport chain, does not require oversight by MPW because they are located on "customary land", and are therefore free to be built to any specifications that local communities see fit. These 'footpaths upgraded to motorcycle tracks' can be approximately 2-metres wide, with simple engineered timber bridges, and built using community labour and local materials. Costs are estimated to be between 10 and 15 times cheaper than feeder road rehabilitation, meaning that for each kilometre of feeder road, 10–15 km of tracks could be constructed (Jenkins and Peters, 2016).¹ Moreover, because of its heavy use of local labour and materials, most of the expenditure stays within the community. This, we hypothesised, would allow villagers to invest in cash-crop production or to initiate petty trading activities, with the knowledge that community access will significantly improve after the completion of the tracks (Fig. 1).

An 'upgrading footpaths to tracks' pilot project took place in Nimba County, Liberia, from November 2016 to April 2017 (Figs. 2 and 3). This rural region is traversed by Liberia's main (but unpaved) north-south primary road. Relatively few interior villages, however, are connected to this road by feeder roads. The project was funded by GIZ's (Deutsche Gesellschaft für Internationale Zusammenarbeit) Ebola Recovery Fund and implemented by an international non-governmental organisation, Global Communities (GC).

The GIZ/GC project aims were to improve socioeconomic development (including access to health), facilitate rural transformation and allow for livelihood diversification through the use of local labour and materials in the track construction process, and by involving groups not traditionally involved in village decision making processes – including women and youth – in track planning, design, implementation, and maintenance (Jenkins and Peters, 2016).

4. Methodology and methods: assessing the impact of motorcycle taxi tracks in Nimba county

Our three year (2015–18) study, funded by the UK Economic and Social Research Council (ESRC) and the UK Department for International Development (DfID), was fitted around this track upgrading initiative. Beginning field work in 2015 we were able to assess conditions prior to, during and immediately after completion of the track improvement initiative. We aimed to assess what impact motorcycle-navigable track construction has had in terms of providing better access to markets for semi-subsistence farmers and access to essential services, including healthcare and education, for villagers. The study also considered potential negative aspects associated with improved access, such as traffic accidents and illicit logging activities.

Following a scoping and mapping exercise by our Liberian research partners, Lofa Integrated Development Association (LIDA), in late 2015, we were able to identify three research areas that were somewhat similar in population numbers, income-generating activities, and proximity to a regional market centre, Saclepea. We are grateful to GIZ for

allowing us to select – based on this basic socio-economic and geographical mapping exercise – two of these village clusters for the track intervention. The selection of these clusters was communicated back to GIZ and Global Communities who then started planning for the track construction for the 2016/17 dry season. The first research area – the 'Gogein treatment cluster' – witnessed the upgrading of a network of footpaths leading from a larger village (Gogein) on the primary road to a number of smaller villages in the forest. The second research area – the 'Keinpea treatment cluster' – also benefitted from upgrading of footpaths running from a larger village (Keinpea) on a feeder road, to a set of more isolated forest communities. A third study area was selected as a control – the 'Kpaytuo control cluster' – since it did not benefit from track upgrading.

As researchers, we were fortunate to have found a donor (GIZ) willing to accommodate our research interests by committing to our suggested 'treatment' clusters and by harmonising timelines, allowing us to collect baseline data prior to the commencement of track construction. Given that GIZ's track upgrading budget only covered 25kms, this allowed us to achieve as much similarity between the intervention and control village clusters as possible and – given our limited research budget – to take a targeted approach in our baseline data collection. Beyond the selection of the interventions, the researchers were not involved in the actual (management and coordination of) track construction, which was overseen by Global Communities.

The study employed a mixed-methods approach to data collection, making use of both quantitative and qualitative methods. A baseline household survey (n = 207) was conducted in the three research areas in April 2016. This survey explored the modes of transport used in accessing markets and essential services, and the relationship between an increased ability to use motorised transport on agricultural decision-making processes, primarily in relation to farm sizes. On the qualitative side, focus group and personal interviews were conducted in order to gather information on changing travel practices, and to assess what effects these have on access to markets and essential services.

In April 2017, while track construction was coming to an end, motorcycle taxi rider and passenger surveys were conducted at the roadside in three areas located along the Saclepea-Tapeta road corridor. These surveys were part of a closely related ReCAP/DFID funded study assessing opportunities for gender mainstreaming in the motorcycle taxi sector in rural Liberia and Sierra Leone (Jenkins et al., 2020a). Study areas were chosen which each had different levels of accessibility for motorised transport services for different lengths of time. In the Doumpa area, motorcycle taxi access had been possible for over 10 years and vehicles operated on a daily basis. Four-wheeled taxis/pick-up trucks also visited the area during market days. In the Zehplay area, like in the Doumpa area, motorcycle access had been possible for over 10 years and motorcycle taxis operated in the community on a daily basis, but four-wheeled taxis/pick-up trucks visited the area only infrequently (typically once every few weeks). In the Gogein track network cluster, motorcycle access had only very recently become possible, and four-wheeled access was not possible. In total, 70 roadside rider surveys and 79 motorcycle taxi passenger surveys were conducted.

While analysing the quantitative and qualitative data we realised that we had predominately (and perhaps overly) focused on assessing and establishing the socio-economic impact of the footpath to track intervention, while paying insufficient attention to the actual activity of track construction, for example how groups involved in this activity organised themselves, and how the various stakeholders involved negotiated roles and responsibilities. This is a common mistake with evaluation/impact studies, which focus mainly on measuring the outcomes of the intervention (project or programmes) but pay less attention to the implementation phase, even though this is likely to have a significant impact on the overall outcomes. To address this oversight, we applied a technographic framework to organise and present the findings on construction.

The word technography is derived from the much better-known term

¹ Costs of improving/upgrading or rehabilitating existing feeder roads.

