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Mobilität mit Perspektiven

Access to transport for the base of the pyramid

Measuring the impact of bicycles in Tanzania

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ABSTRACT

This thesis describes the role and impact of bicycles on households in rural Nshamba, Tanzania. A traffic survey conducted by the researcher showed that riding bicycles is the most prominent mode of transport after walking in this area. From survey results, the bicycle's main purpose is to support income generation. Using a bicycle offers various improvements as compared to walking - new businesses are possible, marketing opportunities are expanded, time efficiency is improved and productivity increased. Prices and profits are also positively affected by the reduction of transport-related expenses. The work effort can be passed to the bicycle, reducing the user's physical strain.

The study shows clear functional differences between Chinese Phoenix bicycles and the Swiss secondhand bicycles distributed by a local partner of the Swiss NGO Bicycles for Africa. The inherent mechanical properties of the two bicycles define the practical utility and relevance for a particular kind of work. The Phoenix is considered to be a "productive tool" at the most basic level. Without a Phoenix, many consider income-generation as inconceivable. VBC bikes, on the other hand, are impractical to transport carriage, and therefore seen primarily as a mode of transport to effortlessly move from one place to another. They thus address different job profiles.

Using the bicycle for business purposes adds to the family income, which is further invested into core assets including basic goods such as food and clothes, accommodation and farm animals. By supporting the "asset accumulation process", the bicycle contributes substantially to the reduction of a household's vulnerability to internal and external shocks and steadily improves a household's socio-economic position. Users of bicycles recorded to also have more time that could be invested into productive, reproductive, social and recreational activities.

The process of buying a bicycle is deliberate, enduring, and demands a substantial initial investment. Households must undergo a period of financial strain or cutbacks that affect household expenditure, investment and consumption patterns. Strategies include consumption-based, financial-based and risk-associated alternatives. That people make sacrifices over a substantial period of time signals the value that the bicycle holds for rural households.

Families commonly share bicycles. Only few bicycle owners assert exclusivity to its utilization. However, hierarchy levels within the family dominate access to the bicycle. The highest income earner usually enjoys the greatest benefit and is the ultimate decision maker over the bicycle's range of beneficiaries. Findings also show that due to inherent gender roles and traditional perceptions regarding the distribution of labor within a family, women do not yet enjoy the full potential of a bicycle. It is expected that the presence of VBC bikes and their line suitable for women will have the potential to accelerate the usage of bikes among women.

Within the society, the bicycle plays an important role regarding schooling and healthcare. Children save more than 70 minutes per day on their school journey compared to those who have to walk, and invest the time in chores around the home. Interviewees recorded lower physical strain and higher scope of pre and after school activities as well as an increased feeling of security when travelling, particularly among girls.

The interviews also conveyed that a certain status or feeling of prestige is attached to (owning) a bicycle. The bicycle is consequently a valuable possession in each beneficiary's household.

In light of these findings, the study suggests to improve credit mechanisms for bike purchases, particularly for women. Students should also benefit from special rates in order to have access to bicycles. It is also suggested to improve the availability and quality of spare parts, tools and mechanics in rural areas. Furthermore, the load-carrying capacity of VBC bikes should be increased. Last but not least, institutional improvements and maintenance of routes can increase the load-carrying capacity and lower the frequency of bicycle breakage.

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Abbreviations

BfA	Bicycles for Africa
BoP	Bottom of the Pyramid (concept)
HDI	Humand Development Index
IDS	Institute for Development Studies
IFAD	International Fund for Agricultural Development
IMT	Intermediate Means of Transport
ISBE	Institute for Small Business and Enterpreneurship
MB/CB/TB	Mountain, City or Touring bikes = VBC bikes
MT	Motorized transport
NMT	Non-motorized transport
PH	Phoenix bicycle
PPP	Purchasing Power Parity
RAP	Rapid Assessment Process
RTI	Rural transport infrastructure
SLA	Sustainable Livelihood Approach
SLF	Sustainable Livelihood Framework
SSA	Sub-Saharan Africa
TSH	Tanzanian Shilling
USD	United States Dollar (1 USD = 1650 TSH)
VBC	Vijana Bicycle Center (Bicycle Youth Center)
WB	The World Bank
WBCSD	The World Business Council for Sustainable Development

Common Swahili expressions used throughout the paper

daladala	Minibus share taxis (for up to 20 people)
dagaa	Type of fish found in the Lake Victoria; EN: silver cyprinid
fundi	General expression for street mechanic
matoke	Banana
pikipiki	Motorbike
sekido	Motorbike taxi
shamba	Agricultural plot (not to confuse with “garden”)

1. Introduction

1.1 Fencing off the research interest

"Around the world, (...) transport is the ultimate enabler!" says previous Vice-President of the World Bank, Katherine Sierre, in her foreword to the published Transport Business Strategy 2008-2012. She puts it bluntly and succinctly. "*It [transport] puts development goals within reach"* (The World Bank, 2008, p. ix). Indeed, transport and mobility are considered to be an important prerequisite for any economic, social and cultural development (The World Business Council for Sustainable Development, 2004, p. 13). Mobility allows people to gain access to suppliers, services and facilities in order to satisfy their daily needs. For the citizen in the developed world, mobility is to a large extent considered self-evident. However, for an estimated number of four to five billion people at the "bottom of the economic pyramid", mobility is still severely restricted by the physical constraint of bad roads and the lack of access to adequate, safe and affordable modes of transport. Not surprisingly, the World Council for Sustainable Development (WBCSD) (2004) emphasizes that these significant mobility opportunity disparities between and within countries will inevitably "*impede growth and development significantly in parts of the world for decades to come*" (p. 28-31). In fact, WBCSD refers to a "mobility opportunity divide" among developed and developing countries (p. 131).

Sub-Saharan Africa (SSA) and its sparsely populated rural areas pose a striking example of the far-reaching consequences that a lack of mobility produces. The average citizen - especially in rural areas - is deprived of the opportunity to move quickly as walking is still the prevalent mode of transport. People spend (or waste) several hours per day commuting *unproductively* in order to make a living (Porter, 2002, p. 285; World Bank, 2005, p. 3). Consequently, poor access to transport inhibits women, men and children to readily access educational or healthcare services, restricts them from obtaining or selling goods in the market or prevents them from taking part in social or communal activities. Consequently, inaccessibility to basic services is likely to lead to isolation, one of the core dimensions of poverty noted by Robert Chambers in the 80s.[1] In that sense, it becomes apparent that the high costs in time, money and effort needed to satisfy the basic necessities severely constrain the rural poor's economic, social and cultural development (Starkey, Ellis, Hine, & Ternell, 2002).

The reasons for the persistent and unsuitable transport conditions are manifold. Clearly, a lack of political strategies and irresponsibility towards rural development within the Sub Saharan Africa (SSA) are one aspect while the misdirected investment policies of international development organizations such as the World Bank are another (Heyen-Perschon, 2001, p. 1). Data shows for example that in the last 60 years, the World Bank has spent more than 60 billion USD worldwide largely on the promotion of motorized transport, specifically on the improvement of roads and cars (Sieber, 1998, p. 69). However, given the majority of the developing world's lack of access to motorized transport and the needs assessments for planning initiatives towards sustainable mobility, these investments have brought little improvement for poorer and rural regions (Dorsey, 2008). SSA is no exception.

[1] The other four dimensions in Chambers definition of 'integrated' rural poverty include (a) poverty proper, (lack of assets and income; (b) physical weakness; (c) vulnerability to contingencies; and (d) powerlessness (in Edmonds, 1998, p. 1).

It is against the backdrop of these circumstances that it has been noted the focus on motorized transport is too narrow (Leinbach, 2000; Mozer, 2000). Consequently, policy makers have increasingly begun to focus attention towards investments in non-motorized intermediate means of transport. Although still scant academic research has concentrated on the direct impact of intermediate means of transport (IMT) for the socio-economic development of households in SSA, some of the studies indicate a link between non-motorized transport and the reduction of poverty for households in the rural and urban setting (Gwilliam, 2002; Starkey et al., 2002).

Within the spectrum of intermediate non-motorized means of transport, the bicycle is one of the arguably more relevant instruments. This is especially due to the fact that bicycles represent an efficient, cost-effective and sustainable form of transport, which is particularly affordable for those of low income (Gauthier & Hook, 2005; Mozer, 2000, Vicotria Transport Policy Institute, 2014). In recognition of this potential, the distribution of new or used bicycles has become popular among development organizations, donor agencies and individuals in Sub-Saharan Africa. However, as Gauthier and Hook stated, "*it [the donation of bicycle programs] was 'a race to the bottom' in terms of the quality [of bicycles], and this undermined cycling as a legitimate form of transport*" (Gauthier & Hook, 2005, p. 9). Additionally, the attitudes toward cycling in SSA vary not only from country to country but also within countries and regions. Single success stories in the promotion of bicycle usage in one particular region could not be taken as a guarantor for positive acknowledgment in another, nor could it obscure the fact that there is a tendency for bicycles to still be regarded as an old-fashioned form of transport, with locals preferring the more modern, advanced and comfortable option of motorized vehicles.

Bicycles for Africa (BfA) has taken up the challenge to promote bicycle usage in Africa as a means to incite social and economic development. It is their stated mission to "*deliver bikes in good quality and adapted to people's needs*" (BfA, 2012). Hence, the Swiss NGO has shipped more than 100'000 bicycles to Burkina Faso, Eritrea, Tanzania, Ghana or Gambia. It is the change of perception towards the promotion of non-motorized transport within the international community, paralleled with the efforts of *Bicycles for Africa* to actively promote the distribution and sale of bicycles in rural areas that spur the interest of this thesis.

Of course, the diversity of the Sub-Saharan Africa, its countries and peoples as well as the complexity of the issue require a more limited and narrow scope for investigation under the thesis. As such, the author has decided together with *Bicycles for Africa* to study the case of Nshamba district, an economically poor area of approximately 20'000 inhabitants in the rural and remote Kagera region of Tanzania. There, BfA in 2011 partnered with a local bicycle center. The center not only sells secondhand bikes but also educates and teaches youth about the bicycle maintenance and business.

Therefore, the author sets out to investigate the story of the "baisikeli" as it presents itself today. It is the objective of this study to gain a better understanding of the transport needs of the people of Nshamba, to learn first hand about the role of the bicycle for the communities of this remote area, to find out more about the challenges of exporting secondhand bicycles to a developing region and ultimately, to determine whether the bicycle has indeed the power to bring social, economic and cultural development, or in simple terms, to *put development goals within reach.*

1.2 Research purpose, question(s) and relevance of the topic

The purpose of this study is both descriptive and explanatory. The data is used to document and describe general bicycle utilization and its impact on households in a rural area. The study is also expected to explain certain bicycle usage patterns. Envisaging this objective, there are two guiding research questions that this thesis aims to address:

1. **What is the ROLE of the bicycle in supporting rural dweller's economic[2], reproductive[3] and social activities in the economically poor and remote region of Nshamba, Tanzania?**

2. **What is the IMPACT of the bicycle on the economic, reproductive and social development of households in the economically poor and remote region of Nshamba, Tanzania?**

Theses guiding questions lead to two subsequent strains of questions. The first strain focuses on the actual bicycle user and his or her needs. The second strain evaluates the information gained from the individual perspective and draws implications for the overall institutional secondhand bicycle business model.

Individual/Household Level	**Institutional/Business Level**
• For which (daily) economic, reproductive and social activities do people/households use bicycles in Nshamba?	• What do activities and usage patterns tell about the types of bicycle demanded?
• To what extent do bicycles support these activities?	• What are the challenges in exporting secondhand bicycles to Africa?
• What is the range of beneficiaries of a bicycle within a household?	
• What do gender and status play in the usage and promotion of bicycles?	

As aforementioned, valuable academic research has been conducted on the significance of non-motorized transport for urban and rural development in developing countries. In this regard, the bicycle has most often been embedded in a broader context and as such its assessment has largely been part of a complex and broad research topic (e.g. rural transport patterns, rural transport services, appropriate transport development, NMT transport solutions et cetera). In most of these analyses, the bicycle has been studied as one particular mode of transport in relation to other options, highlighting its potential and drawbacks on costs, speed or capacity to load. Scant research focused on the benefits the bicycle per se. Given the well-described advantages and disadvantages of the bicycle, this thesis takes these findings as a

[2] Economic or productive activities include work that generates income.

[3] Reproductive activities cover domestic tasks, such as collecting water, collecting firewood or cooking (which are normally done by women). Although this type of activity is actually work, it is often differentiated from what is understood as 'productive" work as it is unpaid.

foundation. Zooming in on the individual level, the author takes a closer look at the direct "micro-socio-economic consequences" the bicycle delivers to people and households in rural Nshamba. This is where the added value of this thesis lies. By focusing on the single bicycle user and its close environment at the heart of the research, the author is able to gain profound insight on the individual perception towards the role and impact of the bicycle. This personal data, depicting the twists and turns of each individual's life, contextualizes the role of the bicycle and lists the direct impacts and challenges associated with bicycle usage for the micro-cosmos "family". The author expects this information to be equally interesting for policy makers, development organizations and (social) business enterprises.

1.3 The thesis in outline

In order to answer the research questions, this thesis is structured as follows. **Chapter 2** presents the research methodology and describes the different data gathering procedures. **Chapter 3** clarifies underlying frameworks and notions of non-motorized intermediate modes of transport, elaborates on the distinction between the concepts of "accessibility and mobility" as well as briefly outlines the different understandings of the term "poverty." Chapter 3 also outlines the Sustainable Livelihood Framework, which serves as a theoretical foundation. **Chapter 4** incorporates important findings from previous studies and reviews some of the theory and practice on the development and transport nexus, going from the broad to the more specific. The chapter starts by presenting findings on the role of transport for development. It gives insight to the nature of rural household travel. This continues by introducing rural transport systems in order to better understand the context of the study. The case for better local transport solutions is made and the role of IMTs, particularly the bicycle is elaborated.

Chapter 5 introduces the case study. It opens by indicating some preliminarily geographical remarks about Nshamba area, including transportation and mobility patterns. Also, the results of the traffic survey presented give an initial idea on the spread and role of bicycle usage in the Nshamba area.

Chapter 6 explains thematic analysis and starts by indicating some preliminarily socio-economic background information on the interviewees. **Chapter 7** then looks at the bicycle buying process and offers the contextual framework for the role of the bicycle. **Chapter 8** investigates the bicycle's role for economic activity and highlights the various beneficial aspects within this context. The economic impact with regard to disposable income and time are presented in **Chapters 9 and 10**. **Chapters 11 and 12** put the focus on the household and look at the additional beneficiaries within the family and close environment. In particular, these sections investigate the role of the bicycle on two important issues, healthcare and schooling, using quantitative data from the questionnaire. The analysis ends with **Chapters 13 and 14**, which present some additional insights into the role of the bicycle with regard to vulnerability and resilience as well as institutional aspects, such as gender and status.

Having gained a multidimensional insight on the role and impact of the bicycle, **Chapter 15** draws conclusions, adds some limitations and offers recommendations for existing and future bicycle initiatives.

2 Research Methodology

2.1 Choice and design of data gathering methods

In order to answer the research questions raised, both the collection of primary data as well as the analysis of second-hand data is needed. The theoretical background of this thesis draws from the review and analysis of scientific papers, research reports, working papers, available statistics and book sections. Primary data was gathered during a two-month stay in the Nshamba region[4]. Due to the institutional link with a local partner of *Bicycles for Africa*, namely the *Vijana Bicycle Center*, the geographical area of and around Nshamba was chosen as a case study model. In using Gerring's (2004) definition, a case study is *an intensive study of a single unit for the purpose of understanding a larger class of (similar) units* (Gerring, 2004, p. 342). By analyzing Nshamba, the prime objective is to draw conclusions particularly for this region and similarly, to provide indices for similar rural regions in Sub-Saharan Africa. Given this context, there was a need to develop a methodology that would allow obtaining in a relatively short time (two month period) a sufficiently profound understanding of the role and impact of bicycles. Against this backdrop, a mix of different survey data collection techniques were applied: a) semi-structured interviews, b) workshops, c) questionnaire d) rapid assessment and e) traffic survey. Table 1 outlines the data collection procedure. Whereas the overall approach was of qualitative, phenomenological nature, the applied tools and methods also contain quantitative elements. Here, the common Microsoft Excel calculations and modeling technologies were used to produce graphs.

Table 1: Data collection procedure

Steps	Who	n	Tool	Method	Location
1	Bicycle users (male and female, Phoenix non Phoenix)	38	Semi-Structured Interview	Random & purposively[5]	Nshamba & environment
2	School Children (Secondary F Level mixed)	2x 13	Workshop	Recruited randomly through local contact (VBC)	Nshamba
3	School Children (Level F1&F3)	100	Questionnaire	Random selection	Nyakitaba Secondary School
4	Banana Transporters	36	Rapid Assessment	Random selection	On the way to Muleba, a trading centre
5	Local Bicycle Mechanic	1	Semi-Structured Interview	Recruited purposively4	Nshamba
6	Program Coordinator VBC	1	Semi-Structured Interview	Recruited purposively[4]	Nshamba
7	NA	>8000	Traffic Survey	Traffic inflow, 2 days at 5 hours each. 4 main roads, 2 footpaths	Nshamba

4 See Annex V for a map.

5 Purposely means that the author has chosen participants on the basis of different job profiles. The list compiled former customers of VBC.

2.2 Sample design, data gathering and coding of qualitative data

The key survey instrument applied to investigate the effects of bicycles on households takes the form of semi-structured household interview surveys. The interviews were conducted using a topic guide that explored different aspects of bicycle usage, including economic, social, reproductive, gender and status related themes.

In Nshamba, 42 one-on-one interviews with bicycle users were conducted. The candidates were chosen randomly by stopping them on the road or purposively using available customer data provided by the Vijana Bicycle Center. The latter sampling method was chosen in order to create a controlled diversity of bicycle users (Albright, Howard-Pitney, Roberts, & Zicarelli, 1998, p. 6; Marshall, 1996, p. 523). In order to triangulate the data from various perspectives, a single one-on-one interview was conducted with the program coordinator of the local bicycle center and an external mechanic from the village. As only few interviews could be held in English due to the language barrier, most of the interviews took place in Swahili or Haya[6] with the help of a translator. The interviews were, in consultation with the interviewees, recorded and transcribed. Annex 1 shows the guiding questions as well the anonymized participants list.

The interviews were coded with "Hyper Research" Software and analyzed using thematic networks analysis. Thematic networks analysis consists of different stages and is "simply a way of organizing a thematic analysis of qualitative data" (Attride-Stirling, 2001, p. 387). To begin thematic analysis, first, codes are created. As Miles & Huberman explain, codes are ''tags or labels for assigning units of meaning to the descriptive or inferential information compiled during a study'' (Miles & Huberman, 1994, p. 56). The process of creating codes was hybrid, hence using both pre-set codes, which are derived from the research questions, literature review, etc. and emerging codes that were provided by the reading of transcripts and thus necessitated "repeated examination of the raw data" (DeCuir-Gunby, Marshall, & McCulloch, 2011, p. 138).

From the experience in conducting the interviews and typing the transcripts, coding sentence by sentence showed to be not be very meaningful. On the other hand, the paragraph level often presented several themes. As such, the text was lump and split at different locations, and codes were allowed to be attached to a phrase, a sentence, or a paragraph, so long as the essence was the same. (MacQueen, McLellan, Kay & Milstein, 1998).

The coding phase was followed by the creation of "themes" that were observable both on the manifest and the latent level, hence underlying the observed phenomena (Boyatzis, 1998). The next step collated the different themes and brought them together in so-called "Organizing Themes". Finally, the Organizing Themes were regrouped into six "Global Themes".

2.3 Workshops

Workshops were conducted with school children in order to find more about the perceptions, opinions, beliefs, and attitudes towards the role and value of the bicycle for students. VBC has issued a reduction of 40 percent on the price of bicycles for school children. Assessing the impact for this specific group was of

[6] "Kihaya" is the local language spoken by the Haya people of this region.

particular importance. Two workshops were conducted, and lasted for approximately three hours each, with different data-collection activities and techniques. See Annex II for the schedule and list of activities.

2.4 Questionnaire

The workshops helped to find the relevant aspects of the bicycle for students. Based on this information, a questionnaire was created for students with a bicycle, including closed format questions, multiple choice questions and Likert-type questions (students indicate their attitudes on a number scale towards a series of statements). A second questionnaire was developed for bicycle non-users with slightly different questions. Both questionnaires were translated in Kiswahili. 100 students of Nyakataba Secondary School (Level F1 & 3) took part in the survey, 50 for each type of questionnaire. Annex III shows the original questionnaire (Swahili).

2.5 Rapid assessment

Another approach that has been used to enable the collection of information at the field level was a “rapid assessment“ among banana transporters. Drawing from the Rapid Assessment Process (RAP) model described by Beebe (2001), the idea was “to quickly develop a preliminary understanding of a situation from the insider's perspective" (Beebe, 2001, p. 1). Due to the rapid nature of the process, the results are more of illustrative character than rigorous. Hence, 36 banana transporters were asked a brief set of structured informal questions in order to get a nuanced idea on the role of the bicycle for the people involved in the banana transporting business. Two one-on-one interviews preceded the actual rapid inquiry. This helped to gain a general understanding of the business. The rapid inquiry took place in the open streets, along the way to the regional market in Muleba. The study started at 6am and lasted for approximately three hours. Annex IV shows the questionnaire.

2.6 Traffic survey

In order to gain an idea on the popularity and distribution of bicycles in the Nshamba area, a traffic count was executed. This information should serve as an indicator of the extent to which people travel by bicycle compared to other means of transport in this rural area. Counting took place on two days (regular weekday and market day), lasting five hours each. Together with 13 students, traffic in-flow on the four main roads as well as the two main footpaths leading to Nshamba center was counted. It should be noted that this was the first traffic count conducted in this area.

3 Definition of Concepts

In order to avoid conceptual fallacies, this section aims to clarify the key concepts in order to provide the reader with a concise understanding of frameworks applied throughout the paper. As such, the author gives a distinction to the common notions of transport, mobility and accessibility, addresses the difference between intermediate and non-motorized means of transport as well as explains the term "bottom of the pyramid". The Sustainable Livelihood Framework is also explained.