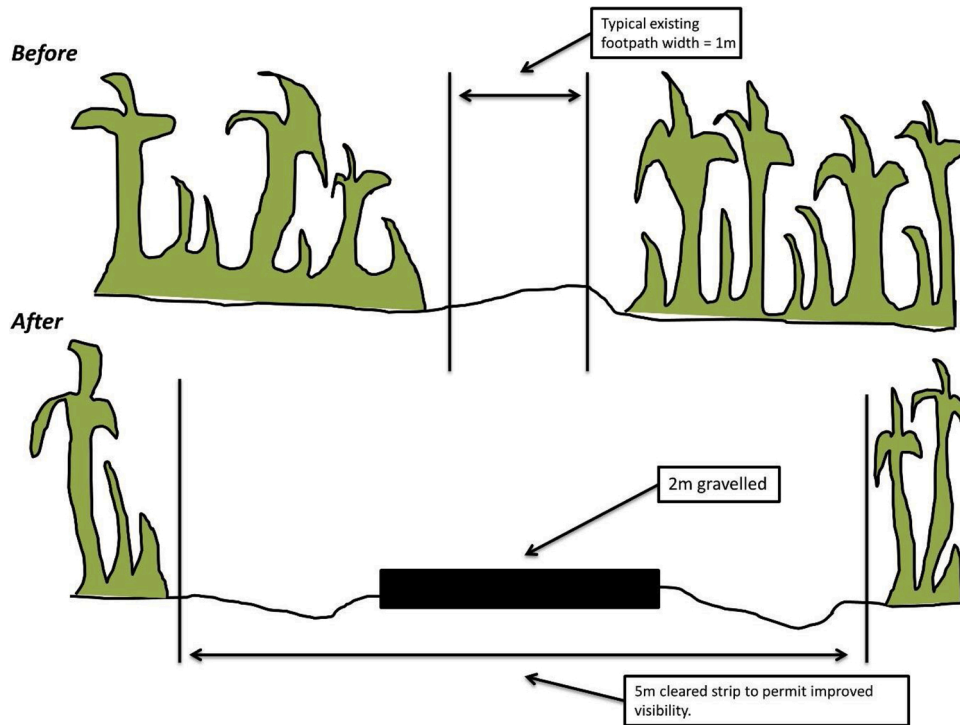


Fig. 1. Illustration of footpaths prior to the intervention and tracks once upgrading is complete (Jenkins and Peters, 2016).

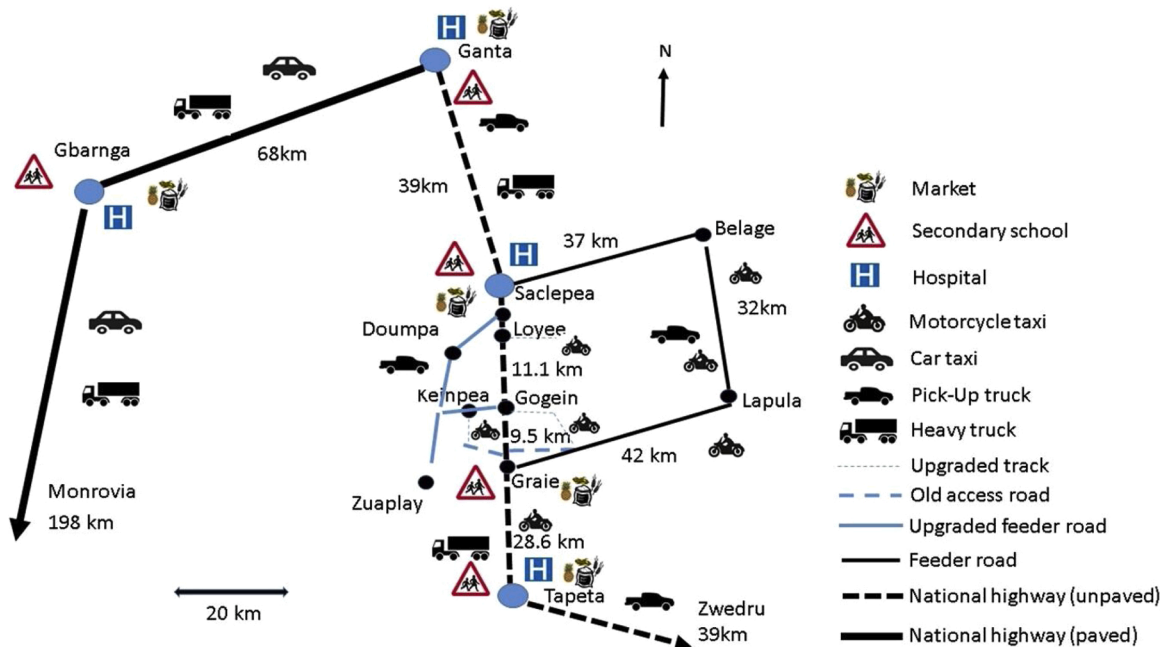


Fig. 2. Ganta-Tapeta Road Corridor.

ethnography, generally defined as an observation-based method for inferring social processes from detailed description of social interactions (Jansen and Vellema, 2010). Technography tries to extend this approach to interactions between technical and social processes, using a fourfold scheme to capture interaction effects at various levels, namely 1) tasks; 2) task groups; 3) professional organization; and 4) community impacts (Richards, 2001). Motorcycle taxi tracks are new kinds of socio-technical assemblages. The task addresses how footpaths are improved, e.g. by opening up sight lines, reducing obstacles such as ruts and potholes, and building motorcycle bridges. Under the heading of

task groups attention is paid to organizational aspects, such as the role of community and/or motorcycle rider groups, or the supervisory part played by civil engineers. Relevant professional levels of mobilization include village organizations for communal work, motorcycle taxi rider unions, local contractors and non-government development agencies. At the community level, technography pays attention the role of improved tracks in creating social goods, and the establishment and maintenance of (public) authority over tracks, including track repairs and safety issues.

Our focus below (for reasons of space) is mainly on level 4:

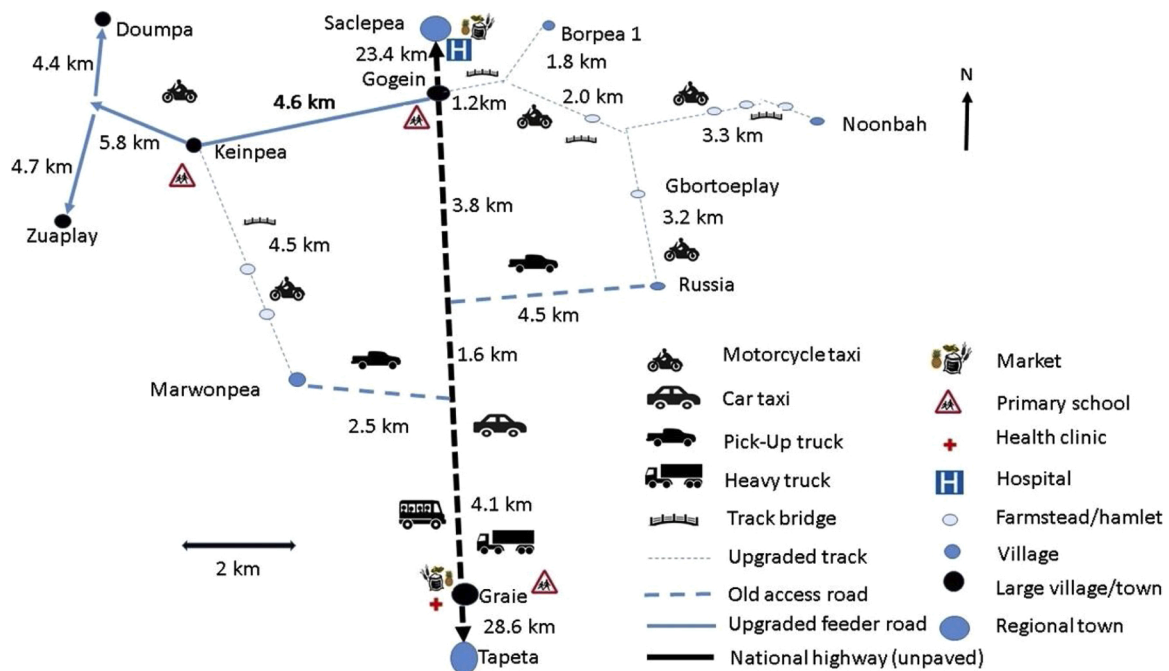


Fig. 3. Map of Treatment Areas Showing Upgraded Tracks.

‘community impacts’, but we also sift through our data to highlight some insights and findings relevant to the other levels. The data presented below concerning the first three levels should be seen as introductory. They provide a starting point for more detailed technographic observations we hope can be published elsewhere.

5. Results of the study

5.1. Level 1: tasks

The selection of footpaths receiving the treatment was driven by a research agenda, rather than by a national development agenda/policy. We recognise that this is quite exceptional and that normal procedures involve more – and different – stakeholders (including communities) and ideally the use of multi-criteria and participatory selection tools. However, once the treatment clusters were selected, the following (somewhat simplified) steps were taken, covering the task of track construction: (1) side brushing along existing footpaths²; (2) de-stumping and removal of small rocks; (3) digging side-drainage channels and dumping the excavated soil on the tracks; (4) bringing in gravel with a wheelbarrow to create a better surface for potential slippery/muddy sections; (5) compacting the layers with a motorized compactor and: (6) constructing the bridges. Log bridges were constructed over streams and woven mats and sticks held banks in place, with the occasional small through-let used to cross boggy areas. Workers used their own cutlasses and hoes, but Global Communities provided a chainsaw, shovels, wheelbarrows and the iron rods that were used as nails for the bridges.

The task of upgrading footpaths to tracks is one that can be done at relatively low-cost, using local labour and materials. While both locally-constructed bridges like the one shown in Fig. 4 and the type of motorcycle bridges constructed as part of footpath-to-track upgrading (Fig. 5) are constructed using locally available materials, the major



Fig. 4. A local guide crosses a footpath bridge, almost impassable for a motorcycle.

² While the tracks mostly followed the existing footpaths, at times, when sections of the footpaths were particularly winding, a more straightened course had to be plotted. This involved discussions with (and possible compensation for) landowners adjacent to the new track section.

difference is in the level of engineering sophistication. As Johannessen (2008) explains, “Building good quality rural roads is a particular skill in itself, requiring proper planning, experienced supervision, good workmanship and the selection of the correct technology and work methods”. For these reasons, it is important that track upgrading is properly



Fig. 5. Newly-Constructed 'Engineered Timber Bridge' in the Gogein Study Area.

designed, planned, and overseen by skilled engineers who can formulate the solutions necessary for individual problems. No area is the same and different water crossings, for example, may require different types of bridges.

Rural motorcycle taxi operators (and aspirant riders) – always young men – were heavily involved in the footpath to track upgrading work. Obviously, they are a key beneficiary of the upgraded tracks. Prior to track construction, motorcycle taxi riders explained in focus group discussions how improved access could impact the task of motorcycle taxi riding:

If the footpaths were upgraded to allow bikes to go [to villages], we would not just go from towns to market but from villages to market too, so we would get higher fares and make more money.

A motorcycle taxi operator in the Kpaytuo focus group explained the consequences of more income:

Riders in work and pay [hire-purchase] agreements would be able to pay [back] the money more quickly. If they could pay the money more quickly, the bike would be in better condition when they [take ownership], so maintenance costs would not be as high.

This, in turn, according to the participants should lead to more employment opportunities in the MCT profession:

The owner would get his money [more quickly]. They would give more people bikes because they would be able to get more money.

Roadside rider surveys showed that the majority of motorcycles being operated in rural areas of Liberia are relatively cheap motorcycles imported from India and China. By far the most common (60 %) motorcycle encountered was the 'Star' model manufactured by the Indian company TVS. In many rural towns located along the primary Ganta-Tapeta road corridor, different motorcycle taxi related services such as bike repair and bike-washing, and a wide variety of items required to keep motorcycles roadworthy such as spare parts for popular motorcycle models and motor oil, are commonly available and provide auxiliary jobs for young men (and increasingly women).