3.1 Mobility, proximity and accessibility

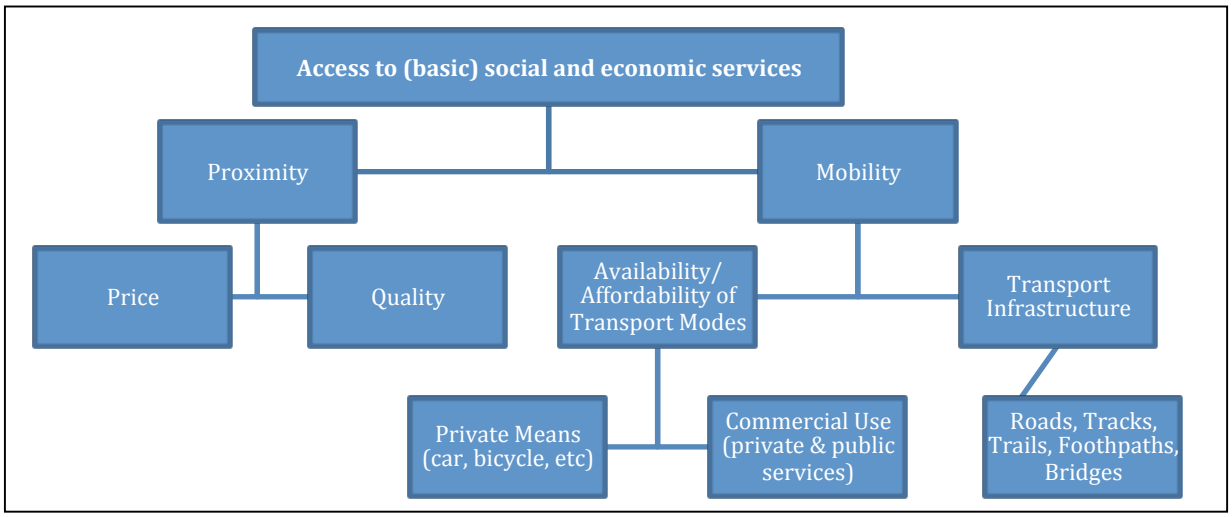
The concepts of *accessibility* and *mobility* are closely related and can easily be confused. At the core of each concept are the fundamental needs of people. *Accessibility* refers to people's ability to **access, reach** or **use** goods, services and activities in order to meet the daily needs of water, power, food, health services, education or employment (Edmonds, 1998, p. 6; Starkey, 2006, pp. 8–9; Victoria Transport Policy Institute, 2013). To what extent people have access to these services and facilities depends on two factors: (a) their *mobility*, or the physical travel, the time and the costs required for reaching these access points and (b) the *proximity* of those services and facilities. Within the context of mobility, travel and transport describe different *types of mobility* (although often they are used interchangeably). In this sense, travel refers to the movement of people (generally not burdened by a load) in order to access services or for social purposes (Barwell, 1996, p. 17). Transport on the other hand implies the carrying of cargo. In the rural context, this includes mainly the movement of basic commodities (water, fuel, wood, food) or agriculture produce (harvest, fertilizer).

Generally, the *level of mobility* is determined by several components including transport infrastructure and the availability and affordability of different modes of transport. Infrastructure and means of transport together influence the ease and frequency of the movement of people and their loads (Victoria Transport Policy Institute, 2013). Mobility is increased if better infrastructure is available (thus increasing the effectiveness of the transport system), and/or if people have access to more efficient means of transport. Although access should be improved through increased mobility, any disruptions in "societal, environmental and economic well-being that more than offset the benefits attributed to greater access" should be avoided (WBCSD, 2004, p. 12).

At the individual level, *mobility opportunities* are relevant when talking about rural transport patterns and poverty. Prahalad and Hammond (2004) go even to the length of noting that *"lack of choice is what being poor is all about"* (p. 36). As such, people who have no alternative mode for a specific trip and are limited to a certain means of transport (in rural areas, this is most often walking), are commonly referred to as *captive users* (Interface For Cycling Expertise, 2007, p. 97). On the contrary, *choice travelers* may have a set of options to choose from (walking, riding a bicycle, using public transportation) in accordance with their individual situation (e.g. the geographical location, their intended travel location or external factors (weather, terrain). Porter (2002) accentuates that the *"characteristics of the individual such as whether s/he has a bicycle or car available, can afford taxi, bus or rail fares, can walk or use public transport, or has knowledge of the options available*" influence the extent to which someone can actually benefit from the transport system (cited in Bryceson, Mbara, & Maunder, 2003, p. 179).

In evaluating accessibility, mobility is one side of the coin, regarding it as the only factor would be a major limitation. As such, *proximity* of services must be added, *"since the needs of people are met at particular destinations*" (The World Bank, 2008, p. 90). Proximity must take into consideration the fact that the price of a certain service and/or may restrict people from using it. Similarly, having access to a service does not tell anything about the quality of it. Therefore, the overall topic of accessibility not only takes in to account the mobility characteristics but also the choices that people make or have to make in order to access services relative to their origin. Figure 1 summarizes the relationship between accessibility, mobility and proximity.

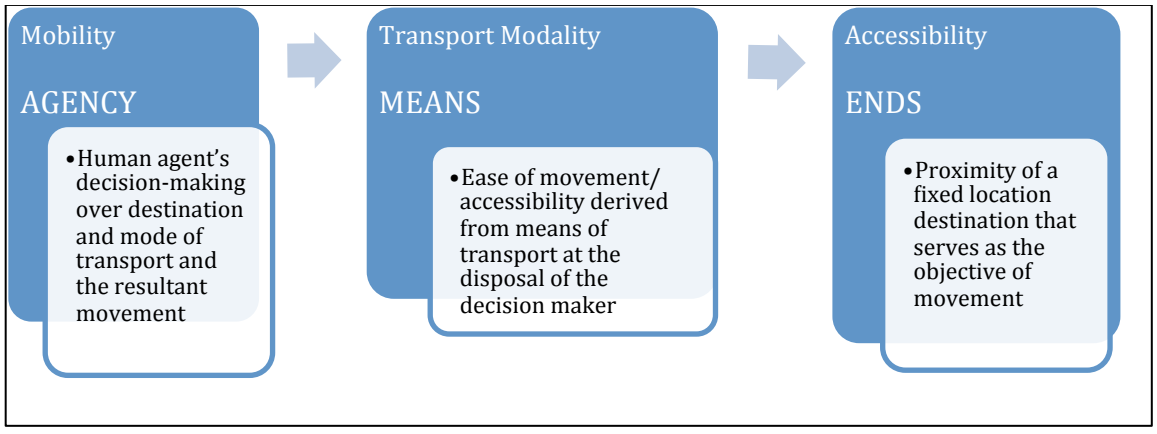
Figure 1: Distinguishing accessibility, proximity and mobility



Source: Personal illustration, with reference to Starkey et al., 2002, p.8

In combining these concepts, it can be said the different modes of transport are basically the means by which households gain access to the services and facilities they need in their daily life. As such, transport is a means to an end. The real need is accessibility. Figure 2 clarifies this relationship.

Figure 2: Summary of the concepts of transport, mobility and accessibility



Source: Adapted illustration from Bryceson et al., p. 179

With accessibility as the ultimate goal, it becomes evident that lack of access is neither a mobility (or transport) nor a proximity (or non-transport) problem only. On the contrary, initiatives to improve access should be tackled from both perspectives. Due to the nature and focus of this research paper, the concentration lies primarily on the mobility aspect.

3.2 Non-motorized and intermediate means of transport

Intermediate means of transport (IMT) are closely related to the notion of non-motorized transport (NMT). However, there is a slight difference. Non-motorized transport, also known as "Active Transportation" or "Human Powered Transportation," includes walking and riding bicycles as well as covers other small-wheeled transport such as handcarts or wheelbarrows (Litman, 2014). In fact, as Guitinik, Holste & Lebo (1994) conclude, the definition of NMT includes "*any form of transportation that provides personal or goods mobility by methods other than the combustion motor*" (p. 2). However, when talking IMT, the traditional mode of walking is excluded and it covers only those means that are intermediate between walking and any form of conventional motorized vehicle (cars, trucks or buses), such as wheelbarrows, motorcycles or bicycles (Barwell, 1996, p. 9; Heierli, 1995, p. 53). As Barwell (2002) points out, intermediate means of transport are particularly different from other modes with regard to investment costs, transport capacity such as *"speed, payload and range of travel, infrastructure requirements, complexity of maintenance and skills, facilities materials and investment required for manufacture*" (p. 9). NMT are in many countries seen as the main form of transport among low-income households and thus contribute significantly to income generating activities or enable access to fundamental services. An overview of common IMTs in Sub-Saharan Africa will be given in Section 4.3.

3.3 Bottom of the Pyramid

Generally speaking, Base of the Pyramid (BoP) refers to the low-income communities, particularly in developing countries. Over the last few decades, there has been a surge in interest in the BoP within the development and business research community. This dual interest can be explained by the recognition of the BoP's market potential. Prahalad and Hammond speak of the "*biggest underserved and untapped market in the world*" (Hammond & Prahalad, 2004). On the other hand, development cooperation has also shifted its practice to a more business-oriented perspective by focusing increasingly on a "*development through enterprise*" agenda (Holt & Littlewood, 2014).

The concept is used to describe people who live below a certain poverty line. The poverty line is used to describe a threshold in the form of "*income required to acquire a minimum food calorie intake or a minimum basket of consumption goods [...] needed to live a basic life*" (Wagle, 2002, p. 156). Where exactly this line is drawn is widely debated, ranging from below one USD a day (extremely poor) to five to eight USD a day (IFC, 2014). Most commonly for developing countries, this threshold is set in absolute terms. For example, The World Bank has set the international poverty line at USD 1.25 PPP (extremely poor, food poverty line[7]) and USD 2.50 PPP (basic needs poverty line[8]) per day, respectively (Ravallion, Chen, & Sangraula, 2008). The World Resources Institute, using a cut-off of USD 3000 per person per year in purchasing power parity, estimates the number of people constituting the BoP to be four billion. In Africa, the World Resource Institute considers over 95 percent of the population (over 450 million in 22 countries) to be part of the BoP (Hammond, Kramer, Tran, Katz, & Walker, 2007, p. 37). For Sub-Saharan Africa in particular, ISBE estimates that 300 million people or 60 percent of the rural population live on

7 People face severe deprivation of basic human needs and cannot afford to meet the daily needs of food.

8 Refers to the income needed to satisfy the basic necessities of life, in other words to acquire a consumption basket of basic goods (Spalding, 2009, p. 359).

less than USD 1.25 a day and as such are considered at the bottom of the economic pyramid (Holt & Littlewood, 2014).

3.3.1 Other approaches to define poverty

The BoP approach measures the material deprivation of poverty. However, the focus on material aspects of food consumption and income is often regarded as too narrow. Chambers and Sen for example expand the definitional scope of poverty by adding the notions of "well-being" (cf. Chambers, 1995, 1997) and "capability" (cf. Sen, 1984, 1987) to the debate. According to Chambers, this broader perspective allows "*people themselves to define the criteria which are important*" and consequently comes up with a variety of characteristics such as "*self-esteem, security, happiness, stress, vulnerability, power or exclusion*," as well as more conventionally measured material concerns" (cited in Scoones, 1998, p. 6). Sen, on the other hand regards capabilities as "*what people can do or be with their entitlements*" (cited in Scoons, p. 6).

Sen's and Chamber's approach highlight the fact that poverty is a multidimensional issue, difficult to capture by a single unit of reference, such as income. Not surprisingly, developments in capturing poverty have led to new concepts that address the complexity by adding a broader range of criteria. A typical example is the Human Development Index (HDI) by the United Nations[9], which adds life expectancy (health) and education to the poverty equation (income/living standard). The 2010 Multidimensional Poverty Index[10] expands on the HDI by adding ten new criteria to income, living standard and health (Health: child mortality, nutrition; Education: years of schooling, children enrolled; Living standards: cooking fuel, toilet, water, electricity, floor, assets). Social exclusion is another aspect of poverty that should not be forgotten. In this regard, Wagle (2002) states that someone "*with adequate income and adequate capability to produce certain functioning may still be poor, if, for example, s/he is excluded from the mainstream economic, political, civic and cultural activities that are embedded in the very notion of human well- being*" (p. 160).

The next section puts the emphasis on the poor in order to contextualize the meaning of these different approaches to poverty.

3.3.2 The characteristics of the rural poor

Defining general poverty patterns is one important aspect in understanding the situation of the poor. It helps to get an abstract idea on poverty issues. However, the next step will look at the individual household characteristics of poor rural households in order to differentiate them from the non-poor. Drawing on findings from the IFAD Rural Poverty Report 2009, the following characteristics can be highlighted. First, poor rural households usually feature substantially larger households than non-poor households. This goes along with a higher share of non-working family members that are dependent on others within the family. Furthermore, poor households exhibit a substantially lower access to assets such as agricultural plots or livestock. Also, poor rural households face severe restrictions on access to fundamental services. (Valdés et al., 2009) This includes access to employment, land, technology, information, credit, health services, water, energy markets, transport and education (Edmonds & Relf, 1987, p. 14). Lack of access to these fundamental necessities has far reaching consequences, leading

[9] See hdr.undp.org/en
[10] See hdr.undp.org/en/statistics/mpi

ultimately to other attributes of poverty, including the lack of skills, low production, low productivity, low income, poor health, poor education or low investment (Hine & Rutter, 2000, p. 2). These factors consequently perpetuate rural household's condition of poverty (Edmonds & Relf, 1987, p. 13). Income of the rural poor is mainly derived from on-farm activities (be it for subsistence needs or market oriented). Thus, natural endowments and the regional context influence the income portfolios. Apart from agricultural work, wage work and remittances are other common income-generating activities (Banjo, Gordon, & Riverson, 2012, pp. 10–12). In the debate on rural poverty, "feminization of poverty" is another issue. Female headed-households are generally seen as very vulnerable, due to their higher dependency ratios and lower average income. However, studies suggest that the disadvantage of female-headed households is less with regard to income or consumption but limited ownership of assets (Banjo, Gordon, & Riverson, 2012, pp. 30-31).

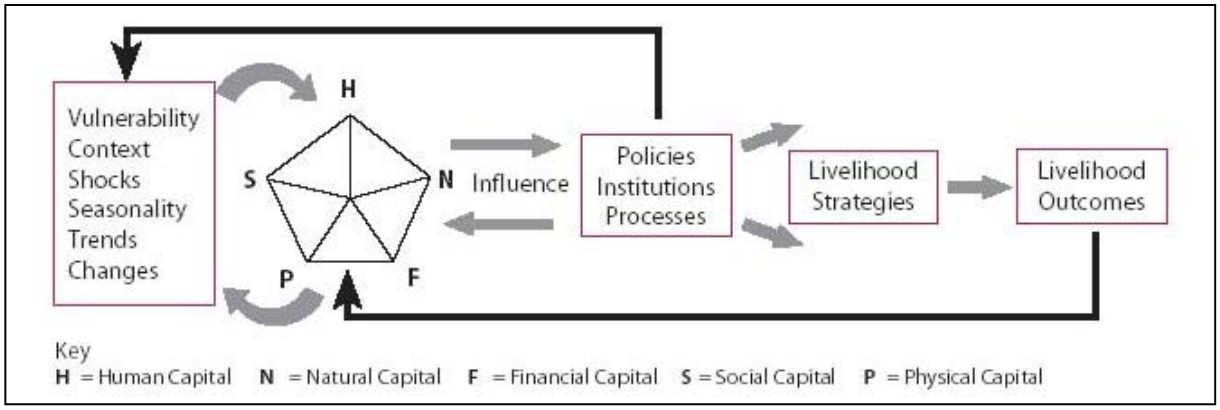
Furthermore, most people of the BoP work in the informal sector, detached from the formal economy of a country and are thus often excluded from global trade and markets. As producers, lack of access to markets make them particularly vulnerable to middlemen who are likely to exploit them (Hammond et al., 2007, p. 18). Many of those at the BoP face a so-called "*BoP penalty.*" Being poor means paying a "premium" on goods and services, be it in the form of a higher price, greater effort to access them (time) or by the unsatisfactory quality of many of these products (Hammond et al., 2007, p. 19).

It becomes obvious that rural poverty is a multidimensional issue, covering the lack of access to "*fundamental goods and services, low income, relative deprivation and socio-economic exclusion, human underdevelopment, lack of capability and functioning, vulnerability, ill-being and livelihood unsustainability*." (Lema, 2007, p. 6)

3.4 Sustainable livelihood framework

It is intuitive that potential pathways out of poverty are complex. For example, Valdés et al. (2009) conclude "*the lesson from experience and much of the rural development literature is that the income generating potential (...) depends crucially on access to assets, such as education, land, and infrastructure*" (Valdés et al., 2009, p. 11-12). Similarly, in recognition of the complexity described above and in the context of alleviating poverty, the concept of "Sustainable Livelihoods" (SL) has been developed by the UK Department for International Development (DFID). It brings various individual concepts together in order to achieve an integrated approach towards sustainable pathways out of poverty. Ellis describes the spheres of a livelihood as the following: "*A livelihood compromises the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household" (*cited in Bryceson, Mbara, & Maunder, 2003, p 178). The aspect of sustainability completes the framework. IDS (International Institute for Development) emphasizes that a "*livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base"* (Krantz, 2001, p. 6). The following graph depicts the different factors constituting the Sustainable Livelihood Approach (SLA). The pentagon stands for an individual household and its five core assets. Every household is not only influenced by policies, institutions and processes but is also affected by (and affects) its environment (context) (Fao, 2104).

Figure 3: Sustainable Livelihood Approach



Source: fao.org

The SLA offers an approach to grasp the the complexity and multidimensionality of rural poverty and to highlight potential levers that create pathways out of poverty. For example, it gives an indication why past transport development approaches had little success. By investing mainly in infrastructure (roads), only one aspect of the framework, namely "policies" was tackled, detached from the actual household situation (see section below). Only by putting the individual household at the core of the assessment, and thus shifting the consideration to the development of the *appropriate vehicles*, progress started to occur. This process and its consequences will be shown below. For the sake of this analysis, the SLA will be used as a guiding framework to contextualize the role of the bicycle as a lever that enables a pathway out of povety.

4 Literature Review

Drawing from various studies in the field of mobility and development, this chapter will highlight the nexus between rural people's economic, social and personal development and transport. In order to understand this relationship, introductory remarks will be given on the shifting focus of international development transport initiatives. After discussing the particular transport needs of households, the focus will shift to rural transport patterns and solutions, hence IMTs and the bicycle. This synopsis helps to contextualize the role of the bicycle and highlights the importance of transport as an element of development at the most basic level.

4.1 International transport development - from infrastructure to utilization

The core idea of research on the issue of rural transport has essentially been to find appropriate transport solutions for rural dwellers, acknowledging the need to link remote areas with urban centers of a country and connect the rural areas with each other (Banjo et al., 2012, p. 38-39). For most of the 20th century, the focus of international development initiatives has been put on the former, hence promoting investments that favored motorized transport. This view was based on modernization theories, which considered transport and roads to be *catalysts* of economic development (D. F. Bryceson, Bradbury, & Bradbury, 2008, p. 459). However, already in the early 50s and 60s, the paradigm of the catalytic role of transport was questioned. Both Hirschman[11] (1958) and Wilson[12] (1965) suggested that transport is important for development but no more than other factors and consequently should be seen as a *necessary but not sufficient component.* Ignoring Hirschman's and Wilson's findings, the World Bank and international assistance lending continued to be primarily directed towards road construction, even in the rural context (Barwell & Howe, 1979; Edmonds, 1998, p. 27-28).

However, from the 70s onwards, a new paradigm in development assistance emerged, shifting the focus from a macro or meta level approach to the actual poverty needs of individual households (Leinbach, 2000, p. 4). In this regard, first studies suggested that all the existing projects and investments in roads brought little improvement for impoverished rural households. It was highlighted a big percentage of rural transport was related to domestic work. Also, motorization of rural dwellers was relatively low due to the high costs and lack of availability of such means (Sieber, 1998, p. 69). On the other hand, maintenance of roads was an additional burden to national governments, leading to a short life time of infrastructure, particularly in Africa (Riverson, Gaviria, & Thriscutt, 1991).

This debate also initiated a new understanding of rural transport per se. It was recognized that although road infrastructure provided a *theoretical* opportunity to access services or reduce transport costs, nothing was been said about the actual beneficiaries (supposedly the rich), whether people can actually utilize the infrastructure provided or whether there may be a call for developing low-cost vehicles instead (Edmonds, 1998, p. 28; Gwilliam, 2002). Consequently, a paradigm shift occurred from the mere promotion of infrastructure (roads) to the aspect of actual utilization (vehicles) by the rural dwellers (Banjo et al., 2012, p.39). In this context, research on individual rural household's travel demands

11 A.O. Hirschman: Strategy of Economic Development. Yale University Press. 1958.
12 G.W. Wilson: Case Studies of the Effect of Roads on Development. Highway Research Record No. 115. 1965.

emerged, trying to assess the qualitative and quantitative realities of rural transport in accordance with the nature of rural household needs (Howe & Richards, 1984; Barwell, Edmonds, Howe, & de Veen, 1985; Bryceson & Howe, 1993) .

4.2 Rural dwellers as the unit of analysis

4.2.1 First studies on rural household travel

The assessment of rural household travel paralleled the growing recognition within the development community that reducing poverty is strongly related to rural people's demand for basic movement in order to satisfy domestic and subsistence needs (Banjo et al., 2012, p. 41). Recognizing this motive opened a new pool of questions regarding household travel patterns. In particular, understanding the "*magnitude, frequency, duration, purpose, gender differentiation, and the modes used*" of rural households would become essential (Banjo et al., 2012, p. 41).

First systematic studies on travel and transport patterns of rural households were conducted in Tanzania and Ghana in the mid 80s, initiating a new field of research (Howe & Barwell, 1979; Barwell & Leggett, 1986; Barwell & Malmberg-Calvo, 1989). Recent studies, for example issued by the World Bank (see Starkey, Ellis, Hine et al., 2002), expanded the scope of analysis and led to further insights on the travel patterns of rural households. From the beginning, the core focus was the individual household and its transport in and outside of the village in order to satisfy basic needs. In doing so, data was gathered on factors such as trip rates, time spent to reach facilities and services, effort needed to transport goods and people, common means of used transport or gender aspects of transport (Banjo et al., 2012, p. 42).

4.2.2 Nature of rural transport

The findings suggest that rural households spend a substantial share of their daily available time on transport related activities. As Barwell and Malmberg-Calvo (1989) with an example of a rural district in Tanzania show, the majority of the daily time and effort spent is to satisfy the household's subsistence needs (fetching water, collecting wood, obtaining fuel) (cited in Sieber, 1998, p.70). The opportunity to transport substantial quantities is "*equally essential as access to these commodities*", however porterage is limiting this potential (Dennis, 1998, p. 3). The basic trips often follow a regular pattern as most of the transport involves carrying small loads between 1 to 150 kg over a relatively short distance within and around the village (1 to 25 km) (Mozer, 2000, p. 3; Banjo et al., 2012, p. 40). As most of these trips are on foot, it is estimated that the procurement of these commodities occupies between three to six hours per day. This so-called "poverty time" is nondiscretionary, as it severs the satisfaction of basic human needs.

This highlights the fact that most of the time spent on transport is unproductive and substituted for economic activities. Other travel purposes are related to the tending and marketing of agricultural products or livestock and various socio-economic activities, including travel for education, health, religion, recreation or income generation. Other social and business purposes define the nature of rural transport (Dennis, 1998, p. 3; Barwell, 2002, p. 17; Starkey et al. , 2002, p. 10).