While there is a growing body of research concerning (the task of) rural motorcycle taxi riding, as discussed above, more 'technographic' research is needed to better understand the task of track construction. A number of questions require additional research in order to develop more thought-through interventions. These questions concern the extent to which the various tasks listed above are similar or different from common farming tasks (do farmers already have the appropriate and necessary skills and knowledge for footpath to track upgrading?), the extent to which common farming tools can be used in track construction, whether new or specific tools and equipment have been introduced, whether workers have the technical knowledge to work with newly introduced equipment, and whether there is a noticeable gender divide in the division and execution of tasks.

With regard to track construction tasks and gender, the following extract from an interview with a middle-aged widow living in the Gogein cluster provides some relevant insights:

I have worked for 11 days on the first [track] bridge; 9 days on the second bridge and 10 days on the third bridge, plus another 15 days on the track construction. I definitely know how to build and maintain these bridges in the future. You can learn all you need to know in about a week. I would really like to build on my experiences by doing other jobs in construction. This bridge construction made me understand that in any technical job, women can do as good a job as men. Yes, they tend to give these jobs to men because men are stronger, but I just kept asking and in the end they gave in [and allowed me on the bridge-team]. Some of the other women even laughed at me, wondering if I am a 'man-woman'. Really, women could build such a bridge all by themselves. That is what I believe. We can even operate a power-saw.

5.2. Level 2: task groups

Besides the inhabitants of the villages benefitting from footpath to track upgrading, rural motorcycle taxi riders are key beneficiaries of the intervention and have been observed by the authors as taking an active role in maintaining tracks or feeder roads. Given this important role – including the contribution of motorcycle taxi riders to Gogein and Keinpea track construction – it is important to better understand this group and the nature of their profession.

Commercial motorcycle taxi riding in Liberia is a skilled task, especially on rural roads. The rider often carries more than one passenger and heavy additional loads. Securing loads on the machine requires considerable ingenuity in the use of fastening materials, typically strong rubber ropes cut from old tyres. Transport of (for example) a goat or a bundle of zinc roofing material requires the passenger to cooperate by cradling the goat or by carrying the load in such a way that it does not become entangled with pedestrians or passing vegetation. The rider is meanwhile involved in keeping the moving machine in balance over alternately rocky and boggy sections of track, or while crossing perilous log "bridges" (Fig. 4, above). Typically, rural riders learn the basics from friends or brothers who already have motorcycles. Thereafter the skill of navigating roads is picked up "on the job".

These skills are widely admired, and passengers in our surveys were quick to praise the rider able to avoid muddy skids or uncontrolled detours into the bush. In rural areas, regular riders are few, and well known to the villagers living along the track. The reputations of the more clumsy or incautious riders precede them. Villagers, as became evident from our focus group discussions, are not slow to voice criticism where the safety of their persons or loads is concerned. Our passenger surveys conducted in Doumpa, Zehplay and Gogein showed that the majority of the interviewees blamed the riders for going too fast 'to maximise the number of fares', that is, the number of clients they serve in a day. But somewhat contradictorily, during the focus group discussions it was acknowledged, on more than a few occasions, that passengers sometimes urge riders to move faster. Serious spills are relatively rare on rural roads. When asked to comment on the accident risks, both riders and passengers will point out that speeds on rural roads are necessarily slow. But minor injuries from tumbles are common. Bush thorns can cut and tear the unwary limb, while a motorcycle spill often results in minor grazes (from a gravelly road) and burns (from an overheated exhaust).

Riders have favoured pick-up points where they wait for clients as a group, under shade trees in the dry season, or close to a community meeting place or shop where they can take refuge from the rain. These places often have roughly constructed bamboo or rattan seats or benches, and tables where minor items are traded. Mechanics carrying out repairs cluster around these sites in larger end-of-line villages, and local gossip is exchanged. If there is cell-phone signal coverage riders are

somewhat freer to return to their own premises between trips, but many will gravitate back to the recognised motorcycle tree or shed for companionship during down time, or to get something fixed on the machine, while waiting for phone calls requesting a ride. The Gogoin motorcycle taxi riders' 'hangout' ticked all the above boxes. There is considerable camaraderie and informal cooperation among the riders. Whether a break-down in the bush or a repair while waiting for clients, it is common to see riders jointly trying to fix things.

Upgrading a substantial length of footpath to a motorcycle accessible track needs the collective labour power of all communities served along the upgraded track. The work is too much for a handful of riders. For the tracks constructed in the treatment clusters, Global Communities' resident engineer demarcated sections of around 100 m. Completing such a section with whatever task required (brushing, de-stumping, digging drainage channels, etc.) would take one person approximately a day and would earn him or her US \$3.50. According to a community mobiliser:

Once a section was allocated, we did not mind if it was just that person or if more persons worked on it. People were paid for the section so if more worked on one particular section they had to divide the money. (...) Some people turned up in the morning but all sections for that day were already given out, so they were put on a list so that they could work the next day. (...) I think more women than men worked on the tracks, including some widows. Children worked on it too, so they could pay their school fees. The women were particularly good at digging the drainage channels because you do that by hoe and women use the hoe a lot in the field.

Both Liberia and Sierra Leone have a somewhat uncomfortable history with 'voluntary' community labour – considered by some to be a root cause or grievance for the civil wars, given that it required the 'voluntary' contributions of the most marginalised rural poor while the product of the labour often benefitted the rural elites (Richards, 1996; Peters, 2011). For sure, expecting small, isolated and extremely poor communities to contribute their scarce labour and materials free of costs under the guise of community-driven development would be a rather cynical understanding of development.

While the construction of the motorcycle taxi bridges required a number of workers to work together as a group, Global Communities opted for a more individual approach for the construction of the tracks, through a section allocation set-up. Further technographic observation would help to better understand the advantages and disadvantages of these two approaches. Furthermore, a key issue of interest in technographic research would be to assess to what extent rural motorcycle taxi riders could gain task (track construction) related knowledge and then oversee (the implementation of) track construction in other places, almost like a 'roving' task force. One thing we have discovered is that riders take a close interest in track construction, and in some instances are willing to take the lead in organising repairs.