4.2.2.1 Human capital

Particularly the transport needs for education and healthcare services are essential and the foundation of any socio-economic development or rural household. These trips often demand travel outside the village as these institutions are not available in every community. In the case of education (mainly secondary), the trips happen on a daily basis. Visits to health centres are infrequent and irregular, depending on the state of health and health care institutions available.

As such, studies suggest that **transport affects education** most evidently with regard to the "carriage" of pupils, teachers and supplies for schools. Furthermore, dependability and safety of transport options are core issues when it comes to school enrolment and attendances decisions[13] (Grieco, Ndulo, Bryceson, Porter, & McCray, 2009, p. 19). This is emphasized in the results of a 1999 World Bank study among SSA countries. The author listed the core obstacles to school enrolment in Africa as distance and transport. In this regard, the "*presence of primary schools had a significant impact*" (from 10 to 25 percent) on the likelihood of children going to school (Filmer, 1999, pp. 32–33)[14]. Given that higher educational possibilities in SSA are limited and usually located in bigger urban areas, this puts an even higher burden on rural households. Not surprisingly, enrolment rates for secondary education can be as low as 30 percent, and in some SSA countries even lower than 10 percent (Dennis, 1998, p. 7). Therefore, immobility due to walking deprives many children, especially those from rural areas, from enjoying the full range of educational services (UNESCAP, p. 22). This circumstance has been confirmed in Nshamba, where primary schools are usually located within the remote villages but secondary schools are less frequent. It is common for children to commute one or more hours (one way) every day to attend school (see Section 12.2).

When discussing the role of **transport for healthcare**, analogous arguments as above can be made with respect to the multidimensionality of the issue. Generally it is said that transport affects health systems in three ways: 1) access by the community to health centers, 2) access by health workers to the community and, 3) the development of sustainable health services themselves (Downing & Sethi, 2001, pp. 4-5). As such, survey results gathered in 2000 show that distance and difficulty in getting transport to medical institutions are considered to be among the most common problems afflicting households (African Union & UN Economic Comission for Africa, 2005, p. 26). Only a lack of financial resources is considered to be a more restrictive factor[15] (Grieco et al., 2009, p. 26). Other studies show a tendency for child mortality to be lower with greater proximity of households to healthcare services (see Leipziger, Fay, Wodon, & Yepes, 2003). Although basic healthcare is usually available on the village level (be it a nurse, health care worker), access to a doctor or hospital is restricted. According to the World Health Organization around 50 percent of the people in developing countries live more than 8 km from a health care facility, the number is likely to be higher for rural areas (World Health Organization, 2013). This is particularly relevant in an emergency. Particularly poor households on the countryside are disproportionally disadvantaged and face high opportunity costs.

[13] Other obstacles include among others the need for children to work at home, lack of money to pay for school fees and/or uniform or low quality teachers.

[14] It should be noted that access alone says nothing about the quality of the education received.

[15] Another factor is for example education.

As mentioned above, **travel for other social and business purposes** is less frequent. Still, transport is an enabler to visit social institutions, such as religious facilities or engage in social activities, be it visiting friends, distant family members or leisure activities. Furthermore, access to financial institutions and government offices is considered to be part of this category. The former is especially a common problem in rural areas, particularly for women. Lack of access to financial resources can have far reaching consequences, affecting agricultural production and marketing as well as the ability to purchase vehicles, including bicycles and other forms of NMTs (Porter, 2002, p. 290).

4.2.2.2 Agriculture and livestock

In rural areas, any economic development has its origin primarily in the agricultural sector. This has been highlighted in chapter 3.3.2 on poverty. Only by fulfilling the substantial needs, people may enter the market economy and start generating additional income, either by selling surplus or engaging in other non-agricultural activities. In agricultural terms, the trip pattern depends mainly on the agricultural cycle and consequently with the production (trips to fields, to organize fertilizer) and marketing of produce (trips to markets, in and around the village) (Barwell, 2002, p. 19). However, as several studies show, transport related to agricultural production is mainly done by foot (Barwell et al., 1985). This implies that reaching markets or moving agricultural inputs consumes time and energy (opportunity cost). It has also been shown that due to limited carrying capacities, large percentages of produce cannot be sold due to spoilage or damage. This may lead farmers to sell produce at exploitative prices to brokers, who capitalize on the farmer's dilemma (Lema, 2007, p. 6). Consequently, investments in the production of more profitable crops are less likely. Additionally, limited transport capacities due to walking forces farmers to pay other people for porterage, decreasing the already small profits. Energy loss due to walking comes also at the cost productivity that could be used in the field. Information asymmetry is another factor affecting farmer's profit margins. Remoteness affects the knowledge about market trends and prices, offering brokers the possibility to skim off a big part of the profits (Lema, 2007, p. 7).

4.2.2.3 Gender aspect and rural transport

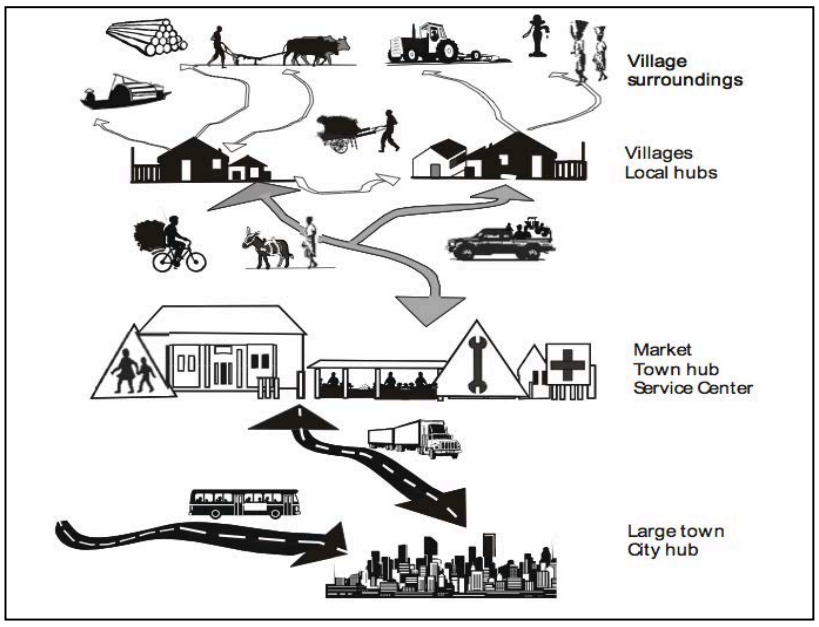
Another important characteristic of rural transport is the fact that women and girls suffer disproportionally higher from poor transport and mobility opportunities (Essakali, 2005; The World Bank, 2008). This has been shown in various studies around the world (see for example Barwell, 1996; Bryceson & Howe, 1993; Malmberg-Calvo, 1994; Priyanthi, 1998). Particularly in rural areas of SSA where sexual division of labor leaves women with the responsibility for household-related transportation (accessing farms and fields, collecting wood or water, visiting markets etc.,), their share of the transport burden is higher (Barwell, 2002, p. 19). According to a study conducted by the Ethiopian Roads Authority, this share is estimated at 90 percent of total household travel (Ethiopian Roads Authority, 2005). Barwell, using data from a study in Burkina Faso, suggests that female adults carry between 10.3 to 15.5 ton-kilometers compared to 3.6 to 4.4 ton-kilometers by male adults (Barwell, 1996). Studies from Sub-Saharan Africa emphasize that women spend between 25 and 30 hours per week on transport, substantially more than men (Barwell & Dawson, 1993).

4.3 Rural transport systems

Rural travel is embedded in a rural transport system, including rural transport infrastructure (RTI) together with transport services, which are prerequisites for rural households to access basic, economic and social necessities. Additionally, rural mobility encompasses systems that contribute to the improvement of access, namely different modes of transport. In that sense, the choice for a particular mode of transport depends highly on infrastructure, purpose of travel, distance, gender and age (Starkey et al., 2002, p. 10).

Studies suggest walking is the most basic mode of transport in rural areas. Walking is important, as it provides a cheap and simple way to move between short distance locations. Expensive motorized vehicles such as trucks, buses and cars are at the other end of the spectrum (Starkey et al, 2002, p. 9). Trucks, pick-ups, mini-buses or bicycles operate on the infrastructure provided in order to carry people or freight for commercial purposes. Between these two extremes, IMTs are a common mode of transport due to its increased capacity to transport loads and reduce drudgery. The range of activity of IMTs covers a radius of up to 20km. Figure 4 puts the use of different modes of transport in relation to context and purpose.

Figure 4: Rural transport system



Rural transport infrastructure has various levels, covering different types of roads leading to different areas of governmental responsibilities. In that sense, the trunk/primary/secondary or even tertiary road network consists of motor-ready road infrastructure facilities that are often part of the national road network under governmental authority. These roads are important as they link urban centers and provide efficient access to a country's internal and external markets. These roads also pass through rural areas, however they primarily benefit villages or communities living near to them. In Tanzania, this network encompasses 12'786 km of trunk roads and 21'105 km of regional roads (Ministry of Works, 2014).

The second element of RTI encompasses road systems that connect rural communities with each other or link them to urban areas. Both classified and unclassified[16] road networks constitute this second level infrastructure network. Apart from rural or feeder roads, simple footpaths or tracks are also counted as part of this network. This latter type of infrastructure is of prime importance to rural households. First, they contribute to the reduction of social exclusion and isolation of rural dwellers. Second, they simplify the routes that rural households walk every day to satisfy their basic mobility and access needs. (Starkey et al., 2002, p. 9).

4.3.1 The case for better local transport solutions

By drawing on various studies in the field of transport and development, the section above provided extensive insight into the nature and characteristic of rural transport. Movement for subsistence needs within the village makes up the majority of daily household travel. Travel beyond the village is less common, often related to aforementioned socio-economic factors and usually requiring the use of IMTs or motorized transport. **In this regard, transport and mobility are for the most part means to other ends**. The consequences of restricted mobility covers four levels: *spatially*, as people cannot reach certain places; *temporally*, because they cannot reach places or services in time; *financially*, because they cannot afford to reach there and *personally*, because of the lack of individual capacities to handle a certain mode of transport (WBCSD, 2004, p. 132). Hilling (1996) summarizes the important role of transport within this context:

> *"Many factors contribute to economic and social progress, but mobility is especially important, because the ingredients of a satisfactory life, from food and health to education and employment are generally available only if there is **adequate means of moving people, goods and ideas**" (emphasis added, p.6)*

The statement highlights the fact that adequate means of transport are essential to rural households in satisfying their daily need for mobility. Although transport interventions such as the improvement of physical infrastructure[17] or non-transport interventions[18] are viable, there is an evident case for focusing on the lower end of the transport network, hence the improvement of the second element of RTI in combination with the promotion and usage of intermediate means of transport. IMTs are seen as a promising transport solution that can benefit rural communities on various levels.

4.3.2 Characteristics of different intermediate means of transport

The price factor of IMTs combined with potential operation costs pose a financial obstacle for rural households. Nevertheless, studies show that people have been investing in them (Starkey, 2006, p. 85). IMTs differ on some common characteristics, including speed, safety, comfort, cargo, fixed and operating costs (Heyen-Perschon, 2001, p. 95). Among the common IMTs, the ***wheelbarrow*** is a small hand propelled vehicle that allows one person to move carriage of heavier weight than they might be able to carry by walking. By using ***handcarts***, people are able to move an even greater load than with a wheelbarrow. These two to four wheeled carriers are either moved by animals or one or more people. As such ***pack donkeys*** are commonly used to transport load. ***Oxen***, who do not like having carriage on their

[16] Classification refers to areas of responsibility for construction within a country. It is mainly done on the importance and function of the road.
[17] Road maintenance, improved footpaths etc.
[18] Relocation of services, improved telecommunications, etc.

backs, are primarily used to pull loads, on sledges or carts. The ***bicycle*** provides a combination of independence, versatility and economy. (Mozer, 2000, p. 3)

The application and design of IMTs in a specific area depend highly on the regional, social and geographical context as well as the characteristics inherent to specific means. Drawing from research on this topic, the following table highlights the performance characteristics of common IMTs.

Vehicle	Max. Load (kg)	Max. Speed (kph)	Max. Range (km)	Terrain/Route Requirements
Wheelbarrow	100	5	10	Flat, narrow path
Bicycle	75	20	20	Flat, narrow path
Bicycle with trailer	200	10-15	15-20	Flat, wide track
Bicycle and sidecar	150	10-15	15-20	Flat, wide track
Pack Animal	100-250	5	15-20	Hilly, narrow path
Animal-drawn sledge (buffalo)	200-400	5	10	Unsuitable for steep terrain
Animal-drawn cart (oxen)	500-1500	5	15-20	Flat, wide track
Motorcycle	100	40-90	100	Motorable path

Apart from performance indicators, the topography of a certain area is also relevant. Hilly areas are usually seen less appropriate for wheeled transport with no supportive conversion and thus favor pack animals (Riverson & Carapetis, 1991, p. 9-10). Infrastructure too is important. As such, the width of available roads and paths determine which means of transport might be suited best, with bicycles and motorbikes favoring single paths. The physical condition of the user also plays a role. Other aspects include the socio-economic background of households. A higher living standard leads people to choose a more "prestigious" means of transport, thus switching from IMTs to motorized transport (I-CE, 2007, p.17). However, in Africa, changes of income generally lead first to an internal IMT change – in other words the acquisition of a bicycle - and at a later stage the ownership of a motorized vehicle, preferable a motorbike (I-CE, 2007, p.17).

4.3.3 Barriers to the spread of IMTs in SSA

Limited utilization of IMTs in SSA is attributable to various factors and differs from country to country. A review on literature suggests the following reasons affecting IMT ownership. On the demand side, low-income levels and low purchasing power are one of the main barriers. Few mechanisms exist that allow households to get financial credit in order to purchase IMTs. Although women carry a high share of the transport burden, they often lack the financial resources or decision-making power to purchase IMTs (Banjo et al. 2012, pp. 109-111). On the demand side, IMTs are always in competition with other modes of transport, whereas the ownership of motorized transport (particularly motorbikes) is often the ultimate aspiration of rural households. Familiarity towards a certain mode of transport and the terrain of a certain region play another role (Barwell, 1996, p. 35). Due to the cultural link, improvements in this regard are inherently difficult. Limited demand affects the supply side, leading to higher prices (Starkey, 2002, p. 6). With government leaving the promotion of IMTs generally to the private sector, discrepancies between demand and supply undermine the staggering spreading of IMTs. On the policy side, governments tend to exclude or ignore the promotion of IMTs among potential solutions to improve mobility. This notion

includes the fact that the use of IMTs is associated with technological degradation (Riverson & Carpetis, p. 14). The lacking sensibility of governments is also reflected in the fact that IMTs, and bicycles in particular, often face high tariffs at the entry point (Gauthier & Hook, 2005, p. 11). Availability is further restricted due to the distant location of shops and rent or repair services from rural areas. This factor is reinforced as many SSA countries have no or weak manufacturing in the field of IMTs (Banjo et al., 2001, p. 110). This leads ultimately to a limited availability of spare parts and services, increasing IMTs operating costs of rural households and thus limiting its prevalence.

4.4 Bicycles in Sub-Saharan Africa

Mozer (2000) concluded "*rural cycling never hit the same kind of peak (as urban cycling), nor reached anything close to its potential*" (p. 4). To some extent, this statement might be ascribed to the barriers of entry that IMTs encounter in general as mentioned above. However, in the mid 90s a survey in Tanzania revealed over 58 percent of the participants rated the bicycle to be among the top transport solutions for mobility problems. Continuous projects and initiatives in SSA in the promotion of IMT led to bicycles gaining slow but steady recognition. As such, an assessment by Hook and Gauthier (2005) highlights "*despite the commonly held view that there is no culture for cycling in sub-Saharan Africa, much of Anglophone Africa (Kenya, Tanzania, Ghana) is buying more bikes than would be predicted based on their income levels. In fact, Ghana is buying more bicycles per capita than China*" (p. 11). This is not least due to the fact that bicycles are considered to the most versatile mode of transport among the IMTs and rural households cannot ignore the advantages that these two-wheelers bring. Looking at some key features, it becomes obvious that the strengths outweigh the weaknesses. Clearly, flexibility and the ability to transport cargo are among the main benefits. As aforementioned, price is one of the core hurdles to increased bicycle usage. Starkey (2006) states that "*in some areas, there has been a vicious circle of high price, causing little apparent demand, little supply and few support services*" (p. 86).

In rural areas, bicycles play an important role in providing access to basic necessities. The few studies that exist on this topic suggest that for medium distances of 20km, bicycles are the preferred mode. However, distances up to 100 km are possible (Starkey, 2006, p. 85). Heyen-Perschon (2001) shows that a bicycle can reduce the time spent on walking for a household by up to two hours per day. Men as the main users usually benefit the most, with a travel-time reduction of up to 52 percent. Women and children are able to reduce their daily travel time by 29 and 40 percent respectively (p. 177). As other studies confirm, this leads to approximately 200 hours of additional time for a household (Barwell & Malmberg-Calvo, 1989, p. 74; Sieber, 1996, p. 97). Bicycles can also be used for productive activities and the transport of people and goods. In that regard, the World Bicycle Relief for example showed that using a bicycle increases the transport capacity (in kg) by the factor 5 compared to walking (Barwell, 2002; World Bicycle Relief, 2013). Heyen-Perschon (2001) lists other positive socio-economic factors of the bicycle, including that it is relatively insensitive towards infrastructure, is compared to walking faster and less tiring, can impact the remoteness factor positively and can be used by different classes of society (kids, youth, old) (p. 102).

Table 2: Factors influencing the prevalence of bicycles

Strengths	Weaknesses

Flexibility (independence regarding choice and time of travel)	Limited range (distance)
Allows to travel from door to door	Security issue (vulnerability)
Limited impact on society (congestion, space consumption, environment)	Exposure to weather/ terrain
Limited skills required, easy to use	Although the initial acquisition costs are lower compared to motorized transport, they are still an issue
Ability to carry reasonable amounts of cargo (compared to walking)	Operating costs
Low costs per km travelled	Might be associated with a lower status
Simple technology (beneficial regarding maintenance and repairs)	

Source: Heyen-Perschon, 2001, p. 100-102; I-CE, 2007, p. 20; own data

The most common type of bicycle in rural SSA is the so-called one speed Roadster. These bikes are very serviceable and stable and thus make it possible to move heavy loads of cargo. However, problems are associated with tires, the inefficient frame geometrics and lower-quality materials that make them susceptible for breakdowns (Mozer, 2000, p. 4). Other types of bicycles, such as Mountain Bikes, are less common. However, as the case study will show, market share of these types of bicycles are likely to increase.

4.5 Concluding remarks

The previous sections highlighted the various aspects of rural poverty and transport, starting with basic characteristics of rural travel needs and patterns. In this regard, transport is essential when it comes to satisfying basic needs and hence accessing healthcare systems, schools, agricultural plots or financial institutions. Given the lack of motorized transport, the value and benefit of intermediate means of transport has been described for these purposes. In particular, some indications based on academic studies on the benefit of the bicycle have been given. The following case study will incorporate this information and add both quantitative and qualitative data in order to create a holistic picture of the role and impact of a bicycle for households in rural Nshamba.

5 CASE STUDY - The Role and Impact of Bicycles in Nshamba

The previous chapters have highlighted the role of transport within the nexus of rural poverty and development. In this regard, the case for better rural transport patterns has been highlighted, including the potential role of the bicycle. This knowledge is now put into practical context. The attention shifts from prior case study results and theoretical understandings to a concrete situation- the case of Nshamba. The following sections capture and assess the different aspects of bicycle usage in a rural village. This serves to better understand the local needs of the beneficiaries of the *Vijana Bicycle Center*, and ultimately support *Bicycles for Africa* and other bicycle organizations in their initiatives.

The following sections analyze and evaluate the various aspects of the research methodology that have been applied over the three-month research period in Nshamba village. Starting with introductory remarks on socio-economic aspects and mobility characteristics of this particular area, the analysis continues by evaluating a small traffic survey. This serves as a first step in understanding the relative importance of bicycles. Then, the focus shifts from the broad and rather descriptive perspective to the "microcosms," individual families. By using thematic analysis, different aspects of bicycle usage will be presented, discussed and put into context. An excerpt on the banana transportation business complements the section. A summary will collect the most important findings and conclusions.

5.1 Household characteristics in Nshamba

In order to understand the contextual conditions, the local characteristics of households in Nshamba will be described briefly. Tracing such data is not easy, particularly as hardly any indicators on the village level exist in English. However, data (in English) could be retrieved for either the district (Muleba) or regional level (Kagera). Wherever available, the lowest level of analysis has been selected.[19]

Rural Kagera with its substantially lower per capita income of US $447 compared to the national average (US $570) is considered to be one of the poorer regions of the country (Mulisa, 2014)[20]. Generally, poverty[21] is more distinctive in rural areas than in Dar Es Salaam, or other urban regions of Tanzania. Furthermore, the region is amongst the most populated areas. According to a 2012 consensus, Kagera counts 540'310 people, with an average household size of 4.7. Nshamba village totals 24'432 people. The main ethnic groups are the Haya and Nyambo.

Nshamba is predominantly rural and the majority of the villagers are engaged in subsistence economy. This is typical as household farming and agricultural cultivation is the main occupation and foundation for over 88.5 percent of rural Tanzanians. Most households are involved in the production of some sort of annual and permanent food and/or cash crop. Livestock (cattle, goats, sheep, pigs or chickens are common animals to keep) and symbolize extra money. Few are engaged as pastoralists. The most important food

[19] The following section compiles data from the following governmental sources and reports: National Bureau of Statistic, Ministry of Health and Social Welfare, USAid Tanzania. Other sources are highlighted within the text.

[20] Also within Kagera, there are stark contrasts, particularly between the very rural and urban regions.

[21] Using income-based calculations, the basic needs poverty line is TSH 36'482 (USD 22.8) per adult/month according to governmental data. The food poverty line is TSH 26'085 (USD 16.3). More than 30% of rural Tanzanians live below the basic needs poverty line, whereas another 11.3% live in extreme poverty.

crops (and as such staple food) in the region are bananas (matoke[22]) and beans. Maize, cassava, sweet potatoes and groundnuts are considered to be other important annual crops. Additionally, fruits (e.g. mangoes, pineapples) and other vegetables (tomatoes, green tomatoes, cabbage) complement the diet. Coffee is the main cash crop grown in the area[23]. The production of food and cash crops is dependent on the climate patterns of the area. Typically, most of the crops are grown during the wet seasons, of which the short one lasts from September to December and the long one from March to May, with the temperature in Kagera ranging from 20 to 28° degrees Celsius (Gov. of Tanzania, 2012, p. 23). As Nshamba is located on an elevation, the minimum temperature is likely to be lower.

Agriculture production leads to the creation of other businesses and trade activities, such as buying and selling of crops, processing raw materials, manufacturing of simple goods for sale and end-user consumption. Non-farm sector activities are also common, including the transport and distribution of water, stones, fish or wood. Some people are involved in small businesses, such as shops with basic necessities, coffee rooms or services of different kinds (e.g. maintenance, repair, hair cut).

The village itself has rudimentary infrastructure. Homes are commonly constructed with mud bricks and roofed with corrugated iron sheets, grass or leaves. A power grid supplied the village with electricity. However, as electricity is a cost factor and power-cuts are not unusual, paraffin lamps are a widespread (and costly) source of lighting. Simple solar power devices are also used. Water is available at a protected water source near the village. However, other sources include collecting water from the local rivers or uncovered (and less often covered) rainwater catchments. Pit latrines are commonly used toilets in the region. A last characteristic is Nshamba's hilly landscape, resulting from a series of mountains running north-south, parallel to the Lake Victoria (Gov. of Tanzania, 2012, p. 5). Therefore, moving around usually involves climbing many slopes.

5.2 Transportation and mobility in Nshamba

The next step is to understand the local context with regard to road infrastructure and availability as well as characteristics of different modes of transport. This will serve as the necessary background information for evaluating the traffic survey. Annex V shows the map and road structure of Nshamba.

5.2.1 Road network and infrastructure

The road network in Nshamba is rather simple. Four unpaved earth roads pass through the village center, of which three are part of the regional road network[24]. The two main regional roads link Nshamba with its district capital Muleba to the East as well as the regional capital Bukoba and the Ugandan capital Kampala to the North via Kamachumu/Muhutwe. Muleba and Muhutwe provide access points to the national paved trunk road system. The remaining earth roads link Nshamba with smaller villages such as Bunyagongo to the West and Bugarama/Biirabo to the South. For the time being, these roads were seen to be in good condition. The routes were passable with any kind of transport during dry periods. However during rains, some track parts leading to more rural areas (e.g. Ngenge) suffered erosion and were hardly passable.

[22] If the fruits are green (mature), they are harvested and then either peeled, boiled or steamed and can be mashed before consumption.
[23] In other regions of Kagera, cotton and tea serve as cash crops too.
[24] The Ministry of Works as a branch of the central government is responsible for the maintenance of these roads.

Another pillar of Nshamba's road infrastructure represents the interwoven network of unclassified feeder roads, footpaths and trails. These mud tracks are important collector routes, connecting the smaller villages, wards and sub-wards to Nshamba and often cut through banana plantations. Maintenance is largely left to the villagers. During rain, the mud ground is a slippery mess and it becomes difficult and dangerous to pass, particularly for two-wheelers.

5.2.2 Intermediate means of transport

IMTs in rural Nshamba consist mainly of bicycles. The Chinese Phoenix-brand is by far the most common type. The single speed Roadster is popular due to its rough underground and suitability for heavy loads. Other models include the Mountain (MB) or Touring Bike (female or male version). However, these bicycles do not enjoy the same visibility and prevalence. Most of the MB and Touring bikes are supplied by VBC, however not exclusively. Few local mechanics also offer City or Mountain bikes[25] (Phoenix brand) in their assortment. Apart from the obvious quality difference, most of the Swiss bikes are recognizable by the typical and unmistakable red insurance plaquette fixed to the carrier.[26] Other IMTs such as donkey/ox drawn carts or wheelbarrows are hardly seen.

5.2.3 Motorized means of transport

The availability and prevalence of motorized transport in the rural region, with the exception of motorbikes (or pikipiki) is very low. Here, the Chinese brand SANGL dominates the market. Pikipikis are either used for personal transport (to carry people or goods) or to transport passengers commercially (sekido service). Sekido drivers can be seen at every big junction or taxi stop. Few collective taxi services (daladala, capacity of approx. 20 people) run infrequently to and from Nshamba to bigger villages or cities such as Muleba (approx. 13km), Biirabo (approx. 8km) or Bukoba (approx. 75km). People can embark on or leave the taxi along the way. Fares usually depend on the distance travelled.[27] Only a few people own cars or trucks.

[25] In the following, Mountain and City bicycles are taken together and classified as VBC bicycles.
[26] An overview of different types of bicycles can be found in Annex VI.
[27] A sample ride from Nshamba to Muleba (15km) costs TSH 1500 (0.93USD).

5.3 Traffic survey: measuring the relative importance of bicycles in Nshamba

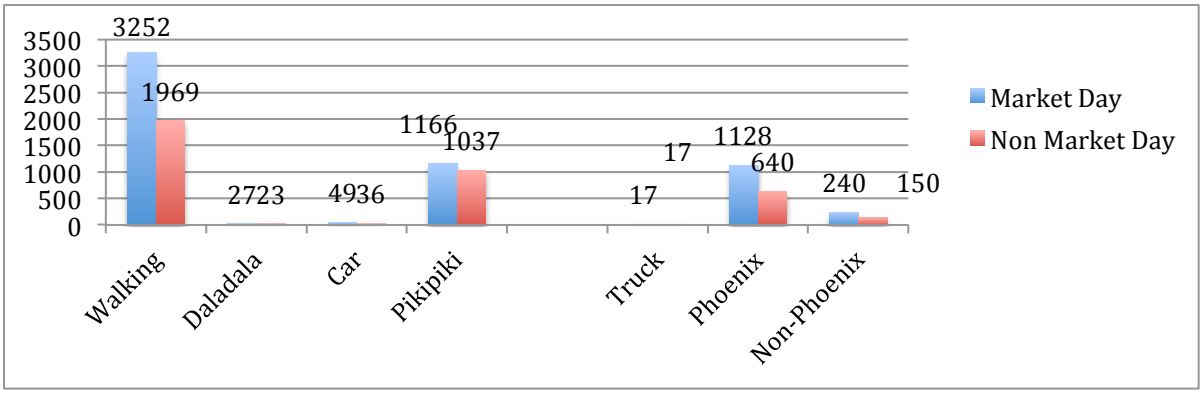
A first step in evaluating the relevance of bicycles would be to look at bicycle ownership numbers in Nshamba and compare them to other means of transport. Unfortunately, no such data exists. Given this lack of information, a small traffic survey was conducted in December 2013 in order to gain an idea on the prevalence of bicycles. Six main routes to Nshamba coming from nearby villages were identified (four main mud roads; two footpaths). Two student enumerators were stationed at each of the six routes and counted inward traffic on (a) non-market day when little traffic was likely to happen (Wednesday, December 4th) and (b) on market day when villagers come to the center of Nshamba to attend and shop at the weekly market (Saturday, December 7th). Counting started at 7a.m. and lasted until 12pm[28]. The results are of descriptive character and highlight the status quo of mobility patterns in the area at a particular time. This will serve as the starting point for deeper analysis. Detailed information on the technical and administrative aspects of the survey is given in Annex VII.

As counting took place for five hours only and on two days in a particular period of the year (with the weather being dry and the roads easy passable), the results doe not capture all the movements and therefore must be treated with caution. Nevertheless, it gives an approximation of the relative importance and prevalence of different means of transport in Nshamba area, including bicycle usage patterns.

5.3.1 Overall traffic movements

Taking the two days together, a total number of 9'749 movements were recorded. Non-market day accounted for 3'871 (40 percent) of the movement whereas market day was responsible for 5'878 (60 percent) movement. Figure 6 contrasts the share of different means of transport for the two days. It becomes obvious that the overall traffic movement on market day was substantially higher. Markets usually attract more people from and outside the region. As such, the number of pedestrians coming to Nshamba increased by 79 percent. The share of bicycles also rose substantially, Phoenix increased by 76 percent and non-Phoenix[29] by 60 percent. With regard to recorded motorbikes, sitings increased by 21 percent. The amount of other motorized transport remained fairly constant.

Figure 6: Traffic movements by mode of transport; two-day comparison

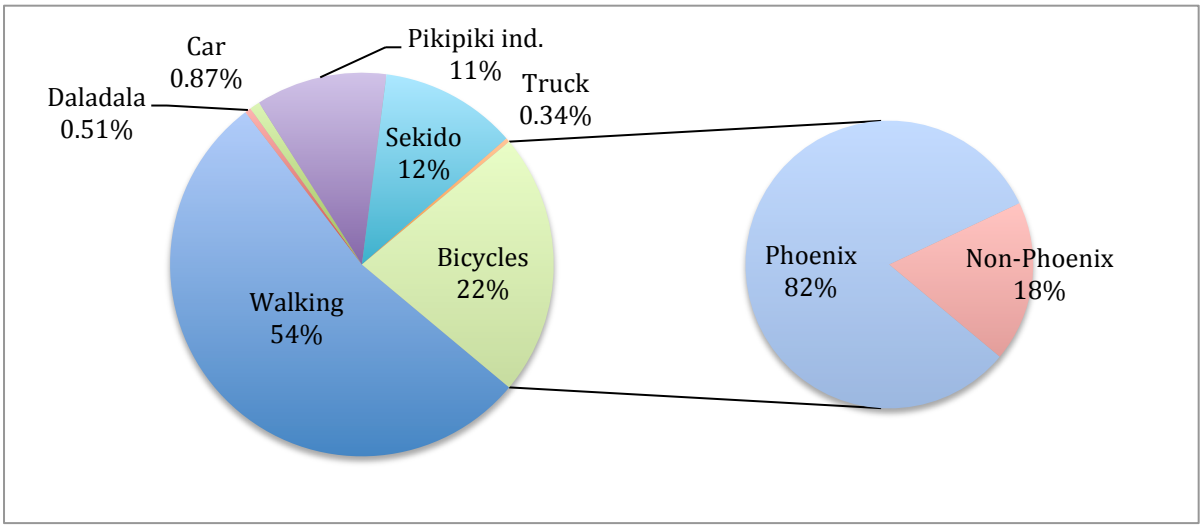


[28] The specific time was chosen for the sake of comparability, as the market starts in the morning and lasts until noon.

[29] Non-Phoenix include **all** types of bicycle other than Phoenix. Although no further distinction was made within this group, it can be said that most of them were Swiss Second-hand Mountain or City bikes, most of them are recognizable thanks to the red insurance plate.

Using the aggregate amount of movements over the two days, the slices of the pie chart below emphasize the prevalence of different modes of transport. The chart highlights walking as by far the most common way for people to move (54 percent). This result is congruent with other studies shown/mentioned earlier. Interestingly, bicycles account for the second biggest group (22 percent) measured with every fifth movement being a two-wheeler.

Figure 7: Share of different modes of transport: aggregate of both days



Among the motorized transport, more than 50 percent were sekido drives. This involved the commercial transport of passengers. These drivers were likely to be counted multiple times. By way of contrast, all car drivers, trucks and daladalas[30] combined reached slightly more than 1 percent, indicating that motorized transport is very rare in this region[31]. Bicycles showed some distinctive aspects. The majority of bicycles recorded were Phoenix. They dominated the share of bicycles by a ratio of more than 4:1 (82 percent to 18 percent). Given that VBC started selling secondhand bikes in 2011, an estimated market share of approximately four percent by the end of 2013 can be taken as a first benchmark for future studies. The data also allows to determine other bicycle-related information.

5.3.2 The gender aspect

Figure 8 demonstrates two distinctive aspects with regard to gender and the bicycle. First, men are the main users of bicycles. Second, riding bicycles is not reserved to men only. One in ten bicycle users were female. This gives a first idea on who are potential beneficiaries of bicycles. The bar chart offers further insights on how the gender ratio looks between the Phoenix and Non-Phoenix riders. It becomes evident that the ratio between male and female Phoenix users is more distinct (13x) than among non-Phoenix users (3.4x). This instance will be discussed as a part of the network analysis in Section 12.

5.3.3 Transportation of cargo

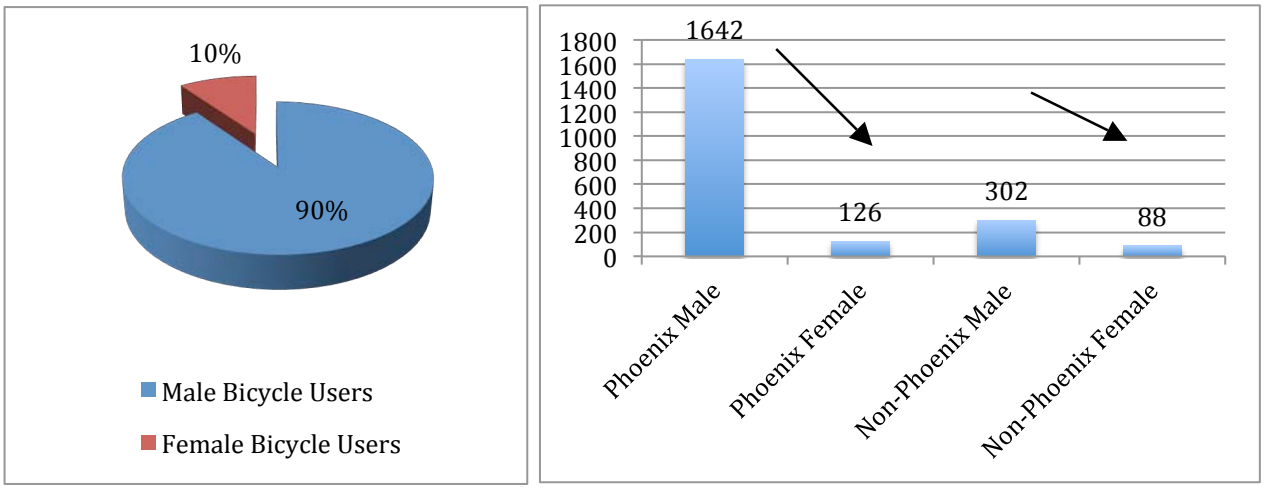
In rural areas, a lot of movement takes place in order to transport small loads, including commodities and people. This was reflected in the traffic survey. Data from the market day survey shows that one quarter

[30] It should be noted that a full daladala carries approximately 20 persons. However, the focus was on the vehicles only. No projection was made on the share of persons arriving together in a daladala.

[31] This result reflects national statistics, which state car ownership to be less than 1 percent in rural areas.

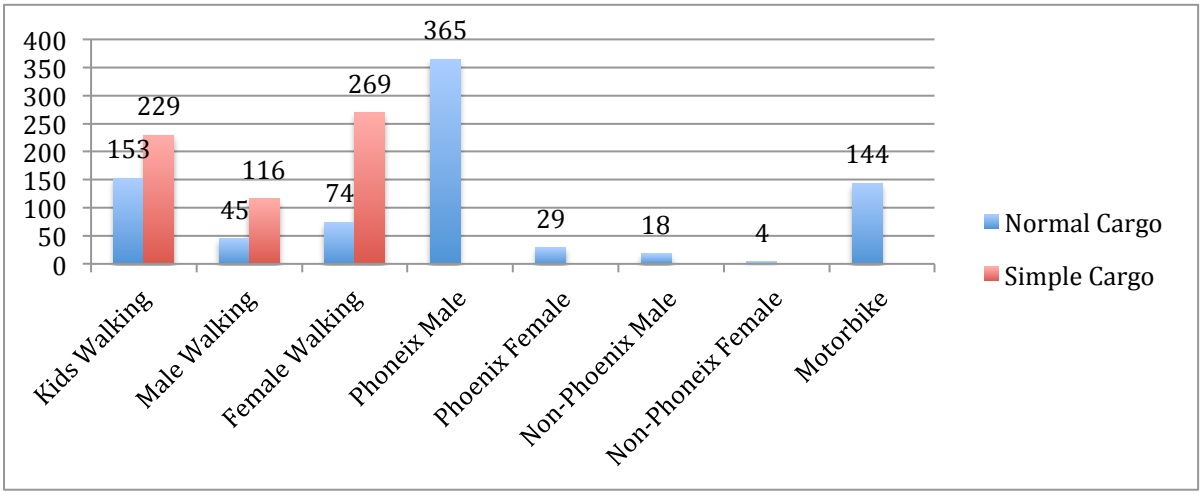
or 26 percent of all movements included the transport of some form of carriage[32]. Figure 9 gives an indication about gender related transport patterns in relation to different modes of transport. By looking at the different modes, it can be said that walking, taking simple[33] items and real cargo together, is by far the main mode for the movement of commodities. Enumerators recorded people head-loading bunches of bananas, sleeping or sitting mats, bundles of clothes and sacks of plastic buckets with all sorts of vegetables (cassava, cabbage, tomatoes).

Figure 8: Gender aspect of bicycle usage



People were also carrying small animals such as chickens or simple wooden bed frames. Children particularly were engaged in carrying carriage on their heads. The Phoenix bicycle was among the modes used to transport heavy loads, including up to four crates of soda or beer, multiple sacks of maize, cabbage, cassava, eggplant, pineapples, tomatoes or the typical amount of three to four bunches of bananas. Massive bundles of grass, banana fibers, sugar cane or firewood were also typical commodities transported on the back of Phoenix bikes.

Figure 9: How and by whom is cargo transported



[32] Cars, trucks (impossible to assess) and sekido drivers (transport of people only) have been excluded from this assessment.

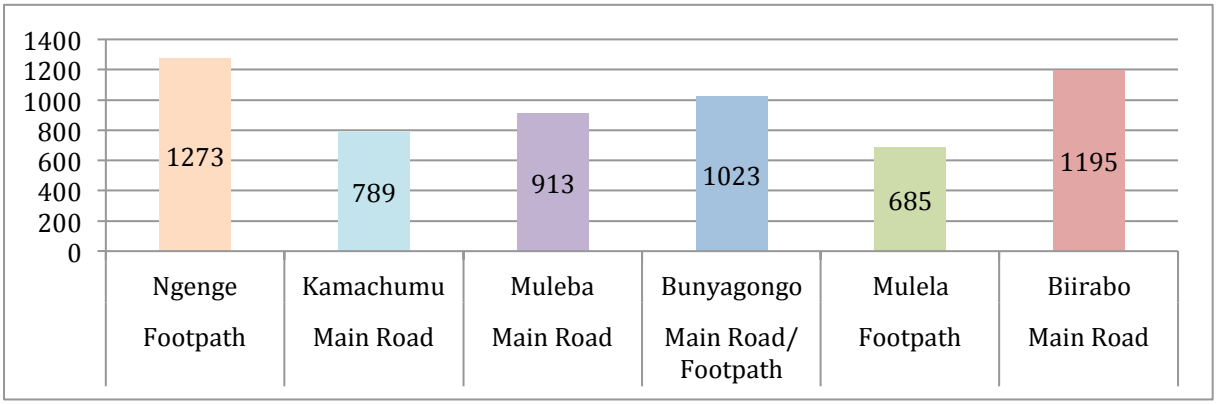
[33] Simple refers to items such as a plastic bag, handbag, shoulder bag, backpack.

It seemed few differences existed between the type and maximum load of carriage that was transported by Phoenix bicycles and motorbikes. Generally, loads are either tied on the back carrier with a rubber band or fixed to the top tube. When it comes to increasing the transport capacity, people become very creative and there are hardly any limits. Some impressions can be seen from the pictures below. However, loading the bicycle to the maximum forces people to push it. It was also very common to see children or other people helping to move the bicycle, particularly on slopes. That is another indication of additional porterage fees. On the contrast, non-Phoenix bikes were visibly loaded with less heavy cargo, carrying mainly simple bags, small boxes and canisters of soap, milk or a maximum of one bunch of matoke.

5.3.4 Modes of transport in relation to different types of infrastructure

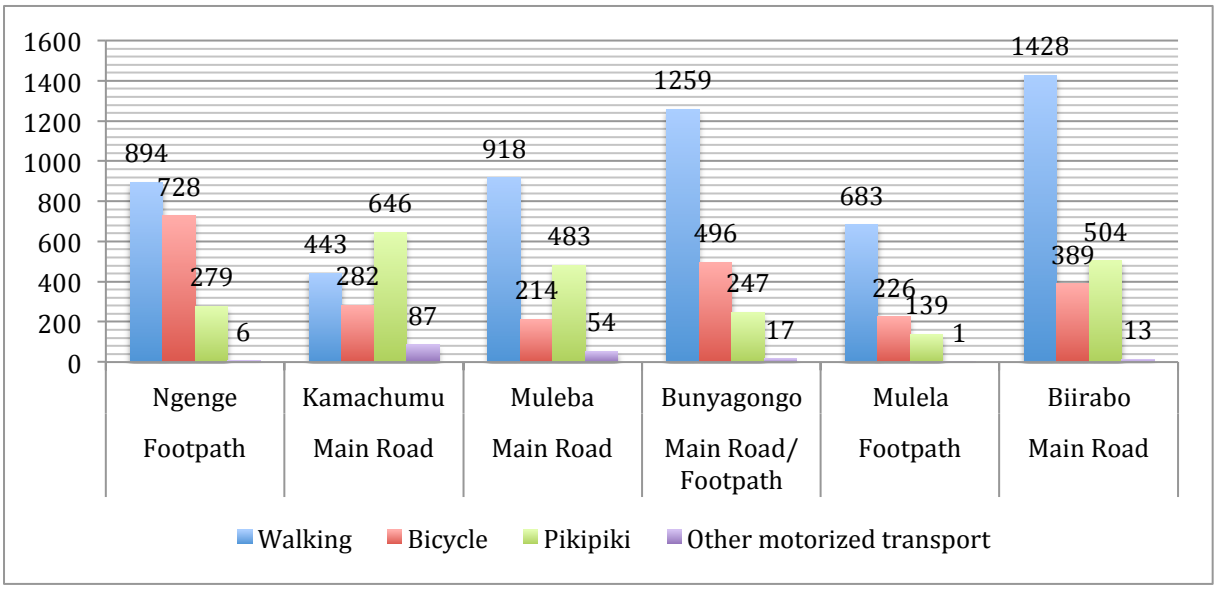
Another aspect is to look on which surface/road type traffic movements take place, particularly movements with the bicycle. This might give further insight on the quality of bicycles or tires needed. It is intuitive that main mud/earth roads are of better quality than footpaths. By looking at the overall distribution of traffic on the market day only, we see the footpaths coming from Ngenge/Kishuro as well as Bunyagongo among the top three frequented routes. This shows inevitably the importance of these feeder pathways and undermines the footpaths that are recognized as basic infrastructure.

Figure 10: Total traffic distribution on market day



Footpaths are particularly crucial for bike riders, as Figure 11 indicates. It highlights that the highest numbers of inflow traffic by bicycles was counted on the feeder footpaths coming from Ngenge and Bunyagongo.

Figure 11: Mode of transport versus road type



Although motorbikes also pass over trails, motorized traffic as a whole is substantially lower. On the market day, the overall ratio of people coming to Nshamba on footpaths (Ngenge, Wakati, Mali Juice) with bicycles compared to motorbikes was two to three times higher, as Table 3 concludes. This difference is remarkable.