5.3. Level 3: professional organization

Following GIZ's willingness to fund the 'upgrading' pilot project, to improve rural livelihoods and access to essential services, we hoped that the implementing partner could be Cardno Emerging Markets. Cardno – at the time – was overseeing the rehabilitation of feeder roads in this part of Liberia as part of the USAID Feed the Future programme. However, Cardno did not qualify for the GIZ's Ebola Recovery funds, being a for-profit company. As a result, the track project missed out on contributions from qualified and experienced rural road engineers but also in integrating the concept within the framework of the government's and international donors' rural access policy. Fortunately, GIZ found the NGO Global Communities to be an interested and eligible implementing partner. Although Global Communities did not have any experience (in Liberia) in rural access, it had run Water, Sanitation and Hygiene (WASH) programmes in the Nimba area (including Gogoin) during and after the Ebola epidemic. Therefore, it was well established and trusted

by the various communities and had a network of 'community champions', from which the local labour and local materials-based track construction intervention benefitted. The authors have previously drawn attention to the suitability of track construction for the involvement of beneficiary communities in the decision making process (Jenkins and Peters, 2016). The pilot project used a community-driven development (CDD) approach, which gives communities direct control over key project decisions. CDD approaches are increasingly used in development interventions, having been applied by bilateral donors to support local public goods provision in a diverse range of areas, including infrastructure, agriculture, health care, and education (Fearon et al., 2008). As Fearon et al. (2008) explain, CDD is regarded as a mechanism by which development can be made more inclusive, and by which the poor can be empowered, governance strengthened, and project effectiveness and sustainability enhanced. The ability of CDD approaches to improve levels of community cohesion in post-conflict communities in states like Liberia has been noted as a valuable by-product of this type of intervention (Fearon et al., 2008).

Community-based organisations (CBOs) were set up by Global Communities and were tasked with holding monthly meetings with community members to provide updates on the progress of the project, and to identify any issues relating to the construction process. As brought up in the focus group discussions, the inclusion of different community groups and the employment of a participatory approach had positive outcomes:

Elders, youths, and women were represented in the decision-making process because it involved the whole community. (...) People feel proud that they were involved in the decision-making process.

The Global Communities Programme Manager responsible for the project also noted a positive impact of track construction on the relationship between community members and local leadership:

Communities now look at development in a different way, and feel that they have ownership of development projects. Before this, the community leadership and the community were not as cohesive.

However, without a detailed understanding of the local socio-political structures, CBOs run the risk of being 'hijacked' by village elites from the outset. Patron-client relations remain a dominant organisational structure in rural Liberia. Motorcycle taxi unions are considered an institutional break with the past, representing a post-war organisation around shared labour interests, based on merit (as a rider or union advocate) rather than patrimonial principles (who you know) (Richards et al., 2004; Peters, 2007). As mentioned, some motorcycle unions have been effective in undertaking collective action, such as bridge building or track repairs, with the latter handled better if it is placed in the hands of the riders who are the first to see the benefit of maintenance.

Given the relative novelty of rural motorcycle taxi riding in SSA, which in turn makes an infrastructural intervention that sits between footpath and feeder road, as here assessed, a logical and justifiable choice (for a pilot project), it is understandable that, as yet, no 'best practice' has been defined as far as the organisation of footpath to track upgrading is concerned. A technographic account of future interventions, paying particular attention to the different stakeholders, how these interact, according to which rules (and how these are formulated), how risks are managed and disputes resolved, etc. would help to formulate a (context-specific) set of 'best practices' in footpath to track construction.

5.4. Level 4: community impacts

5.4.1. Improved access to markets

A key benefit of the lower degree of engineering sophistication is that footpath-to-track upgrades can be done with local labour and materials.

Labour and materials can be purchased from the community, ensuring that as much of the infrastructure fund as possible ends up in the community. For example, close to 300 community members were estimated to have worked on the Gogoin track project, inclusive of 175 females and around 240 young people. Workers were paid USD \$3.50 per day worked, which is the minimum wage in Liberia, but a relatively high daily wage in Nimba County. The above cited widow reflects:

I worked for 45 days on the project now and it gives me US\$3.50 each day. (...) I also used the money to hire labour to work on my farm. For the money I get from working on the project [each day], I can hire about 3 labour days of farm work. And these are young and strong men working on my farm as a group. This has allowed me to expand my farm and I know that next year it would be much easier to transport my produce to the market now that motorcycles can reach here with the new track. Before, it was just me head-loading everything, and there is not much you can take on your head. So, women love the [motorcycle taxis] because women often have loads.

Before the track construction intervention, farmers, as the widow quoted above, indicated that they could produce more for markets but struggled to get the extra produce there because of transport limitations. Where farmsteads and villages are connected to the main road network by no more than a footpath, head loading is the only option and there is a limit to what can be carried: *I can't carry all of my produce to market, so some of it spoils.* An older resident in the control cluster said that at his age, he had to rely on labour provided to him by 'middlemen'. These middlemen provide labourers/organise carriers, but in exchange buy the produce at a much lower price than what could be obtained if the producer were to be able to sell the produce at the Saclepea market. The ability for increased transport connectivity brought by the spread of motorcycle taxis to facilitate a move away from village-based mercantilism to one rooted in petty trading was highlighted by the authors in a gendered assessment of the spread of motorcycle taxis in rural Sierra Leone (Jenkins et al., 2020b).

Motorcycle taxis can carry surprisingly large volumes of produce and are able to transport it quickly: When we have to walk to Gogoin we can take 2 or 3 plantain heads and it is about an hour and a half one way [but] the motorbike can take 25 plantain easily. As shown in Table 1, in the two treatment clusters 'walking and head loading' to access markets dropped from 96 % to 17 % (Gogoin treatment cluster) and from 100 % to 62 % (Keinpea treatment cluster) following the intervention, because of producers and traders now being able to use motorcycle taxis from their points of origin. Note that one part of the journey – from Gogoin to the Saclepea market or from Keinpea to the Graie market – is always undertaken by car or motorcycle taxi, as these distances are respectively 23.4 km and 14 km. This explains why the villagers living along the footpaths in 2016 (before track construction) indicated that they reached local markets using a mix of walking and motorised transport.

Traffic counts conducted in the treatment areas one year after the completion of tracks (see Table 2) back up this finding, showing that motorcycle taxis are now well used in the areas where motorised transportation was not possible before. Traffic counts on the Keinpea village cluster track showed 24 motorcycles passing on a non-market day and 39 on a market day. This represents more than 9500 motorcycle taxi movements per year. The Gogoin village cluster track, terminating at a small village deep in the forest, saw over 5300 motorcycle taxis movements on an annual basis. These are significant numbers given the relatively small populations living in these village clusters (approximately 2500 people live across the two clusters with the roadside villages of Gogoin and Keinpea being the largest settlements) and the fact that they were measured just one year after the intervention. A young motorcycle taxi operator illustrates:

I travel twice a day along the track and I mainly transport loads for farmers and the villagers. Farmers prefer us because it saves them time and energy. They can call my mobile if they need me, even if it is during

the night-time, for emergencies. I started riding a bike when the track was opened.

In the Gogoin treatment cluster, traffic counts recorded a greater number of motorcycle taxis passing the survey point than passengers, indicating that some were carrying loads without any passengers. A farmer along the Gogoin track explained this as follows: *Head loading is heavy work and you can take 25 kg maximum. A bike can take 4 times 50 kg. Some of the riders are based in Gogoin, so we know them well. We use them as couriers so then we can get our things without the need to go all the way to Saclepea.* Other farmers explained how a motorcycle taxi can sometimes make two runs for them on a market day: one to bring a number of bags with produce to the market (where they are left behind with a trusted person for safekeeping) only for the rider to return to pick up the farmer (with an additional one or two bags). It also underscores the finding that informal cooperative business units are set up by motorcycle taxi riders and villagers (typically village women) in areas served by motorcycle taxis (see below).

In the Keinpea treatment cluster, a much greater volume of traffic was recorded than in the Gogoin treatment cluster. Qualitative interviews revealed that this greater use of the track is to a large extent due to its use as a shortcut to the periodic market at Graie.

Travel times were also reduced by 40–50% in the treatment clusters (see Table 3), cutting down journeys by several hours, while no reductions took place in the control village cluster. A female farmer in the Gogoin cluster described this improvement:

Motorbikes can easily carry three times as much as what you can carry on your head, plus yourself. If I had to carry the load that the bike takes in one go on my head, it would take me three days. If it is a small load which I can take on my head, I do it to save money. But for anything bigger I take the motorbike.

The tracks and motorcycle taxis have helped farmers to become more integrated in the market/cash economy and have already facilitated agricultural growth: *We increased the size of our farms because the produce can now be carried by the motorbikes. Before the track was built the produce got spoiled because everything had to be head loaded.* Note that the figures above represent immediate/short term impact, just one year after the tracks were constructed. Farmers typically need several years to change the type and quantity of produce that they grow, and while acknowledging that improved accessibility is not the only factor in a farmer's production choices (mitigating risks, such as those posed by crop failure or volatile market prices, are other factors), a further increase in both motorcycle taxi movements and cash crop production is expected.

5.4.2. Access to health and education

Motorcycle taxi transport has enabled rural dwellers to quickly and relatively conveniently access health services. Prior to the construction of the tracks, the villagers either had to walk when seeking medical attention or be carried by hammock. Table 4 shows the modes of transport used in a journey to a healthcare centre (located in Saclepea and Graie) before and after the construction of tracks.

The improved access to health following track construction was widely praised: Because of the tracks, we don't die of health problems because [motorcycle taxis] can come and take [sick people to health-care]. Pregnant women seem to have benefitted in particular: [Motorcycle taxis] rush pregnant women to the health centre.

Track construction has also improved access to education. In many rural areas in sub-Saharan Africa, school children take motorcycle taxis to and from school, but in rural Liberia this is not common due to financial constraints. However, track construction improved access to education by reducing the transport burden which most heavily falls on the shoulders of women and children in Sub-Saharan Africa (Barwell, 1996).

Table 1
Means of Transport Used to Reach Primary Points of Sale Before and After Track Construction.

	Gogein Treatment Cluster				Keinpea Treatment Cluster				Kpaytuo Control Cluster			
	2016		2018		2016		2018		2016		2018	
	N	% of cases	N	% of cases	N	% of cases	N	% of cases	N	% of cases	N	% of cases
Walking, carrying own load	22	95.7%	4	17.4%	13	100 %	8	61.5%	9	90.0%	9	90.0%
Walking, bearer	4	17.4%	0	0%	3	23.1%	1	7.7%	1	10.0%	3	30.0%
Motorcycle Taxi	7	30.4%	17	73.9%	1	7.7%	6	46.2%	1	10.0%	10	100 %
Car Taxi	9	39.1%	4	17.4%	0	0%	0	0%	8	80.0%	4	40.0%

Table 2
Traffic Counts along both Tracks on Market and Non-Market Days in 2018.

	Non-Market Day		Market Day	
	Motorcycles	Passengers	Motorcycles	Passengers
Gogein (A)	18	15	14	15
Keinpea (B)	24	49	39	76

We spend 2 to 3 days transporting our produce to Keinpea, depending on the amount that needs to be transported. Most people have their children to help them. On the days when children help to carry produce, they can't go to school, but we have [no other option but to] have our children help us, because if we can't sell enough produce at market, we won't make enough money to pay their school fees.

In qualitative interviews conducted one year after track construction, teachers in Keinpea noted an increase in school attendance since the completion of the tracks:

Before the track was made, there were hardly any children in school on a Monday because they were all busy helping their parents to get the produce from the farms to the road side, to get it picked up for the Graie market ... [but now] the kids just help to get some of the produce to the track-side and then go to school because the motorbike will now pick up the load. We have full class rooms on Mondays now!

Improved access also makes rural areas more attractive for government personnel, such as rural nurses and teachers, to settle down and work, as explained during a group interview with rural teachers who hoped that track construction would be expanded to the areas in which they live:

We can tell you that if the track would be expanded to other villages it would be helpful for some of us teachers, because we come from different villages. Now some of us stay at the school during the weekday and go back for the weekend, but we can get worried if we have to leave our family behind for the week. But with a track, we could take a motorbike and travel up and down the same day.