Table 3: Comparing road type and bicycle/motorbike traffic

Location	Type of Road	Bicycles / Motorbike ratio
Ngenge	Footpath	**3.3**
Kamachumu	Main Road	0.43
Muleba	Main Road	0.39
Wakati	Main Road /Footpath	**2.09**
Mali Juice	Footpath	**3.26**
Biirabo	Main Road	0.9

5.4 Summarizing the main insights from the traffic survey

The traffic survey allowed a first impression on the importance of different means of transport in rural Nshamba as well as various bicycle-relevant usage patterns. The following points summarize the abovementioned:

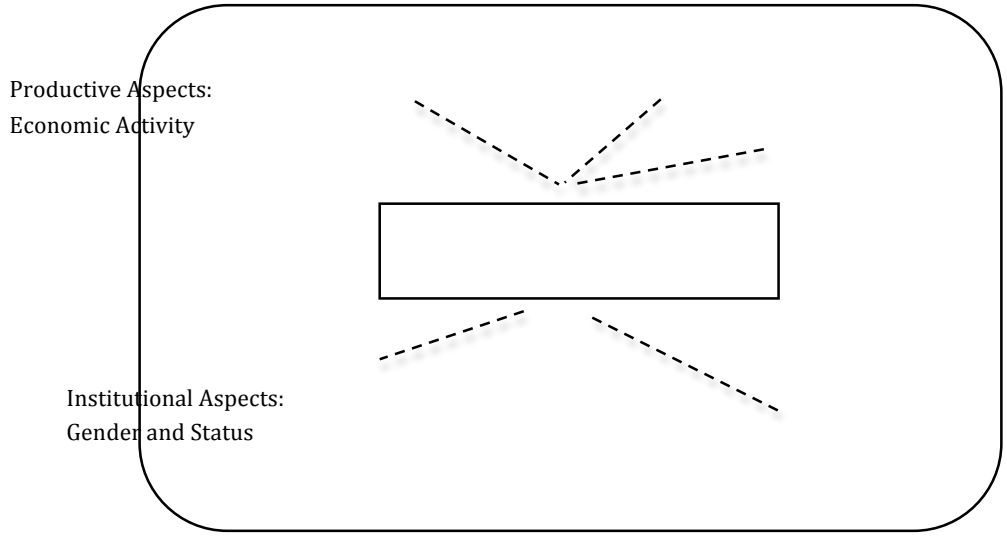
Walking, cycling and using a motorbike are the core modes of transport in the Nshamba area. However, walking is by far the most prevalent mode, be it for personal mobility or the transportation of commodities. Bicycles have a major stake in the transport of people and goods. Motorbikes are either used for commercial purposes (sekido) or for personal usage. The former is very distinct, whereas motorbikes for the personal movement of people and goods are less pronounced. The Phoenix is the predominant type of bicycle, especially among men. Although riding bicycles is not exclusively for men, their share is substantially higher. The difference among non-Phoenix users is less distinctive than among Phoenix riders. When it comes to transporting commodities, the Phoenix bicycle is the primary mode of transport.

Collective taxi services exist, however they make up only a small percentage of total traffic. Ownership of motorized transport such as cars or trucks on a whole is low.

The traffic survey inevitably revealed some important aspects on traffic patterns. The bicycle is the most prominent mode of transport after walking. Moving from the descriptive to interpretive, analytical approach the next section will identify the manifest and latent reasons that are likely to explain this high share of bicycles within the community.

6 Thematic Analysis

The traffic survey allowed a first insight into the relative importance of bicycles in the Nshamba area. It was observed that the bicycle is the most prominent mode of transport after walking. The following sections will use the data from the interviews to further understand the role of the bicycle for rural households as well as the potential impact on a family's economic, reproductive and social development. Using thematic analysis, six global themes of bicycle usage have been identified. The first theme uses data to discover the rationale behind buying a bicycle. The material in this section will further be used to frame and contextualize the remaining five topics: 1) economic aspects, 2) economic impact, 3) reproductive and social aspects, 4) vulnerability and resilience as well as 5) institutional aspects.



6.1 Socio-economic background of interviewees

The following table highlights the core characteristics of the interviewees. A total of 42 persons were interviewed. The ratio between VBC bikes and Phoenix users was balanced[34]. The large majority of interviewees were male.

The average interviewee's household size was slightly larger than the national average, amounting to five people. This number refers to the immediate family living in the same residence as the interviewee and excludes extended family members[35]. The majority of the interviewees mentioned more than one source of income. However, sales were the predominant business activity. This includes the sale or resale of commodities such as bananas, water, fish, stones or vegetables. Other sources of income are generated as a teacher, photographer, pastor, carpenter, doctor or farmer.

[34] Only few interviewees had both types of bicycles.
[35] The concept of the extended family is typical for African communities and usually involves a larger group of related and unrelated people beyond the immediate family.

Leisure
Job related

Table 4: Socio-economic characteristics; interviewees (n=42)

		Non-Phoenix	Phoenix	
Type of bicycle user		22	20	
				Average
Age	Media	33.3	37.5	35.5
	Min/Max	25/54	19/70	
				% of total
Sex	Male	19	16	83%
	Female	2	5	17%
				Average
Average Household Size		4.1	5.9	5 (Nat. Average: 4.7)
Other means of transport within the household (n=38)	None	25		
	1	10		
	>2	3		

7 Rationales for buying a bicycle

The first global theme pulled together background information about the context and conditions for buying a bicycle. This process turned out to be deliberate and enduring. Three organizing themes encompass this aspect:

- *Expectations:* To buy a bicycle demands a substantial investment for poor rural households. People have concrete expectations regarding the purpose that the bicycle is going to serve.
- *Saving Period:* To purchase a bicycle is an enduring and deliberate process.
- *Decisive Experience*: To acquire a bicycle is a decisive experience. This is underpinned by the fact people remember many details about the purchasing process.

7.1 Expectations

In order to address this topic, interviewees were asked the baseline question "What were your expectations and considerations in buying this bicycle?"[36] in order to ascertain their rationale behind the bicycle purchase. Capturing this rationale is crucial as it sets the framework for understanding the scope of activities that the bicycle is likely to be used for. The data analysis reveals two crucial aspects. First, there are five recurring topics concerning potential considerations when buying a bicycle:

The bicycle is expected to…

1. Improve the ease of working
2. Reduce unproductive time spent on walking
3. Help increase productivity
4. Establish income activities
5. Serve as a convenient means of transport for leisure activities or save transportation costs

With more than 80 percent of the responses in this field (25 out of 30), job related references were the main reasons why interviewees considered buying a bicycle. Respondents linked the bicycle directly to

[36] The question was directly addressed to 30 of 42 interviewees (71 percent). The following calculations are based on these 30 respondents.

income-generating activities. As such, the bicycle was expected to bring relief regarding head loading, reduce the commuting time to the workplace, increase the capacity in transporting commodities or ultimately, to enable the engagement in new business activities. Table 5 below highlights some examples.

Table 5: Expectations when buying a bicycle

What were your expectations and considerations in buying a bicycle?	
Basic Themes	**Quotes**
Improve the ease of working	• *The main thing that prompted me to buy the bicycle was my work as a pastor. I was travelling so long on foot, so I decided to buy a bicycle in order to simplify my journey. (Painter M, PH)* • *I used to carry heavy load on my head. But I felt so tired, so I decided I need a bicycle (B-woman L, PH)*
Reduce unproductive time spent on walking	• *For me, it was mainly to help me reach work. That was the idea. (Teacher D, MB)* • *My intention was to use the bicycle to come here to Nshamba, where I used to work as a teacher. (Teacher O, MB)*
Help increase productivity	• *The reason for me to buy a bicycle was to help me increase my productivity (from 1 bunch of bananas to 4). (Banana Transporter R, PH)* • *If you think about my mission (as a pastor), I need to reach people everywhere (…). So I needed the bicycle to reach more people in less time. (Pastor B, MB)*
Establish income activities	• *The reason that prompted me to buy it (the bicycle) was that I needed to supply my family with food. So I expected to use it to find a source of income. (B-man H, PH)* • *When I grew up, many people were already using a bicycle. So at that time I also wanted to start working with the bicycle. That's why I wanted to buy one. (Dagaa Seller J, PH)*
Serve as a convenient means of transport for leisure activities or save transportation costs	• *I bought the MB with the expectation that I am going to use it in my free time, not for work. (Lucian, MB)* • *I thought of many things, I can't mention all. (…). If you use it to move from one place to another, it comes with high costs if you have to hire another means of transport. (Banana Broker J, MB)*

The second aspect relates to the rationale of the bicycles that people bought. Among Phoenix users, "Improve the ease of working" and "Establish income-generating activities" were the two main arguments. The factor "Productivity" was hardly considered and mentioned once. For VBC riders, "Improve the ease of working" was also the most common answer, followed by the "Reduction of unproductive time" and "Increase in productivity". Here, no reference was given to "Establish income-generating activities". These differences offer a first indication that the type of bicycle has a direct link to someone's planned or actual field of work.

To summarize, the majority of people interviewed expected to use the bicycle towards some form of income-generating activities. In that sense, the bicycle is expected to have practical relevance and is supposed to serve as a functional tool. Only for a handful, the bicycle was supposed to be used for leisure and hence does not represent a direct impact on job related activities.

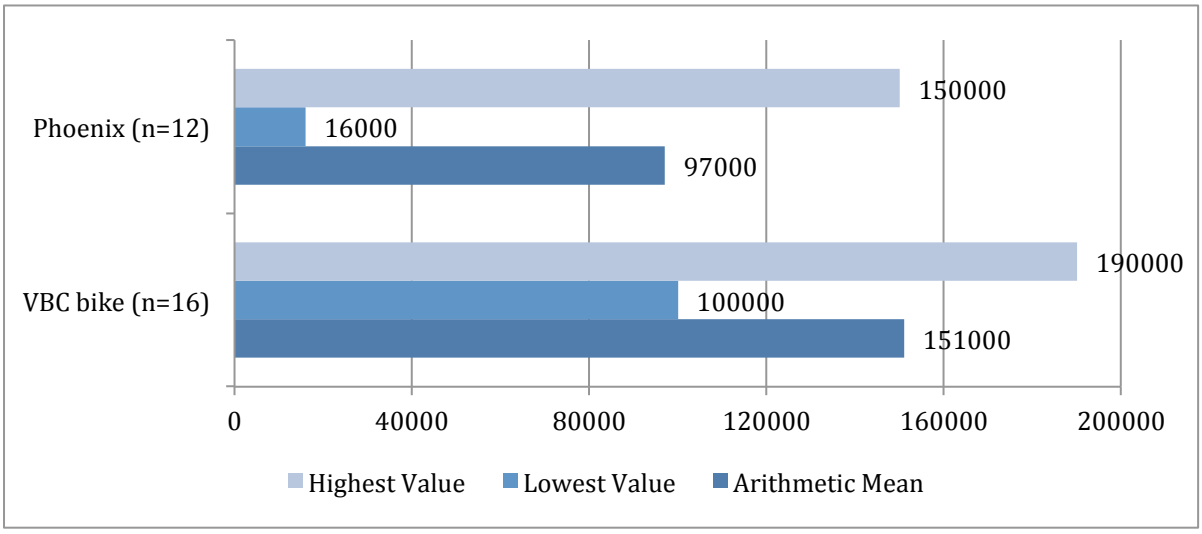
7.2 Saving period

Buying a bicycle demands a long-term financial investment. Taking the specific data from the interviews, the graph below shows the average price paid by the interviewees per bicycle[37]. Figure 13 indicates

[37] Against the backdrop of a steadily rising inflation and for the sake of comparability, only purchases from 1995 onwards were considered.

average prices of TSH 97'000 for a Phoenix and TSH 151'000[38] for a VBC bike, respectively. It should be noted that among the Phoenix owners, almost 50 percent bought a secondhand model instead of a new one due to the lack of financial resources at the time of purchase. That average expenditure levels of TSH 97'000 and TSH 151'000 are considered to be substantial investments becomes evident when recalling the average per capita income levels for Kagera of USD 447 per year or roughly USD 40 (TSH 65'000) per month.

Figure 13: Average prices paid for a bicycle 1995 – 2013



The interviews revealed that the decision to buy a bicycle was followed by a short to medium term saving period, as interviewees did not usually have the required liquidity for such a substantial investment. Depending on the individual socio-economic situation, the saving period regularly extended over several months, in some cases up to some years.

As Table 6 depicts, a short term saving period between two to five months was the most common case. However, it was not unusual to undergo a five to 12 and 12 to 18 month period of deliberate saving. Only few interviewees mentioned saving periods of more than 18 months, with one case that was saving for over six years. The overall average time period of saving was approximately 10 months.

Table 6: Approximate saving periods, number of references given (n= 25)

	2 – 5 months	5 – 12 months	12 – 18 months	> 18 months	Average
Phoenix	1	4	4	1	**17.5**
VBC	**11**	1	3	0	6
Total references	**12**	**5**	**7**	**1**	**10.3**

The interviews also revealed the distinctive difference between saving periods for Phoenix and VBC bikes, with the former being on average a substantially longer saving period. Clearly, every household has their own story linked to their particular socio-economic situation when it comes to buying a bicycle. However, one possible argument to explain this difference between Phoenix and VBC bikes links this instance to the fact that VBC riders are more likely to be engaged in an income-generating activity that offers a regular

[38] As of December 2013, the price for a new Phoenix was TSH 150'000 (approx. 90 USD). Mountain Bikes and City Bikes were sold at VBC between TSH 100'000 up to TSH 250'000.

monthly pay check and thus money can be accumulated faster (see section 8.1). Phoenix users often have their own small business and generate income and profits on a daily basis. This indication is supported by the fact that among VBC users, those who are entrepreneurs and also self-employed (such as a photographer for example), saving periods are distinctively higher and comparable to the ones seen from Phoenix bike users (> 12 months). The following two statements exemplify these two different circumstances.

"I had a plan to buy a bicycle. Actually, the salary would be good enough to buy a new bicycle. (…) it took me three months." – Teacher S; VBC bike, saving period 3 months -

This businesswoman selling vegetables on the other hand showed the dependence on several rounds of harvest to accumulate enough liquidity.

"It took us almost one year. For tomatoes to get ripe, it takes three months. It took us three rounds of harvest in order to get the money ready". – B-woman J; Phoenix, saving period approx. 12 months -

What also became evident is that such a saving process inevitably demands not only a deliberate plan but also the necessary commitment. The following interviewee put it bluntly:

"To me, there were many things I had to forego. It had a clear-cut plan. (…) I needed to find priorities and forego these things in order to get a bicycle, first". – Teacher A -

The interviews showed that such a savings period demands people to apply concrete saving strategies and undergo serious financial cutbacks, which ultimately affect their already low living standard and fragile lifestyle.

7.2.1 Saving strategies

Eight different basic themes emerged out of the interviews. These themes can be converted into three groups of actual strategies, including consumption, financial-based strategies and strategies associated with taking up risks.

Possible saving strategies

1. Forego simple personal consumer goods
2. Forego simple consumer goods for the whole family
3. Postpone asset investments
4. Accumulate assets in order to sell them later
5. Put aside small profits from the business
6. Join a savings or credit cooperation
7. Take up debts
8. Suspend necessary expenditures temporarily

7.2.1.1 Consumption-based strategies

Consumption-based strategies were seen to be a practical way to save money. On the one hand, interviewees mentioned cutbacks regarding personal or family expenditures towards simple goods, such as mobile vouchers for the phone or clothes. On the other hand, saving also affected individual or a

household's diet, leading them to doing without "expensive food", such as meat or fish. This was well articulated by a businesswoman selling vegetables:

"I stopped everything, including some necessities for the family. For example, I decided not to eat well or buy new clothes or eat fish." – B-woman B -

The term "luxury" goods was named several times. Following up on this expression showed that "luxury goods" were a common term used by young men to describe small snacks, drinks or even alcoholic beverages, as by this banana dealer:

"Yes, mainly I forewent luxury goods. (Interviewer: Tell me, what's that?). For example, you have made a profit of 5000 in one week. Then on Sunday, you go to a bar and buy soda and eat chips. So the 5000 will be gone quickly. In only one day, it's over". – Water Seller J -

7.2.1.2 Financial strategies

Another common basic strategy included the omission or postponement of some planned investments for the unknown future in order to have enough liquidity for the present. This also shows the high value of the bicycle compared to other assets within a household.

*"First I decided **not** to buy the goats. I haven't bought the cow yet either". – B-woman B -*

It is intuitive that the omission of investments is not an isolated strategy but rather goes along with other cutback strategies, such as consumption-based restrictions. Several interviewees spoke of the mixed-saving approach, as this businesswoman reiterated:

"For example, we postponed some investments or acquisitions. As such, I did not buy a goat. First we wanted to buy the bicycle. Also we did not buy the additional land that we planned to acquire. At that time, we would also forego meat and eat only mchicha[39]. – B-woman MA -

Instead of postponing or omitting investments, some interviewees particularly acquired or invested in new assets in order to "store" money in non-financial assets. With lacking financial institutions and few secure savings options in rural areas, this strategy seems to be an expedient and pragmatic way. Also, some assets are likely to increase in value over time and as such would yield additional profits (e.g. rearing of goats or chicken).

"At that time, I did not save money. What I did is I bought with my little profits one after the other chickens and later also a goat. Then, when the time was ready, I sold everything and bought a bicycle." –Dagaa Seller D -

Relying on investments to payoff revealed to be an enduring and long-term strategy, as the following statement by a security guard at Rubya hospital shows. He describes the continuous and steady accumulation of money that finally led to the purchase of a bicycle.

"(…) So when I got the new job at the hospital, they gave me a loan. With this loan, I was able to buy a shamba[40] (…). I invested a lot of time to improve the harvest in order to have enough food for my family. As a consequence, the harvest (…) allowed me to spend less money on buying food. So with this new capital inflow I managed to start saving money. (…) Furthermore, the salary and this additional income allowed me then to buy cattle. Finally, in 2011, I was able to buy again a mountain bike from my savings." –Security Guard S -

39 Swahili expression for amaranth leaf.
40 Swahili term for a piece of land used for farming (not to confuse with garden).

A third trend in this field related to the saving of profits resulting from business activities. On the one hand, these profits were yielded from casual labor, as this businessman stated:

"I used to care for someone's cattle. I saved the salary I got from this job and managed to buy a bicycle." – B-man E -

On the other hand, selling harvest was another way to accumulate liquidity. Obviously, the success of this strategy was closely linked not only to the harvest cycle of vegetables or fruits but also to the amount and quality of the harvest. For people engaged in the selling of such commodities, this was expressed as a very promising option.

"After harvesting, I had money available from selling. But you know, when we started cultivating the tomatoes, we had a plan to buy this bicycle." – B-woman J -

Last but not least, an option particularly mentioned by women was the participation in a savings or credit cooperative. The goal of such a cooperative is to provide members with the necessary financial liquidity or loans to do a bigger investment and also encourage saving habits. Generally, cooperatives consist of members of the same occupation or community. The cooperative requires each participant to contribute on a weekly or monthly basis a specific amount to the overall account of the group.

"We have cooperation for women. We are 12 women and everybody of us has to contribute 10'000 per week. So every month, someone gets 120'000 TSH. For my case, I decided to buy a bicycle after 6 month of contributing". - B-woman MA -

Every week or month respectively, one member receives the total amount in the 'cash pot.' Members of these groups are advised to spend the money on a productive asset rather then on short-term benefits. The bicycle is considered to be such a productive asset.

7.2.1.3 Risk strategies

In expecting the bicycle to deliver profits in the future, some interviewees mentioned borrowing money as a viable option. This strategy is fraught with risk, in the case the bicycle fails to meet the buyer's expectations, in other words earning enough money to pay back the debts. The most extreme case of taking risks was encountered by the following interviewee. He would even suspend the payment of school fees for his younger brother in order to buy a bicycle.

"I decided not to support my younger brothers school fees for some time in order to get a mountain bike first. After having bought the bike I planned to pay back these debts." – Photographer L -

However, this was a rare case among interviewees and the majority were not willing to take such high risks. In this regard, suspending school fees for children was inconceivable, as well emphasized by this businesswoman:

" I stopped everything (…). The only thing I continued was to support my kids in school (fees). – B-woman B -

That people recall so many details about the time when they were saving for a bicycle leads to the last organizing theme.

7.3 Decisive experience

Interviewees were generally full of vim and vigor when asked about their past considerations or expectations for buying a bicycle, the price paid or the duration of the savings period. People remembered

various details of the buying process. Lots of interviewees presented even an anecdotal reference, such as this water seller:

"At that time, I was a casual laborer. But than, a friend's wife needed to go to the hospital and her husband asked me to support him with 8000. So in return, he wanted to give me his old bicycle (as a deposit). But it was bad. So I started buying spare parts until it was in a good shape. At the end, I bought it for 8000 from him. That was in 1997. In 1999, I sold this one and bought another Phoenix" –Water Seller A -

That people remember many details about the bicycle-purchasing process is an indication of the value that is attributed to the bicycle. This also links to the substantial saving period that people usually have to endure.

7.4 Preliminary conclusion I

The survey results show that the majority of people plan to buy a bicycle in order to use it for income generation. Only few buy a bicycle for leisure purposes only. In that sense, households usually have high expectations regarding the impact of a bicycle. However, buying a bicycle is a deliberate and enduring process and demands a substantial investment. Households undergo a period of financial strain that goes along with serious cutbacks, affecting household expenditures, investments and consumption patterns. There is a wide spectrum of strategies to accumulate the necessary money, including consumption-based, financial-based and risk-associated alternatives. However, the socio-economic situation of a household plays a crucial role and restricts the choice of alternatives presented. The fact that people make this sacrifice over a substantial period of time manifests the value that the bicycle has for rural households.

8 Productive Aspects

When asked about their expectations for buying a bicycle, the majority of participants associated the main utility of the bike with income-generating activities. Only in rare cases, interviewees would refer to the bicycle as a sole means of transport for leisure activities. The overall theme is that the bicycle serves as a tool to secure a family's income and livelihood. A deeper analysis of the scope of economic activities performed with the bicycle gives a more nuanced picture. Therefore, the second global theme encompasses some distinctive usage patterns between the Phoenix and VBC bicycles.

8.1 Phoenix and VBC: Two pairs of "wheels"

When it comes to economic utility of bicycles, the interviews revealed clear-cut functional differences between the Phoenix and VBC bicycles. This is mainly a result of the inherent mechanical properties of the two types of bicycles.

8.1.1 Mechanical properties

The Phoenix is associated mainly with its ability to sustain greater weights. This allows it to be used as a means to transport different kinds of commodities and substitute head loading. However, its robustness leads it to be a heavy and chunky vehicle, particularly difficult to ride for women. Also, the single gear system makes it unsuitable to ride in hilly areas.

The VBC bikes are seen to be substantially lighter and smoother to ride. Many interviewees acknowledged the gear system to be a big advantage. The ability to switch gears to manoeuvre undulating terrain (particularly in the light of the hilly area of Nshamba) this is a big advantage. Lightness and speed led to an overall positive attitude towards riding VBC bikes, with interviewees referring to them "less tiring". It is particularly due to these positive characteristics that some people mentioned VBC bikes to encourage women to ride bicycles more often (see Section 12). Only a minority viewed the technical component of multiple gears as a potential burden, particularly for women. The main drawback of the VBC bikes was the inability to transport heavy loads and the price, particularly the high costs for maintenance (see Section 11.2.2).

8.1.2 Functional differences

These inherent mechanical properties of the two types of bicycles turned out to define the practical utility and relevance for a certain kind of work. Therefore, the utility of a Phoenix or VBC bike depends on someone's job profile or needs, as these statements highlight:

"(…) I could not accept a Phoenix. This one here (Note: he points on the MB) fits my needs". – Teacher N -

"Although the color is good, it (the Mountain Bike) cannot support me in the job. It is not functional". - B-woman J -

In that sense, the Phoenix is considered to be a "productive tool" at the most basic level in order to transport commodities or people. Being a productive tool, income generation is to a large extent inconceivable for many without a Phoenix, as this stonemason exemplified:

"No, this one (the Mountain Bike) is only for leisure. If you take away my Phoenix, it's like someone has stolen a hammer from me."- Stonemason E –

The VBC bikes on the other hand are seen as convenient vehicles to move effortlessly from one place to another. By simplifying the journey, VBC bikes have more of an indirect impact on income generating activities. Understanding theses differences is relevant when discussing the influence of bicycle for people's economic activity.

8.2 Usage of the bicycle for different types of work activities

The economic relevance of the bicycle is associated with specific job profiles. As such, teachers, church workers, photographers, farmers or businessmen/women[41] judge the utility of the bicycle differently. Three categories could be established, depending on a certain type of work. The main type of bicycle employed for a certain category is a result of the mechanical properties described above.

Table 7: Impact areas of bicycles

The type of activity that the bicycle is mainly used for	Main type of bicycle employed
1. The bicycle is used mainly in the delivery and sale of commodities. This involves transporting large quantities of different types of goods.	Phoenix only
2. The bicycle is used mainly to visit and reach customers or clients.	VBC / Phoenix
3. The bicycle is used mainly to reach the workplace or office. Therefore, the bicycle is considered a convenient means of transport for commuting.	Mainly VBC

8.2.1 Transporting commodities

By large the biggest emergent theme with regard to income generation was the utility of the bicycle to transport commodities on a commercial basis. Due to its robustness, the Phoenix is the only suitable bicycle for this purpose. Both VBC and Phoenix users agreed on this fact:

"I use the bicycle (Phoenix) to fetch the cargo. I also use the bicycle to fetch fertilizer and transport it to the shamba." – B-woman B, Phoenix user -

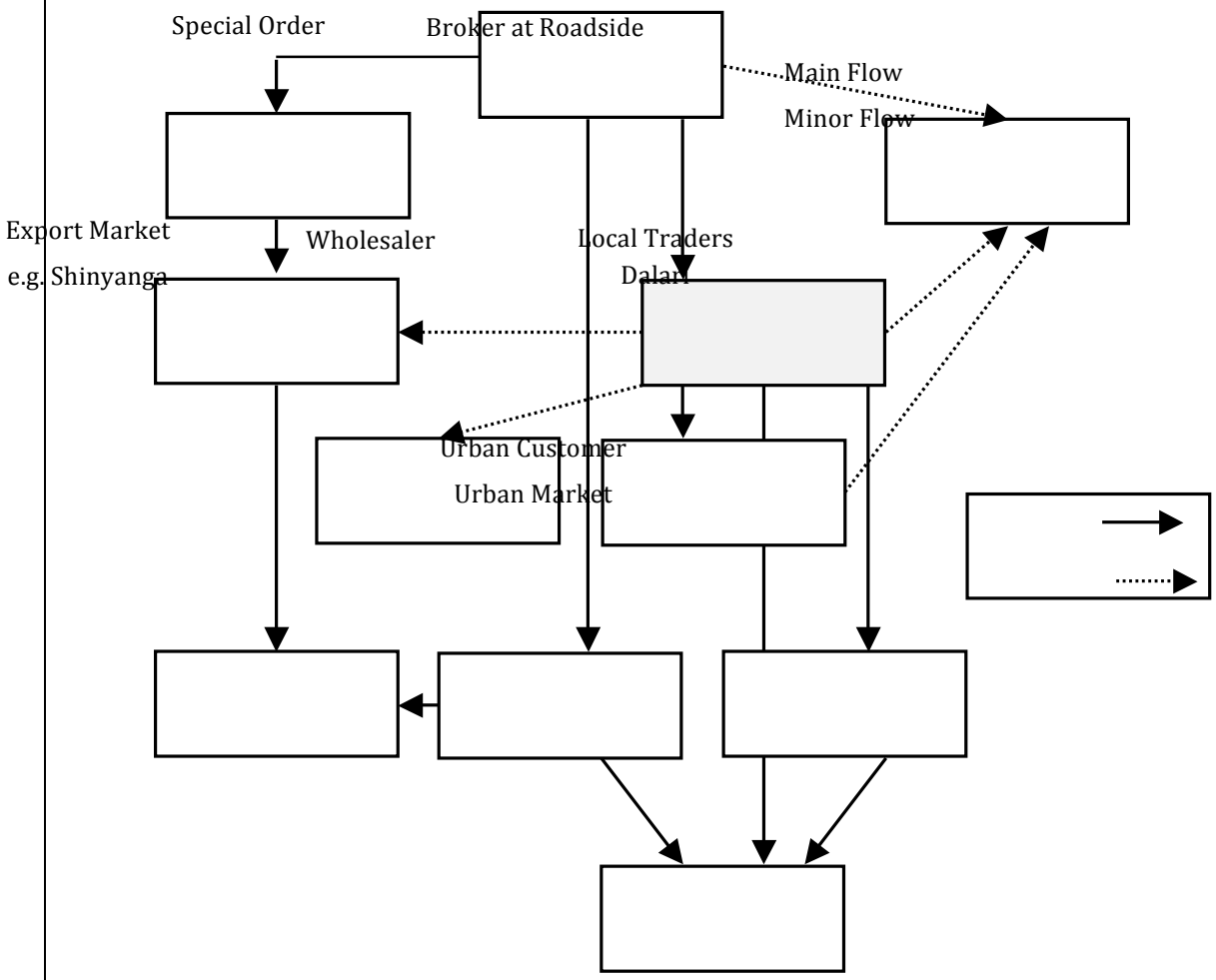
"For taking pictures, the mountain bike is useful. But as I am also a farmer, I can use the Phoenix to transport harvest." - Photographer L, VBC bike users -

People using the bicycle (i.e. the Phoenix) for this purpose were largely self-employed. The foundation for these activities are either based on the sale of individually produced agricultural products (vegetables and fruits), the resale of such commodities or the delivery of other commodities such as stones, water, grass, fish, sand, timber or charcoal. Banana transporters are a typical example for this kind of work in Nshamba area (see excerpt below). These businesses are merely monitored by the government and thus informal, with people "working mainly for cash" on a daily basis (versus receiving a monthly taxable income).

Excerpt: The banana bicycle transporter

[41] Businessman/woman are either producers of goods (such as tomatoes, green tomatoes, pineapples etc.) or people who act in an intermediary capacity between producers and consumers and thus mainly resell commodities. Commonly, businessman/woman in Nshamba would sell foodstuff such as vegetables, fruits, fish and bananas but would also deliver stones, sand, water, timber or charcoal.

Transporting bananas is a prevalent business in Nshamba area with matoke as the staple food for the region. A rapid assessment among 36 banana transporters was conducted to gain a quick understanding of the role of the bicycle for this business sector. Bicycle transporters search for bananas from dispersed farmer plots and sell them to broker or on the market. Transporters are part of a larger industry, involving players from the producers to the end consumer. The graph below gives a rough idea of this network.



The rapid assessment showed that the average banana bicycle transporter is male, 26 years old, spent 3.4 years in the business and has bought his personal secondhand Phoenix at an average price of 69'500 TSH. Hiring a bicycle is uncommon, though it is done when the personal bicycle has a problem. Hiring costs are about 2'000 TSH per day. Transporters do not produce matoke, instead collecting and selling is the main job, with some smaller side jobs for additional money. The transporter collects the bananas in and around the village he lives. However, if the availability is limited, he can outreach up to a radius 2 to 5 km. He visits the market in Muleba approximately three times a week, thereby carrying three to four bunches of banana per trip on the back of the bicycle. One bunch weighs roughly 30kg, adding up to 120kg of cargo. This trip to the market is likely to take more than two hours. As such, he has to leave early in the morning in order to reach Muleba between 7 and 8 o'clock when the market starts.

The journey is physically demanding and exhausting, and at steep passages, he needs help from young guys who receive five to six bananas in return for their service. When all bunches are sold, he starts his

way back and reaches his village around noon. Usually, he does not take any goods back from Muleba, however sometimes he buys simple commodities for the family, such as flour or fish.

The job is physically demanding for the banana transporter and his Phoenix. Regular maintenance of the bike is needed. As such, the transporter needs to visit the mechanic (fundi) up to two times a week, and weekly costs for simple reparations (mainly the spokes and tires) accrue to approximately 5'000 TSH. Serious problems may cost up to TSH 10'000 (e.g. change of steering fork). The bicycle is the transporter's main capital (mtaji) and if broken, fixing it is his highest priority. However, if this is not possible in time, he tries either to hire a bicycle or spend the day at home in the shamba (village). Daily revenue depends on various factors, but is mainly influenced by supply (season, banana disease) and demand (season). A simple cost-benefit analysis is shown in Annex VIII.

8.2.2 Reaching out to customers and clients

Another prominent theme mainly among VBC bike users was their bicycle is used as a mode of transport to reach out to customers and clients. Few Phoenix riders attributed the bicycle to helping them reach out to customers too. Accessing customers was an issue identified by pastors, church workers, photographers, one electrician, a doctor, an NGO worker and three banana brokers[42].

"I am a photographer. So I have many customers here in the area. I was expecting the bicycle to help me visit these customers." - Photographer L -

What these profiles have in common is that most of them provide a counseling, consulting or manual service to the community. As such, they usually do not need to travel with heavy cargo, hence the popularity for lighter VBC bikes with gear systems.

8.2.3 Reaching the workplace or office

A minority of interviewees said they would use the bicycle primarily to reach work. As such, the bicycle is considered to be a convenient means of transport for commuting. People mainly employed in the formal economy mentioned this point. Formal economy meant having a job that offered a monthly payment. The majority of interviewees who talked about using the bike to commute to work were teachers and one NGO worker.

[42] Banana brokers usually do not transport bananas but buy bunches of banana on the roadside. The transport of the cargo is left to the initial transport. Banana shanters buy bananas from the farmers and have them deliver by banana transporters to the truck owner, who then deliver them to urban centers.

"I am 26 years old and I am teacher in the Biirabo Ward. I use my mountain bike to go to school." – Teacher S -

Church workers constituted an exception, as this work is largely on an informal basis too.

"I m a church worker. (…) The bike helps me to go to the church very fast in order to preach. I go there three times a week." – Church Worker –

Although this was only a small sample group (six teachers, two church workers, one NGO worker), these people offered another perspective on the use and importance of the bicycle as an efficient mean of transport.

8.3 Beneficial role of the bicycle within the work process

These are the main three categories identified in which bicycles are seen to support people in their economic activity. Within these categories, the analysis shows that having a bicycle is profitable in many further respects. As such, the bicycle:

1. Improves time-efficiency
2. Increases productivity
3. Creates new business opportunities
4. Expands marketing opportunities
5. Reduces expenditures for transportation
6. Impacts prices/margins and profits
7. Simplifies work effort
8. Allows business continuity

8.3.1 Improving time efficiency

A first basic theme that emerged relates to time efficiency. Time efficiency describes to what extent time is used well. When talking about mobility, this relates to the time needed for a person to move from point A to point B. As such, interviewees gave references to how the bicycle has positively influenced time efficiency, largely compared to "walking." Interviewees reported average daily walking times of 45min to two hours to reach a fixed work place. By substituting the "mode of walking," the time needed for a specific journey was cut substantially. Individual statements are in line with common literature that using a bicycle cuts travel time by the factor three to four compared to walking (Riverson & Carapetis, 1991; Barwell, 2002). One interviewee confirmed this:

"You know, from where I live to Kabya it takes me 30 to 45min to walk. With the bicycle, I only need 10 to 15min."
- Security Guard S -

It is important to note that this finding only holds for people who need to reach a specific location/workplace or visit customers in order to provide a service, such as pastor and thus travel without any cargo. They therefore can "ride" the bicycle as opposed to pushing the bike and benefit from the velocity increase.

Picture 5: Loaded bicycles need often to be pushed

This clarification is relevant as business people, who visit distant markets in order to sell their commodities, primarily push their bicycle due to the heavy load. In hilly areas, people usually need the help of others to move the bicycle up the hill. Only few people have been seen to master riding a bicycle with 120kg of cargo tied to the bicycle. For the purpose of moving commodities, the bicycle unfolds its potential once the cargo is sold or delivered.

Time efficiency is also related to **planning security**, namely the possibility to estimate the time needed for a certain journey in order to have a formally structured day. Interviewees expressed both walking and using public transportation to be afflicted with uncertainty. Their explanation is that the transportation system in remote areas is inefficient, and those options available are considered to be inaccessible and time consuming. Collective taxis only operate on main routes to larger business centers in the region (such as Muleba or Bukoba). Hence, reaching out to remote villages is not possible at all. Secondly, these services run very infrequently, as the taxi only leaves when full. This makes serious time planning impossible. Private services like taxi or boda-boda would be faster and more reliable. However, this alternative comes at a higher cost and is not affordable for everyone (see 8.3.5). Walking time is also difficult to estimate, as external conditions (weather) or personal physical fitness vary it. **It is against the backdrop of planning insecurity that the bicycle was reported to present an efficient and needed alternative.**

"I am not worried if I have to go somewhere. I don't have to wait for a daladala or pikipiki driver. I can just use my bicycle". - Photographer B -

This affects people's ability to be **punctual**.

"(…) now I can arrange my schedule, tell people that I come and meet them, and also hold my promise. Even now, I was able to manage to come here at 0905 and fulfill this appointment." - Pastor B-

Teachers particularly would highlight this issue. For them, being late is not only very inconvenient but also affects their students' education. Teacher A emphasized the relevance of the bicycle in this regard.

"Before August, I was reaching school late. After buying it (the bicycle), I am now reaching school on time. I am punctual. The students appreciate this too." – Teacher A -

Additionally, other interviewees stated that being punctual is well appreciated by customers and thus improves overall customer satisfaction. As such, it was mentioned that potential clients would prefer those service providers with a bicycle, as they usually **are more reliable and predictable in fulfilling their service on an agreed point in time.**

"Yeah, there is a change. Customers have increased. And the reason is that they are satisfied with my service as I can bring them the photos on time. Especially the bicycle helps me visit these customers faster". – Photographer K -

Another aspect concerning customer satisfaction encompasses the ability to react to unexpected demands or requests on short notice**. The bicycle thus allows certain flexibility**, as stated by this photographer:

"If someone uses a new picture for their passport, I can do express pictures. He can call me cause he knows I can reach him immediately". – Photographer E –

These examples show that time efficiency not only implies "moving faster" from one place to the other but also relates to factors such as punctuality, planning security, flexibility and independence. Every single factor can be attributed to the bicycle and thus represents real improvement. Taking these aspects together point to a much broader theme: the opportunity costs associated with the usage of inefficient modes of transport. Opportunity costs in this regard imply the loss of time on walking or travelling/commuting that could be invested in more productive activities. These costs are substantial and the re-investment of such resources will be discussed in Section 10.

8.3.2 Increasing productivity

There is an increase in productivity compared to walking. Increasing productivity has different aspects. On the one hand, this may include an increase in the capacity to transport cargo (amount of kg), consequently having more commodities to sell at a market place and thus increasing the return on labor. Similarly, this also includes a growth in the number of customers or clients that can be visited per day. The bicycle was seen to have a positive and stimulating influence on both factors. Actual transportation capacity was told to be three to five times higher than compared to walking, therefore correlating with prior studies in this field (see 3.4). This benefit is mainly attributed to the Phoenix bicycle, as people would not use the Mountain (has no carrier) or City/Touring Bike (very fragile) to move commodities. The following businesswoman emphasizes the beneficial role of the bicycle when it comes to increasing the capacity to transport commodities compared to walking:

(…) at that time I was only able to carry (…) one bucket. (Now), I can carry five canisters. I can tie two on the side and put (more or less three canisters) in one big (wooden) basket on the back carrier." B-woman B -

Increases in sales volume are particularly relevant for business people trading commodities, where margins are small and only become profitable with increasing quantities.

The point is that if you need to carry the cargo by foot, you cannot transport the same quantity as with a bicycle. And little quantity means little profits. If I compare this, this is (with the bicycle) now four times more!" – B-woman MA –

With regard to an increase in the number of customers, interviewees generally affirmed the supportive role of the bicycle. Although exact numbers regarding the growth of customer/client visits per day or month were difficult to assess (this clearly depends also on other factors such as the season or scope of the business), the following statement gives an idea on the improvement on accessing customers by the interviewees themselves:

"If I had to put a number on it, I would say that I might have been able to visit 3 to 5 people, depending on the distance to. Today I may visit up to 10 to 15 households, again depending on where I go." – Pastor B -

These factors are likely to impact the income positively and this case will be shown in Section 9.

8.3.3 Creating (new) business opportunities

A third theme that became apparent was the fact a bicycle can be the basis for a particular job (or starting/continuing a particular enterprise). Without a bicycle, it would just not be possible to accomplish accessing new business opportunities, clients, products and commodities. This is due to the fact that villages are sparsely populated in rural areas and cannot be reached by foot.

"The business of a cameraman without a bicycle is hard. You cannot work by walking." – Photographer L -

However, some interviewees also mentioned that the acquisition of a bicycle helped them to leave their tiring job and set up their own business:

"I was not satisfied with the job as a casual laborer. So after buying the bicycle, I used the remaining capital to start another business. This is when I started to bring matoke to Muleba and then to fetch dagaa[43] from Kagoma." – B-man H -

The desire to be more independent must be seen in the context of interviewees describing casual labor as very tiresome, to some extent even exploitative, with the payment unsatisfactory.

"If you are working for someone, these people use you as they want. You won't get any rest. Although the salary is low, you will have to do the heavy work. This will make you tired. The bicycle brought relief to my life." – B-man E -

Another important factor must be attributed to the bicycle on a more indirect level regarding business opportunities. People acknowledged that the bicycle, particularly the Phoenix, can be used for different purposes. This implies that it allows people to change their job if external circumstances (e.g. the collapse of a market, a disease that destroys commodities) demand it. Theoretically, a water seller can change employment with little to become a banana transporter. In both cases, the bicycle as a "load vehicle" provides the fundament[44]. No substantial additional investments are needed. The bike is the sole greatest investment. This point is particularly relevant as many of the businesses that rely on the transport of commodities are volatile in nature[45]. Therefore, the bicycle as the basis for a certain business activity offers an alternative employment plan in a potential time of crisis. Water Seller J, who has been in the water business for eight years, acknowledged this.

"There are many jobs, which you can use a bicycle for. If the business stops, I can look for ndizi (bananas) and bring them to Muleba or Kemondo. Or I could go to the lake and buy fish and bring it to the market". - Water Seller J -

[43] Dagaa is a local fish.

[44] Practically, there are some institutional differences. A banana transporter needs some liquidity to buy bananas. A water seller needs five empty canisters to start the business.

[45] Two specific examples (the banana business and the water business) are described in Annex IX.

Furthermore, a fish seller said the bicycle not only reduces the walking time substantially to the shore (from six hours to 90 minutes) and increases the capacity of fish (from half of bucket to two buckets) he can carry per trip but the bike also allows him to add another business. As such, he now can transport bananas on the way to the shore and sell them to the fishermen. This clearly adds to the employment schema among owners of a bicycle.

All in all, the bicycle can be seen as a prerequisite door opener and lifeline for new business opportunities. Interviewees expressed joy at having more control over their business opportunities, utilizing their time productively and improving the return to labor.

8.3.4 Expanding marketing opportunities

The bicycle enables new business opportunities and also helps to expand existing business activities to grow and become profitable. In a first step, the bicycle has been reported to improve accessibility to existing customers and markets in a faster and more reliable fashion. The bicycle also allows expansion of the scope of business to new geographical areas. Compare this to the most popular transport mode of walking, which only allows one to reach limited distances.

"When I used to walk, I could only go to close places". - Photographer E -

This point particularly holds for people selling commodities on markets. As markets are not held in every village, and market days and locations vary, the bike makes accessing these selling opportunities more probable. So too, the price differentiation among markets allow for commodity traders with bikes to demand higher prices for products, such as bananas, in out-of-reach villages. This has been aided by the difference for price in bananas in Nshamba, Muleba or Shinyanga.

It is against the backdrop of these aspects that the bicycle unfolds its positive impact. The bicycle not only makes it possible to visit different market locations but also enables people to reach more distant markets where profits are higher. The case of MA, a businesswoman from Rushalunga who sells vegetables, is a good example of this. With the bicycle, she can visit up to four markets every week: Rushwa (approx. 6km[46]), Nshamba (approx. 16km), Kashe (<10km) and Nyarugando (approx. 11km). Depending on the harvest, she can even visit Muleba (approx. 29km), as she states herself: "*Today, I usually visit Rushwa, Nyarugando, Kashe and Nshamba. When I have enough vegetables, I can also go to Muleba. At that time (before having a bicycle), I was only able to visit two markets, which are close by. This was Rushwa and Nshamba.*"

Although it takes her at least two hours to deliver the commodities to these markets with the bicycle (to Muleba it is even four hours), she managed to double her sales volume compared to the pre-bicycle era and benefit from higher prices (e.g. in Muleba).

Distance is not the only factor when considering marketing opportunities. The amount of commodities or goods that can be transported are equally important, as has been seen under section 8.3.2.

Furthermore, having access to a bicycle and being more flexible impacts salespeople who deliver their service directly to customers. One interviewee said that due to the bicycle, his reputation as a salesperson

[46] Distance from her residence in Rushalunga

improved, benefitting his status within the community and ultimately leading to better marketing opportunities.

"Even in this area, I think I am the first agent who distributes these panels by using a bicycle. I am way more popular than other men selling solar panels." - Solar Panel Agent -

Marketing opportunities in Nshamba largely relate to the ability to physically reach places. In rural areas, where market locations and customers are sparsely populated, distance is a real issue. The bicycle serves as an efficient tool to overcome these spatial hurdles, offering better marketing possibilities for products and services, leading ultimately to higher profits.