The importance of access and mobility in attracting health workers is underscored by a 2010 World Bank Health, Nutrition and Population Discussion Paper, which found that (free) transportation was valued more by rural nurses and certified midwives in Liberia than pay, location, housing or workload (Vujicic et al., 2010). Tracks would allow health-workers to visit deep rural areas/villages in case of emergencies, travelling at the back of a motorcycle taxi or riding a motorcycle themselves.

5.5. Gender

Women are major beneficiaries of track construction and motorcycle taxis, as head loading is often a task done by women (and girls). Our 2017 gender study referred to above showed that the majority of motorcycle taxi passengers are women, particularly on market days (Table 5).

Women can now travel to local markets more conveniently, more quickly, and with larger quantities of produce. Furthermore, in those communities served by motorcycle taxis, more women are involved in (part-time) petty-trading, using the motorcycle taxi as a courier service for bringing in consumer items normally found only in urban centres: *The riders have helped us greatly because [we] can just send them to town to buy all the goods we need in town.* They even use the motorcycle operators as short-term money lenders, bypassing the traditional middleman or village trader: *The riders even loan us if [we] are without money at a*

Table 3
Total time taken to reach Primary Points of Sale before and after Track Construction.

	Gogein Treatment Cluster				Keinpea Treatment Cluster				Kpaytuo Control Cluster			
	2016		2018		2016		2018		2016		2018	
	N	% of hh	N	% of hh	N	% of hh	N	% of hh	N	% of hh	N	% of hh
Less than 30 minutes	0	0%	1	4.55%	0	0%	3	23.1%	0	0%	0	0%
30 min. to 1 h	3	13.6%	12	54.5%	1	7.7%	6	46.2%	2	20 %	2	20 %
1 to 2 h	10	45.5%	7	31.8%	9	69.2%	4	30.8%	5	50 %	5	50 %
2-3 hours	5	22.7%	1	4.5%	2	15.4%	0	0%	3	30%	2	20 %
3 to 4 h	2	9.1%	1	4.5%	0	0%	0	0%	0	0%	1	10%
More than 4 h	2	9.1%	0	0%	1	7.7%	0	0%	0	0%	0	0%

Table 4
Type of transport used to access Health Service before and after Track Construction.

	Gogein Treatment Cluster				Keinpea Treatment Cluster				Kpaytuo Control Cluster			
	2016		2018		2016		2018		2016		2018	
	N	% of cases	N	% of cases	N	% of cases	N	% of cases	N	% of cases	N	% of cases
Walking	24	96.0%	9	36.0%	19	100 %	6	31.6%	16	100 %	16	100 %
Motorcycle Taxi	5	20.0%	21	84.0%	2	10.5%	12	63.2%	0	0%	5	31.3%
Car Taxi	4	16.0%	1	4.0%	0	0%	1	5.3%	4	25.0%	2	12.5%

Table 5
Male, Female, and Child Passengers on Market Days and Non-Market Days in areas with Recent and Long-Term Motorcycle Access.

	Market Day in Gogein (Cluster with Recent Motorcycle Access)	Non-Market Day in Gogein	Market Day in Doumpa (Area with Long-Term Motorcycle Access)	Non-Market Day in Doumpa
Passengers	19	25	104	12
Men	7 (36.84 %)	10 (40 %)	28 (26.92 %)	7 (58.33 %)
Women	9 (47.37 %)	10 (40 %)	66 (63.46 %)	3 (25 %)
Children	3 (15.79 %)	5 (20 %)	10 (9.62 %)	1 (26.67 %)

particular time. One question we pursued in the gender mainstreaming study was whether, now that women were actively involved in the decision making and implementation of track construction, they were more likely to take up professions not typically associated with women, perhaps even motorcycle taxi riding themselves. There were lively discussions in both male and female focus groups on whether women should and are suitable to take up motorcycle taxi riding. We could not (yet) however notice a significant change in gender roles (Jenkins et al., 2020a).

5.6. Road safety and environmental damage

The spread of motorcycle taxi transport in sub-Saharan Africa has resulted in a significant increase in the number of road traffic incidents (Bishop and Jinadasa, 2014). This is a key reason why some countries have banned them in urban areas, on highways, and sometimes even in rural areas. Indeed, motorcycle taxis were banned from operating on the main roads in Liberia's capital city, Monrovia, in 2013, despite the apparently pivotal role they played in the city's transport sector.³

However, given that they contribute significantly to socio-economic development and improve access to health, education, and other services, one can ask whether a (universal) ban is actually beneficial, irrespective of whether this can be enforced. Good aggregated data on motorcycle accidents may help to design targeted policy interventions to make riding safer. Since the tracks have been opened, very few if any accidents have taken place, according to the villagers: *Since the track was built there have been no accidents whatsoever; Safety-wise the track is much better than the main road.* There are several reasons for this: (1) motorcycle taxi riders do not have to compete with conventional means of motorised transport for road position on the motorcycle-only tracks; (2) riders operating along the tracks tend to be familiar with the route and conditions, so know where to slow down and where they can go faster; (3) the tracks are in a good condition and can be easily maintained using local labour and materials; and (4) the tracks have been designed for intermediate forms of transport, with sufficient cleared areas on both sides to give room for pedestrians. A motorcycle taxi rider explains:

The main road from Gogein to Saclepea can spoil the bike because it is so muddy. We riders, we prefer the tracks. The tracks, you can ride them at any time of the year and they are safer because there are no potholes. If you have potholes and they are filled with water it becomes very dangerous. For the tracks, it is important that the people brush the sides so that it is safe to ride them because you can see road ahead of you. But I never had an accident while riding on the tracks.

It is well-documented that the opening up of forested areas/primary rainforest by rural roads often leads to increased deforestation by (il) legal logging companies, landless farmers or large agro-businesses (Li

³ This ban resulted in the introduction and explosive growth of the three-wheeler 'auto-rickshaws', known locally as 'Kekeh', which give passengers better protection against the natural elements and possible traffic accidents.

et al., 2015). None of these issues were observed in our treatment village clusters. The tracks were designed in such a way that no vehicles with four or more wheels could enter, mainly because the bridges constructed were too narrow for anything wider than a motorcycle (or motor-tricycle).⁴ The harvesting and transportation of non-timber forest products (NTFPs), including 'bush-meat', could have easily increased along the tracks, even to an unsustainable level, but our data showed that it was the control village cluster rather than the treatment village clusters which actually saw a significant increase in this. A possible explanation for greater harvesting of NTFPs in the control cluster could be that rural dwellers there struggled more to obtain sufficient income from their agricultural activities, given the lack of access for motorised transport in this area.

6. Discussion

More than half of the population in Liberia lives below the poverty line (54.1 %), with a significant urban-rural inequality. Poverty is much more prevalent in the predominantly rural inland northcentral (72 %) and southeastern (79 %) regions than in the capital city, Monrovia (31.6 percent) (Iimi and Rao, 2018). The agricultural sector is of vital importance: it constitutes the primary source of income for roughly 70 % of the population (Peterson, 2016), contributes the most to the nation's export trade (Peterson, 2016), and accounts for 66 % of total value added (Block, 2016). Agricultural activities predominantly take the form of semi-subsistence farming, with individual farm sizes typically being between one and four acres (Peterson, 2016). Productivity in the agricultural sector is low, with limited market access, especially in rural areas (Iimi and Rao, 2018). More generally, in Sub-Saharan Africa, two out of three people live in rural areas, and nearly half of the rural population is "economically active" in agriculture (Block, 2016). Transport infrastructure provides access to markets and services, influences returns to labour and investment, and supports regional integration, communication, and the transmission of ideas and new technology (Bird et al., 2010). It is a major determinant of agricultural productivity growth, with the ability to increase both output per capita and output per unit of land, mainly by reducing transaction costs in input and output markets, and by better integrating markets within sub regions (Gajigo and Lukoma, 2011). Specifically, high transport costs and barriers to movement are constraining factors for semi-subsistence farmers' ability to lift themselves out of poverty by increasing their production for sale at markets, and participating more fully in the cash economy (Bird et al., 2002).

The recent introduction of and explosive growth in motorcycle taxis operating in rural areas offers a unique opportunity here. In a context of high need for improved infrastructure and governments' limited ability to finance this, the incorporation of lower-cost alternative forms of transport infrastructure – specifically motorcycle track construction in low-transport density remote rural areas – was offered as an alternative strategy. Evidence from countries around sub-Saharan Africa show that ensuring a basic level of connectivity – that is, making the road accessible to motorised transport – to the road network is more beneficial to rural communities than upgrading existing rural roads, from a gravel to a paved road for instance (Starkey and Hine, 2014). Footpath-to-track construction requires a lower degree of engineering sophistication than feeder road rehabilitation/construction, and can make use of local

⁴ This was true for the Gogein track but when the primary road between Saclepea and Tapeta became temporarily impassable during the rainy season, drivers of conventional vehicles expanded the simple bridges on the Keinpea track and started to use it. Within a matter of weeks the track – not built for such axle-loads – was heavily damaged. The local communities blamed Global Communities for not putting in a better physical barrier and/or involve the district and county authorities in the intervention process so that the track could be better protected.

labour and materials, providing a short-term cash injection to communities.

Remarkably, there is hardly any data available on the socio-economic impact of rural motorcycle taxi riding, or examples of infrastructural interventions by governments or donors to further promote this sector in rural SSA. This may be because of the relative novelty of the motorcycle taxi in SSA – particularly in rural areas. Another explanation might be that motorcycle taxi riders (in urban areas) are often associated with unruly road behaviour and an increase in accidents. A number of African countries have introduced measures to ban motorcycle taxis from operating in urban areas, on highways, or even across the country (Afukaar et al., 2019). In a socio-political climate where policies remain overwhelmingly aimed at regulating and restricting motorcycle taxis, rather than promoting the practice, it would be unlikely that without clear data on the socioeconomic impact of opening up rural areas to motorcycle taxis, national governments and international donors would become interested in policies along the lines of the proposed ‘footpath to track upgrading’ intervention.

Our research, set-up as a baseline/impact and treatment/control study, found a significant and positive impact on rural lives and livelihoods, with few if any negative effects. Firstly, track construction has allowed producers to use motorised transport from their point of origin, rather than from roadside. Traffic counts showed a rapid uptake of motorcycle transport in treatment areas. While the quantitative data did not (yet) show increased farm sizes resulting from the increased ability of farmers to transport more produce to market – perhaps due to too short an interval between the completion of tracks and the endline study – the qualitative data indicated that rural producers are now beginning to make the decision to increase their agricultural output because of this increased access to markets.

Secondly, the constructed tracks increased the ability for households to access healthcare quickly and more easily, highly praised by the villagers. Track construction also increased access to education by reducing the transport burden which ordinarily falls on the heads and shoulders of women and children in Liberia and other parts of Sub-Saharan Africa.

While female employment in the motorcycle taxi sector remains low – no female commercial motorcycle taxi operators were identified in the study areas despite researchers actively looking for one – the use of motorcycle taxis by rural women is very high. The tracks have improved access to markets for women and the willingness of motorcycle riders to act as couriers for rural women and to supply them with goods (on credit) has allowed rural women to bypass traditional moneylenders and middlemen.

7. Conclusion

This study of motorcycle track construction in northern Liberia – basically a proof of concept study – has shown that ensuring a basic level of access to motorised transport to previously off-road communities through the provision of low-cost, low-volume transport infrastructure can lead to improvements in a number of areas. Considering the great need for a basic level of access to the road network for millions of people in Liberia and other countries in Sub-Saharan Africa, the financial constraints in which governments and donors have to operate, and the unique opportunity offered by the rapid and market-driven spread of motorcycle taxis operating in rural areas, the potential of upgrading footpaths to motorcycle taxi accessible tracks should be recognised by those tasked with bringing socioeconomic development to poor remote rural areas. While our data shows a clear and positive impact, our technographic structuring of the data has laid bare a number of levels/aspects which require further research and understanding. Foremost, it shows that footpath to track upgrading is more than just a simple engineering intervention.

Declaration of Competing Interest

The authors reported no declarations of interest.

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