8.3.5 Reducing expenditures for transportation

The bicycle also allows **direct savings on transport expenses.** Costs associated with commuting or moving are considered to be burdensome for any household budget. Such costs particularly accrue when reaching out to more remote areas, which are not situated along the main road corridors and therefore are not served by conventional transport such as daladala and pikipiki. In an extreme case, the expenses for transportation may even devour a substantial part of the income as this example shows:

"If my wife had to hire a pikipiki to go to school every day, you would find that she has been working only for the transportation! You see, one way is 2000. This make 4000 a day and 20'000 a week. In one month, this is 80'000. To spend this amount is no sense!" – Bicycle Agent E -

This point illustrates that the bicycle can have a direct monetary impact on a family budget. When disposable income is limited, financial savings from owning your own transport can ease the financial burden and open up new employment and leisure opportunities (see Section 9).

8.3.6 Impacting prices/margins and profits

Another sub-theme that has been brought up by the interviewees relates to a simple cost-benefit analysis. It is closely linked to the transport expenses described above. However, the focus is put upon the actual business practice. According to the business logic, every (additional) cost has to either be carried/shared by the consumer (via the price) or by the service provider (via the margin/profit). Costs for transportation follow this logic. The following explanation articulates this cost-benefit calculation, in this case to the disadvantage of the producer:

"You know our business of taking pictures offers little profits. If you say let me use this money for transportation. So when we make a calculation, by daladala is 5000 while we got a profit of 6000. This leaves me with 1000. That's why we do use the bicycle. I can spend only 2000 (e.g. food) on the way and remain with 4000." – Photographer B -

That producers are likely to get the short end of the stick is not uncommon, as competition is usually very high among service providers in rural areas (successful business ideas are copied immediately). In this context, it is difficult to transfer the costs to the customer. An electrician spoke of the additional costs (in this case, fuel) that arise from transportation in order to reach the customers. In this particular case, the costs for transport for the consumer would have been even higher than the cost of service itself. The bicycle helps to offer a service at a competitive rate by economizing on unnecessary transport expenses.

"People call me for the simplest jobs, like changing a light bulb. With a pikipiki, you would have to charge him 5000 for the bulb and 7000 for the fuel. This is non-sense. So when I come with the bicycle, he will be happy!" – Electrician E -

That transportation expenses are a considerable issue in rural areas is underlined by the fact that such costs may even hinder one from conducting business at all. One interviewee specified that it can happen he cannot deliver his paintwork as the lack of financial resources inhibit him from reaching remotely situated customers in the first place.

"By crisis I mean I need to reach a customers but I don't have money to pay for transportation. In this sense, I can use the bicycle and do the job, consequently earning money." - Painter M -

Additionally, transportation costs may also accrue when larger quantities of an item or commodity must be transported and walking will not suffice. In that case, the bicycle helps the service provider to save costs on hiring costly transport services.

"If you (…) get 5 bunches (of bananas), it is very likely you need to hire again a pikipiki. But if you own a bicycle, you don't need to spend this money. So the final price depends also on the mean of transport". – Banana Broker R -

The bicycle inevitably has a key role to play in lowering transportation costs associated with business trips. It enables people to offer their services and products at a competitive rate, helps financially poor people to reach customers and acts as a substitute to more expensive transportation alternatives. Higher profits ultimately affect the family budget.

8.3.7 Simplifying physical strain

The burden in physical terms associated with walking was another point identified by the interviewees. This must be seen in the context that people are usually captive users (have no choice but to walk) when going to work, reaching social and health institutions or attending a market place. And as such institutions are located sparsely in remote areas, this usually involves several hours of walk. In this context it is understandable that people describe walking as "tiresome and exhausting". This was undermined by the fact that people would even have to take time off from work because they are not physically fit to manage the journey anymore. Although cycling demands some physical exertion too, the actual effort is perceived as less exhausting compared to walking. In few cases cycling was even associated with having a positive influence on personal fitness.

"It (the Mountain Bike) brought a change. Not only that I am more punctual, it also helps me to exercise." – NGO Worker M -

Physical strain endured by walking was also mentioned to affect the quality of the work itself. In the case of schooling, students would suffer under their exhausted and tired teachers. In this regard, the bicycle has the potential to positively contribute to the overall well being of a person.

However, physical strain is seen less to be an issue when it comes to the transportation of commodities. As the previous chapter showed, one important factor for people to buy a bicycle is the expected ease of working. However, people who regularly move commodities with the bicycle still classify their work as "very exhausting." Although the bicycle carries the load, people increase the capacity to such an extent that pushing the bicycle (up to 150kg in some cases) becomes very tough. With regard to the ease of working, this aspect relativises the advantage of the bicycle.

Ok, I am faster than people who have to walk. But carrying 120kg of bananas is exhausting. It is tiresome. This limits the advantage of the bicycle of being a means of transport. – Banana Transporter R -

All in all, it can be said that the impact of the bicycle with regard to physical strain is ambivalent. Cleary, riding a bicycle is less strenuous than walking. However, as people tend to transport heavy cargo with the bicycle, this offsets the benefit remarkably.

8.3.8 Allowing business continuity

The bicycle also allows a certain business to continue in a moment where the actual user is tied up with other issues. Interviewees reported that in such a situation, the bicycle could be "outsourced" to family members, friends and working colleagues. Interviewees mentioned mainly two different scenarios where this can be the case. First, participants mentioned that the due to the exhausting work, they feel weak or sick. In this case, they can hand over or hire out the bicycle in order for someone to take over their business, thus continuing to earn a little profit.

"Given I am sick, I can even call somebody to sell the cargo for me. I stay in business." – B-woman F -

Another comprehensible option that was mentioned relates to children taking over some part of the business while the head of the household is busy with other work. In this regard, children can support their parents and contribute to the household income.

"I have 7 children, me and my wife. Sometimes if they come back from school, they can help me to deliver stones. They can carry two stones and deliver them to the customer while I am preparing more stones." – Stonemason E -

These examples highlight another important benefit of the bicycle. The bicycle can be considered an **"inclusive"** means of transport. Unlike the car or a motorbike, where certain prerequisites are mandatory (license, age restriction), bicycle usage only demands one criterion, namely skills. As soon as someone knows how to ride, he or she can make use of it. This seems to be relevant particularly in the case of rural households as money is earned on a daily basis. If the head of household (who is often the only one engaging in income generation) is not capable of working, this is likely to have serious and immediate consequences for the whole family. Therefore, as the bicycle is the basic tool for many types of work, it can easily be outsourced to others in order to guarantee that some money will be available at the end of the day.

8.4 Preliminary conclusion II

The bicycle is an important, if not the most important tool for many people's economic activity in rural settings. The purpose of the bicycle is mainly to transport commodities, visit customers or reach a workplace. **In many respects, the bicycle is a "tool" at the most basic level rather than a common mode of transport.** It can substitute costly transportation expenditures. Using a bicycle for economic activities also offers various improvements compared to walking. Engaging in new businesses is possible. Marketing opportunities are expanded. Time efficiency is improved. Productivity can be increased, be it by additional cargo that can be transported or by an increase in the scope of the business radius. By utilizing a bicycle, prices and profits are positively affected by the reduction of transport related expenses, ultimately benefitting the customer and the service provider/producer. The work effort is to some extent passed on to the bicycle, reducing the physical strain. The business continuity can be maintained as a wide range of users, including children and friends, can use the bicycle and take over the business activity. This leads to other improvements including flexibility, independence, punctuality and time management.

All these points are a direct outcome of having access to a bicycle, be it a Phoenix or a VBC bike. The overall impact of these eight points is twofold: first, the bicycle frees up time that can be put into other use. Second, the bicycle augments a household's budget by increasing profits or reducing expenditures. How people make use of this additional time and money is the next step in the assessment.

9 Economic Impact I: Disposable Income

The utility of the bicycle for economic activities has inevitably a direct impact on disposable family income and time. These two aspects emerge as a third global theme, incorporating various aspects related to investments with additional money, investments of additional time and asset accumulation.

9.1 Growth of total family income

The different aspects raised in Section 8 give a strong indication that having access to a bicycle positively correlates with an increase in the disposable income of a household. However, in order to assess the total monetary impact, a range of other indicators is needed. Given the scope of the research period, this was not possible to assess. Hence, data from other studies must be used. Two important factors can be identified using qualitative data from the interviews. On the one hand, this includes the overall positive vocalization of a bicycle's positive impact on family income. On the other hand, it can be shown to what extent people make use of this additional income.

A study conducted by Heyen-Perschon in 2001[47] compared the overall household income of rural households in Uganda before and after having a bicycle. The results showed that households headed by men experienced an increase of 39 percent whereas the income of women-headed households rose by 36 percent. The raise in disposable income was mainly a result of expanded marketing possibilities of agricultural produce, new engagements in non-agricultural activities as well as additional revenues that were achieved through the hiring out/renting of the bicycle. Although it was in the present case not possible to assess such an exact monetary impact, the interviews yet confirm that due to the bicycle, profits increase. Here are some examples:

"Let's put it like that. When the bicycle has a job, I get a profit". – B-man V -

"It (the bicycle) has helped me to increase my income. The money which I spent to hire bicycles I can now use for other purposes". - Sales Agent N -

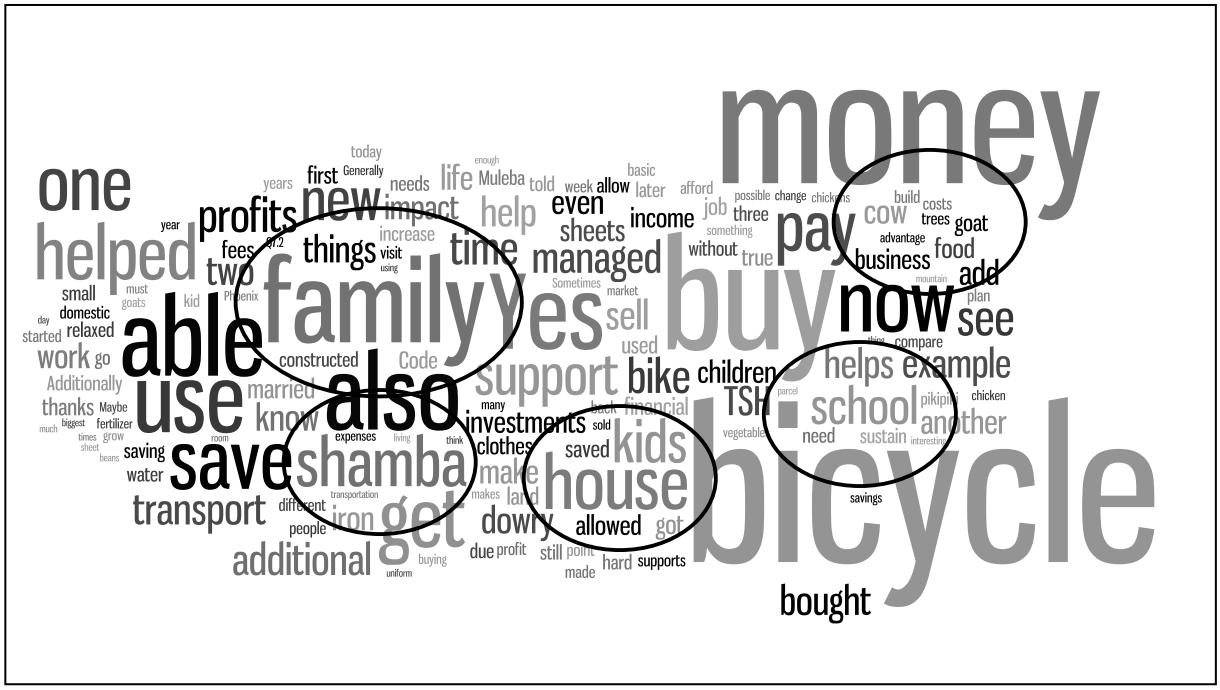
More importantly, the statements also indicate that this additional income is allocated for other purposes and investments. The next section deals with this issue.

9.2 Utilization of additional income

When asked about the use and impact of additional income, interviewees usually were proud to tell their achievements as a result of having bought a bicycle. The word cloud below shows the most prominent topics that were expressed in this regard.

[47] Heyen-Perschon, 2001, pp. 187 ff.

Figure 15: Word Cloud showing topics related to the use of additional money



The most prominent topic was **basic household necessities**. This would mainly include additional expenses for food and clothes for the whole family. A second point often mentioned included **paying school fees, school material or even school uniforms for children**. It should be noted that the payment of school fees poses a serious problem for financially poor households. The fees are high (from 60'000 TSH onwards depending on the school and academic level, which almost represents a monthly income) and therefore lead to a substantial outflow of money at a particular point in the year. The issue gains weight if more than one child is enrolled at school. Apart from the financial strain, there is also a psychological component, because being unable to pay for school fees is punishable by imprisonment in Tanzania. Interestingly, the decision to have or not have children was rarely dependent on the profitability of a business or a household's income, but rather on GOD's plan (religious component), as this businesswoman described:

"You know, producing kids is different from producing profits. Because producing is according to GOD's plan. You could have much profit and still not be able to get kids." – B-woman MA -

Another common point was **to buy animals**, including goats, chicken, pigs or cows. In this case, people would refer to the additional advantages of purchasing animals, namely that it provides a family with fertilizer (dung), milk, meat or money (after a sale) in case needed. An animal can also be seen as an investment in that buying a suckling yields profits when sold later, as water seller A explained: *"When I get for example 10k, I can buy an additional baby goat and keep it for two or three months. Then I bring it back and they will give me 60k".* School fees and animals are followed by other assets, such as the **construction of a house or the purchase of a new or bigger farming plot**. These two assets clearly need more financial resources and thus require a period of saving. However, buying or enlarging a house or an agricultural plot was a common investment that people would do once enough money was put aside. The benefit of a personal agricultural plot was largely mentioned to be for the family, namely the production of bananas and vegetables for basic consumption. However, few interviewees increased their agricultural

plot in order to grow more products and increase the selling capacity. With regard to the construction of a house, it was interesting to see that many people specified how many iron sheets (roofing material) they used in the construction. Apparently, the amount of sheets is seen as a sign of comfort and wealth. Also, improvements with regard to construction materials (from mud to bricks) were an issue. A sixth factor included the **payment of dowry.** As such, the additional profits that yield from the bicycle allow men to pay the dowry and ultimately get married. It should be noted that getting married was often mentioned as the first big investment, followed by the acquisition of a piece of land where later a house was constructed on: *"I was able to pay the dowry, buy a shamba and construct a house. I was also able to get a goat. And the reason that made it possible to achieve this is the bicycle." - Water Seller A -*

Less common but also mentioned was the fact that some interviewees had initiated a **new business** with the additional money. Examples in this regard are the establishment of a chicken farm or the cultivation of shoots for sale. Similarly, some would invest the profits into business **specific working equipment or tools**, such as a new camera. Only few bought **a second bicycle**. Also only two persons explicitly mentioned that they would put the additional **profits aside in order to save.** Some individuals also talked about joining a **cooperative or paying off depts.**

9.2.1 Future investments

Supporting children, purchasing animals or buying a house were also the very prominent topics when asked about potential **future investments**. However, **buying a motorbike** was the most prominent one, indicating that having a motorbike is inevitably a further desirable step. However, buying a second bicycle (for the wife for example) was only mentioned twice. Potential explanations are given in Section 14.

9.2.2 A second bicycle – hardly considered

Given the positive impact of the bicycle, it was expected that more people would consider investments in a second bicycle. However, only few actually bought a second bicycle for their family and only two people actually planned to buy another one in the near future. Explanations might relate to common family structures and responsibilities in rural African areas. It is quite common that the husband is the head of the household and is supposed to bear the responsibility for a family's income. The wife is mainly responsible for domestic activities, such as fetching water, cleaning or preparing food. Thus, traditionally perceived gender roles might explain why an additional bicycle is not a first priority among male-headed households. It would be an economic consideration to invest in assets such as animals or garden plots that are seen to be "more financially profitable" than buying a second bicycle for the wife (see also Section 14).

9.2.3 Asset accumulation

Households tend to accumulate different assets over time. This happens by the acquisition of new items, such as garden plots, farm animals etc. People reported trading up assets in sequence deliberately, for example chickens to cows, or a cow to land, or cash from farm income to a house or other livestock. Clearly, the acquisition of additional assets affects the living standard of a family first and foremost. However, the current understandings of poverty emphasize the operational relevance of asset ownership, particularly those assets that can be used productively (e.g. a garden or animals) with regard to vulnerability to external or internal shocks. The bicycle as the basis for investments has therefore a crucial

role to play in the context of a household's resilience to withstand unexpected happenings (see section 13).

9.3 Preliminary conclusion III

Having access to a bicycle is likely to impact a household's disposable income. The bicycle is the most basic tool to engage in a business activity. Survey results show additional income is not spent randomly. It is used to invest in core assets that are relevant for a family. In that regard, it was shown that investments into family necessities are a priority. The bicycle helps to sustain the family with basic goods, as summarized by this bicycle mechanic: *"If you have a bicycle, you do not go to bed hungry. If you are not lazy, of course" (Mechanic S).* Dowry, although not a direct asset, is particularly important for men as an expenditure, as the basis to start a family. If the financial situation allows, people acquire assets like animals, a house or a garden. These assets represent a long-term perspective, as they are seen as an "investment tool" that might yield profits in the near future and/or provide resilience to external aforementioned shocks. The ability to purchase such assets, a bicycle reduces a household's vulnerability and incrementally, though steadily improves a household's socio-economic position.

10 Economic Impact II: Disposable Time

Social Domestic Productive Recreation Work

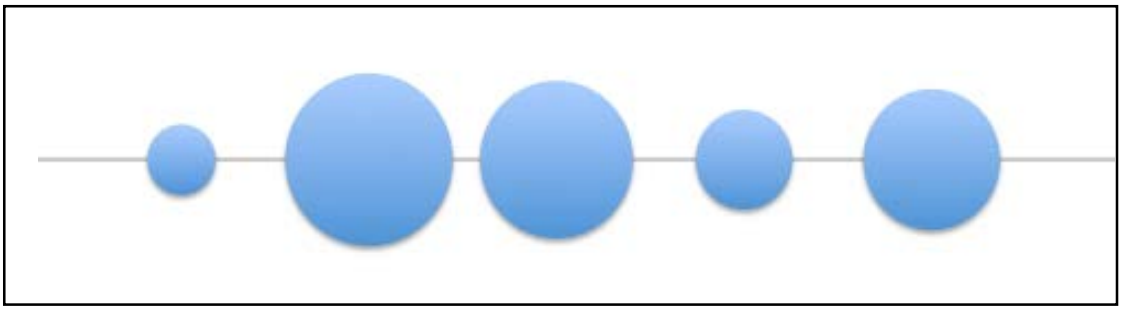
Due to the time efficiency posed by a bicycle, the time spent on a journey can be substantially cut to benefit a business activity in different ways (flexibility, punctuality, management of a schedule). From previous studies it is known that the bicycle is three to four times faster then walking. This was largely confirmed by various statements by the interviewees, as exemplified by this security guard:

"You know, from Bugasha (Note: place he lives) to Rubya (Note: place he works) it takes me 30 to 45min to walk. With the bicycle, I only need 10 to 15min." – Security Guard S –

Being faster has a direct consequence on the time management of people. As such, questions about the utilization or reinvestment of the additional time showed some distinctive results.

10.1 Utilization of additional time

Interviewees were generally aware that the bicycle saves them time. When asked about specific investments of additional time, responses clustered around five core topics: social activities, domestic work, productive work, work-related activities and recreational activities. The bubble graph below shows the relative importance of these categories, reflecting the frequency an issue was mentioned[48]



10.1.1 Domestic activities

Domestic activities were the most mentioned activities that people would invest their additional time in. Female participants mentioned activities such as preparing food, collecting firewood and water or caring for the children while male respondents referred to the cultivation of garden vegetables as their main domestic activity.

"I go to our shamba, plant trees, cut banana trees. Because of coming early at home, I can do all this work."-Teacher A

10.1.2 Productive activities

Productive activities aim to yield additional profits to the original income activity. In the interviewees' cases, this mainly related to the cultivation of vegetables and crops for sale. Men mentioned that they enlarged the agricultural plot in order to cultivate and sell additional produce. As the bicycle helps to substitute walking, it preserves energy for these activities. By starting a new small business or extending a current on, there is a financial impact. The additional income is then used productively, be it for household necessities, animals or dowry (see above). And even a marginal financial impact helps, as it provides

[48] Usually, interviewees would mention more than one point. In that case, these were counted separately.

households with ad-hoc liquidity (this is particularly relevant for people who are engaged in the formal economy, like teachers), as the statement below from one interviewee shows:

"This additional time allowed me to plant a garden. I started growing crops to sell. This led to additional income. (…). with this money I earn during the week I am able to buy small things that I need." - Teacher O -

10.1.3 Work related activities

Work-related activities refer to the additional time that benefits income generation. When people with bikes sell commodities, they have more customers and markets that can be reached in less time, benefitting overall profits. Teachers with bikes expressed that their additional time was invested into preparing for class or settling other work-related issues.

"I can reinvest the time I save everyday to prepare the lessons for school, for the next class." – Teacher O -

10.1.4 Recreational and social activities

Recreational and social activities were also mentioned. They include physical exercise and visiting friends and family members. It should be noted that the usage for leisure activities was only brought up my male interviewees. This gives the indication that men are more likely to use additional time for leisure or recreation whereas women invest additional in the family, particularly the care for children, as could have seen above.

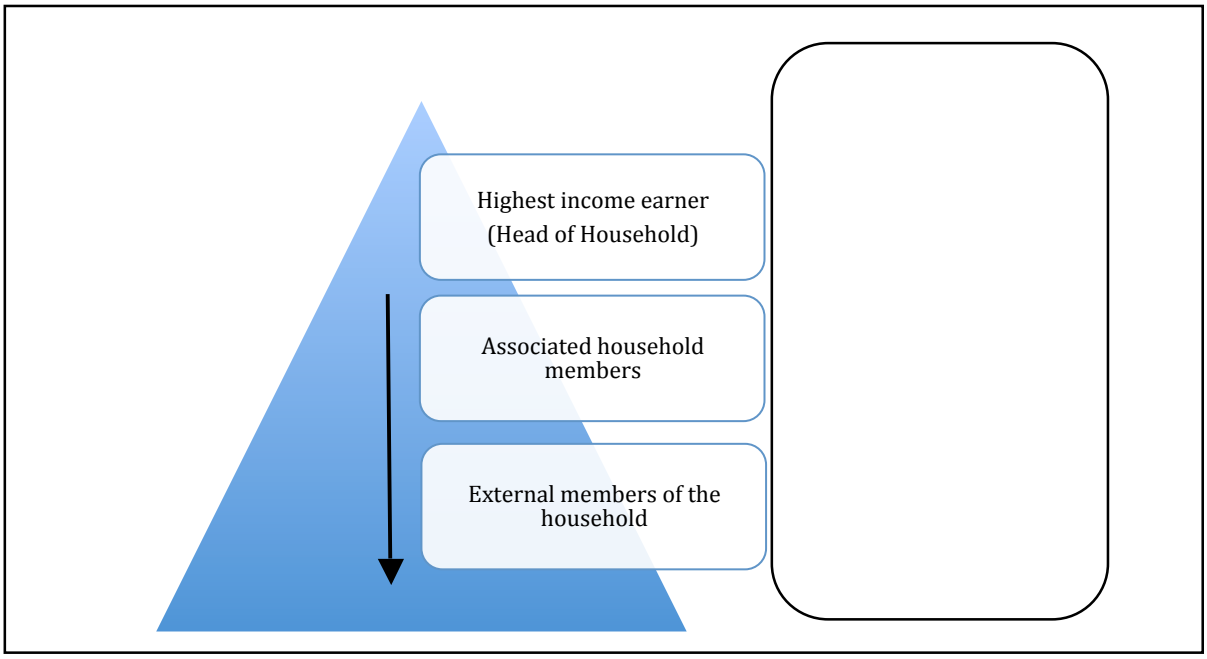
"I can see that the time I gain has a great impact. I can do domestic work and do exercise. When reaching home by foot, I would be tired and had no energy to exercise. I would cook and go to bed."- Teacher S -

10.2 Preliminary conclusion IV

Users of bicycles recorded more time, time that can be invested into productive, reproductive or social and recreational activities. In keeping with traditional gender roles in African societies, men and women identified different types of domestic work in which they use their time. Engaging in new income-generating activities is another popular option, particularly for men. Such activities can yield additional money that is needed by households who suffer volatile incomes. Time is also invested to relax and recover, supporting the physical and mental fitness of people. However, personal leisure time is more prevalent among men, with women dedicating their freed up resources to the family.

11 The Bicycle Within the Family

The interviews revealed that the utility of a bicycle within the family is linked to the family hierarchy. The highest income earner usually heads this hierarchy. This person decides the utilization of the bicycle. The following graph summarizes the relationship between the different users based on the level of hierarchy, scope of activities and restrictions faced.



11.1 Levels of hierarchy

These hierarchy levels are important because 27 of 41 people interviewed (66 percent) noted the bicycle as the only mode of transport the family possesses. 12 cases (29 percent) mentioned having a second IMT in the household, whether another bicycle (9 cases) or less likely, a motorbike (3 cases). Only two interviewees reported to have more than two vehicles per the household. Given the limited availability of travel alternatives, the bicycle must be regarded as a rivalrous item within a family, as its usage by one person prevents that of another family members. This has an influence on the potential scope of users.

Several indications show that for most households, the primary user of the bicycle can be identified. This is most often the member of the family who uses the bicycle for income generation (if the bicycle is not particularly bought for a child to reach school). This person is likely to be the highest income earner (HIE) (in many households, this is congruent with the (male) head of household)[49]. This person generally has more control and authority over decision-making, which also affects bicycle usage. Hence, the HIE has the final say over who can use the bicycle, what it should be used for and what time it can be used. This control became apparent when looking at the responses to the question "who else can use the bicycle within the family?" Typical expressions included (emphasis added):

[49] "Head of household" is a concept for itself. Particularly with regard to the concept of the extended family, this person is often found to be the oldest one. No particular reference was given in the interviews to this fact. As such, the primary income earner is the focus of attention.

- "if I don't use it, THEY CAN have it"
- "my wife CAN use it"
- "if I…, HE CANNOT use it"
- "of course, I GIVE IT to them"
- " I CANNOT GIVE HER my bicycle"
- "I haven't AUTHORIZED him to use it yet"

This gives a strong indication that the interviewee was entitled to decide who could use the bicycle. The bicycle owner thus enjoys direct authority over the bike and indirect authority over its users.

11.2 Scope of users and restrictions

Thus, the question remains, in which cases and to what extent do secondary users in a household benefit from a bicycle. Although there is a strict hierarchy, 76 percent (31 cases) of the interviewees reiterated that other people (be it family members, friends and neighbors) are eligible in using the bicycle. Within the family, the number of beneficiaries reaches up to five people, given to the average household sizes recorded. Among those 31 cases, fifteen cases did not mention particular concerns or restrictions for others using it.

"(…) when you buy such an asset, you don't expect it to use alone. It does help many people."- Banana Broker J –

For the other sixteen cases however, others were free to use it if it the bicycle is not used for a particular activity by the HIE.

"When I go to the market, I reach home at 3pm. So from 3pm onwards, other family members can use it." -B-man E -

17 percent (or 7 cases)[50] specifically denied that others could use it. The main reason for the denial was the fact that the bicycle is occupied the whole time for income generation (4 cases) or that it is just too sensitive (costs, no fixation possible) to give away (3 cases).

"The bicycle is only for business purpose. There is no joke about it. Nobody can touch it." - Water Seller B -

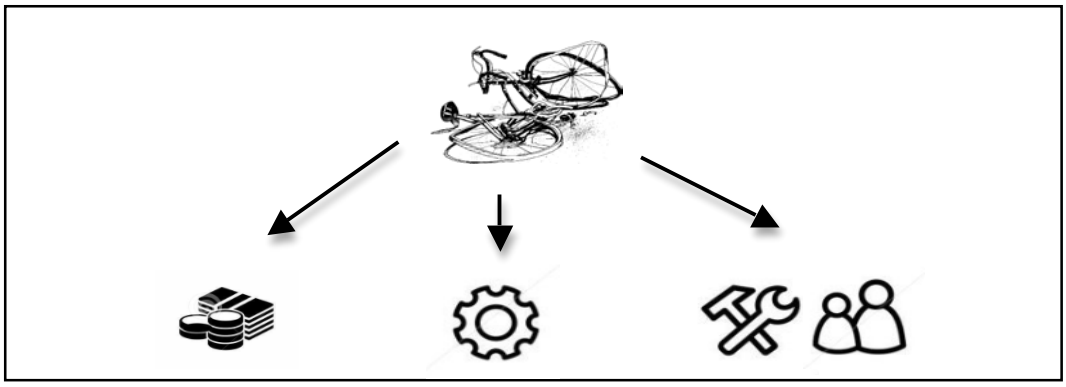
Although the majority of the bicycle owners were open to share the bicycle with other family members or close friends, the willingness to share was for 30 percent not without concern. These ten cases mentioned lacking riding skills of users, the possibility of people overloading the bicycle or just people breaking it, as issues that make them feel uncomfortable in giving the bicycle away. The reason behind this fear turned out be closely linked to economic and institutional hurdles in fixing a broken bicycle, as the next section shows.

11.2.1 Economic and institutional hurdles in fixing a broken bicycle

The magnitude of having a broken bicycle manifests itself in the difficulty of repairing it. Figure 18 illustrates common responses to the problem of maintaining and fixing a broken bicycle. The main factors include economic aspects, availability of spare parts/tools and availability of mechanics with the appropriate tools and knowledge. The most prominent or economic reason for not being able to fix a bicycle is **money**. Although Phoenix and VBC bike users mentioned this, the financial worries with fixing a bike was more prominent among Phoenix users (seven cases for Phoenix, only three for VBC). For both types, the high cost for spare parts is seen as the key burden. For Phoenix, problems with smaller parts

[50] Three cases gave no specific reference to this question.

(such as broken spokes) are less of an issue, whereas a broken frame, a broken front fork or a non-functioning trailer system pose a financial challenge.



Among VBC users, costs for spare parts are generally seen as very high, even for those who have the financial capacity. Edimundi Reverian, managing director of the Vijana Bicycle Center, declared this to be a "*real challenge. But if you compare the spares that we have to the ones that are available in the local market,"* he says, *"I can say that ours are of very good quality. And a good quality normally comes with a bit higher price"*. Nevertheless, a lack of money can hinder one from getting his or her bicycle fixed and thus presents a rationale for restricting usage to others.

Lacking money is unlikely to be an issue that can be resolved instantly. All of the ten cases referring to money being the restricting factor claimed that it usually takes them several months to have the financial capacity in order to pay for the reparation, such as this businesswoman explained:

"I had problems with the back tire and the tube. This would cost me 20'000 TSH. So I decided to leave it until the harvest to come. Once I got the money from the harvest, I was able to repair it. This was about two months."- B woman MA -

As the absence of a bicycle is linked to a self-enforcing downward effect on the family income, several coping strategies were identified to fix the bicycle as soon as possible despite lacking personal resources (points 1 to 2) or make sure business continues (point 3).

Table 8: Different coping strategies

Coping strategy	Anecdotal reference
1.People would ask friends to lend them money	*"You know, the bicycle helps me to make a living. It is better to ask a friend for money and get it fixed. I need my bicycle!" (Dagaa seller D)*
2.People would take up debts in order to pay for it	*As soon as you have a problem you need to see the fundi (moneylender). If you don't have the money, you have to pay him later. You cannot not have access to the bicycle! (B-woman J)*
3.People would hire someone to do their work	*"I would call someone to pick up and deliver the cargo for me." (B-woman MA)*

The second prominent issue or institutional aspect is **the availability of spare parts**. This issue pertains only to VBC bikes as street mechanics in Nshamba, and particularly in remote villages, are unlikely to have appropriate spare parts on stock. This affects the clientele. NGO worker says:

„It is hard to get spares sometimes. Also, other shops in Nshamba sell spares that are of bad quality. You may need to fix it again shortly after you fixed it."

Even VBC cannot guarantee to have all the necessary spares available, particularly for some rare secondhand models. The lack of spares is often compensated by street mechanics using fake or inadequate parts, solving the breakage issue only temporarily. This raises concerns for VBC users to have their bike fixed in the streets.

A third prominent, institutional issue is the **quality and availability of mechanics and tools**. Again, this is mainly relevant for VBC bikes, as mechanics with the necessary knowledge and tools to fix these types of bicycles are difficult to find, particularly in remote areas[51]. Teacher L says:

"Another problem is that where I live, there is no mechanic. So when I have a problem, I need to take a pikipiki and bring it here."

With lacking mechanics, people are forced to see regular street mechanics. However, as this teacher stated, seeing a street mechanic is always linked to uncertainty and risk concerning the outcome of the work:

"Not all of them (Note: street mechanic) are very good. It can even happen that they are fake mechanics. And such fake specialists who are imitating to be professionals can damage your bike" – Teacher O -

This issue is reinforced by the fact that due to the different types of secondhand bikes distributed by VBC, a range of tools is needed to cope with all the models, tools that are sometimes only available at VBC and difficult to acquire for the general street mechanic, as Mr. Reverian reiterated:

"There are parts that need special tools. At VBC, we have these tools that cannot be found anywhere in Tanzania. If you don't have such a tool, you cannot fix it. So if you improvise, you are likely to destroy that particular part."

This stands in contrast to the standardized Phoenix model, which necessitates only one predefined set of tools. In this regard, simple issues like inflating a flat tire (some VBC bikes have a special type of valve) can become a serious issue, as this statement exemplified:

"We don't have the appropriate pumps for these valves (…). (…) for the simplest thing to maintain, we need to come here (Nshamba) in order to have it fixed."- Teacher O -

The aspect of lacking mechanics and tools show that having a broken bicycle is likely to lead to serious problems. It can force households to forego the bicycle for a substantial period of time, suffering an impact on their income and life standard.

11.3 Preliminary conclusion V

Hierarchy levels dominate access to the bicycle within a family. The highest income earner usually enjoys the greatest benefit from purchasing a bicycle and enjoys the ultimate decision power over a bicycle's range of beneficiaries. Nevertheless, the interviews showed that the scope of beneficiaries goes beyond the HIE. As such, the majority of the HIE share the bicycle with family members or close friends. Only a minority asserted exclusivity to utilization. This was mainly based on the fact that the bicycle is the basic tool to earn income, making HIE reluctant in giving the bicycle to others, even within the family. The

[51] Mountain/Touring bikes show different mechanical attributes compared to Phoenix bikes, and thus need specialized knowledge and education.

difficulty households face in fixing a mechanical problem was common concern. Financial distress or the difficulty in finding appropriate spare parts, tools or mechanics are key issues.

12 Impact of the Bicycle on the Scope of Activities within Households

76 percent of the interviewees mentioned that the bicycle is shared within the family. Whereas the HIE uses the bicycle for income generation, this does not apply for "second level" household members (wife and children in most of the cases). Moreover, interviewees mentioned the following range of activities:

Table 9: Scope of activities that a bicycle is used within a household, excluding income generation

Reproductive Activities	Social Activities	Healthcare	Schooling
• Reaching the agricultural plot • Collecting produce from the plot • Fetching water • Collecting firewood • Collecting food for the animals (grass) • Visiting markets to buy food	• Visiting friends • Visiting family members • Attending meetings/ cooperatives • Attending a funeral • Visiting church/mosque	• Visiting healthcare institution • Delivering food to patients • Buying medicine	• Riding to school (children)

Given the utility of the bicycle for second level household members' daily activities, the interviewees emphasized on the impact that the bicycle is likely to deliver.

12.1 Impact on reproductive and social activities

With regard to reproductive and social activities, the bicycle's main benefits are seen to be higher speed in reaching places, higher capacity in transporting domestic goods, be it water, firewood or market items, less effort in fulfilling tasks that demand travel and last but not least, higher frequency in visiting distant friends and family members, as identified by the statements below:

Speed/Time	Capacity	Effort	Frequency
"She also is faster. Maybe I want to send my boy to get something. Also him, he can reach the destination faster and be back on time." – B-man B -	*"She needs to go only once as she can carry three canisters and hence the water lasts for 2 days. " – Painter M -*	*"She can visit them (friends) even without the bicycle. But with the bike, it simplifies her journey. And she has more energy to chat." – Painter M -*	*"I can't see my friends more often, but when I want to visit them, I can just do it." - Teacher S -*

However, as the interviews are conducted mainly with HIE, there is a lack of specific information regarding the assessment of average values regarding the bicycle's impact on certain activities, for example the "number of trips needed to collect water". Nevertheless, the anecdotal references by the HIE give a strong indication that freed-up time, increased transport capacity and lower physical strain as a result of using a bicycle will benefit second level household members (women and children) strongly as they usually bear the majority of the transport burden.

12.2 Impact on healthcare

In order to understand the value of a bicycle when it comes to health-related issues, a further brief understanding of the contextual circumstances is needed. In this regard, the organization of health

services in Tanzania plays an important part. The Tanzanian Health systems is structured as a pyramid, starting from the bottom with the community level and moving up to the treatment abroad (MoH Tanzania, 2014). On the community level, there are village health services, which can only provide

Picture 6: Steep passages are common in Nshamba one step services. Dispensaries (operated/managed by government or by religious institutions) are the second stage in health care. Dispensaries are supervised by health centers that can serve populations of up to 50'000 people. Every district has an additional district hospital, which is usually run by the government or religious organization. Regional hospitals offer similar services as district hospitals, however they have a higher capacity to offer more specialized care.

Given this pyramidal structure, one of the main issues is the uneven distribution of health services in different villages and communities. People have to travel long distances and several hours in order to access a healthcare facility. Studies in Tanzania show it is common for people to travel between five to ten kilometers before reaching a basic health service point. The travel distance from a residential area to hospitals can range from ten to 60 kilometers (Mamdani & Bangser, 2004; Ministry of Health, 2007). In Nshamba area, this distance is amplified as people have to pass difficult terrain, such as bad roads, valleys and mountains.

Although health facilities are usually located in close distance to main roads (studies estimate 0.2-0.3 km for Tanzania) and are theoretically accessible with public transportation, public transportation in rural areas is not very reliable and is, given limited financial resources, also very costly (Mayala, Mcharo, & Nyigo, 2014). Walking, which takes time and effort, taking a motorbike, which poses a price factor or using a bicycle, which presents an energy-effort factor are the potential alternatives.

In the present case, the distances to reach a health facility from different villages are comparable with the findings above. In Nshamba, the distance can range from less than one km too ten km, depending on the type of facility. Table 10 lists the distance in kilometers that people from the villages of Kashanda, Nshamba, Rushalunga, Ruswha, Kanwwangonge and Biirabo traverse to access the different types of facilities[52]. The indicated distances are an approximation, using only the main roads. Data was collated from motorbike usage on these main roads and from the interviewees' response to travel route questions.

Table 10: Approximate distances to health facilities from different villages in Nshamba area[53]

Village	Nshamba Health	Rwentege	Rushwa	Rubya / Kagondo

[52] It should be noted that not all dispensaries in the area have been listed.
[53] (brackets) = unlikely to visit this health facility, as there are closer options offering the same services.

Facility	Center	Dispensary	Dispensary	District Hospital
Nshamba village	< 1 km	1.9 km	(9 km)	10 km
Kashanda village	10 – 11 km	9 km	6 - 7 km	20 km
Rushalunga village	10 km	8 km	5 km	19 km
Biirabo[54] village	7 km	9 km	(16 km)	17 km
Rushwa village	10 km	8 km	1 km	19 km
Kanywangonge village	8 km	10 km	--	18 km

The table shows that the distance to second stage health services is, if not directly situated in the village itself, at least five kilometers. If some extra services are needed, Nshamba health center is ten km away for households living in the vicinity of Nshamba town. Reaching the district hospital in Rubya may take up to 20 kilometers for people coming from Kashanda or Rushwa village. Annex V shows the map of the area in order to picture the distances.

Given these remarkable distances, the impact of the bicycle turned out to be manifold: The bicycle can be used to transport weak and sick patients to the hospital. Hereby, the patient "*sits on the carrier, and you have to push. Haraka haraka haina baraka[55]. It's like carrying bricks or water, you cannot ride the bike, you have to push it*", *Painter M* explained. Using the bicycle for this purpose has several positive aspects. People reach the health delivery point faster than by going on foot or using public transport. This can be particularly relevant for emergency referral care since ambulances are severely lacking. Transportation costs can also be saved as a substitute for daladala or sekido, which are paid transportation. Last but not least, given these distances, it is less exhausting to use a bicycle as compared to walking when helping someone to reach the hospital. However, there are some exceptions to the usefulness of a bicycle, particular*ly "if that person is very sick, you need a pikipiki" (B-man E).*

The bicycle also simplifies (speed, time and effort-wise) the journey to reach a health facility in order to see a doctor, buy medicine or visit patients. A last aspect of the bicycle is its usefulness in delivering nourishment to patients in hospitals. As hospitals do not provide food[56]. it is up to the patient's family or friends to organize food on a daily basis. Given the distances mentioned above, walking is hardly an option, and the bicycle becomes an assistance to the situation.

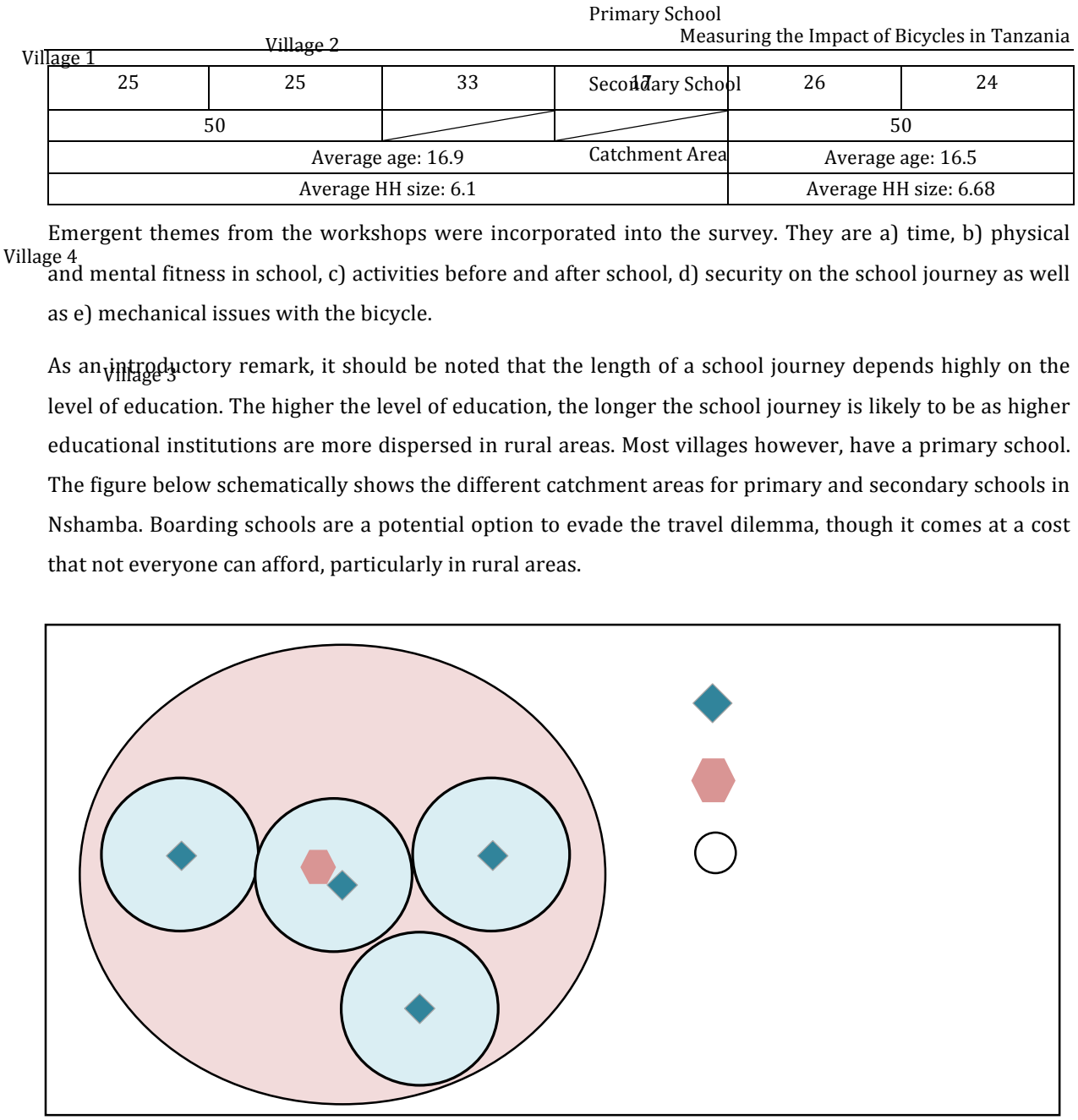
12.3 Impact on schooling

Bicycles also support children on their school journey. This was gathered from an in-depth survey with school children from Nyakitaba Secondary School, including 50 students (S1 & 3) that come to school regularly with a bicycle and 50 students who have to walk. The questions were based on the results of two workshops with 13 children each that helped to perceive a preliminary understanding of the issue.

Table 11: Survey participants

Bicycle Users				Non-Bicycle Users	
Boys	Girls	Phoenix	Non-Phoenix	Boys	Girls

54 Limited services are available in Biirabo Dispensary.
55 Swahili saying for "hurry hurry has no blessings" or just "no rush".
56 Dispensaries, which are usually closer situated to villages, do not offer over night stay.



25	25	33	17	26	24
50				50	
Average age: 16.9				Average age: 16.5	
Average HH size: 6.1				Average HH size: 6.68	

Emergent themes from the workshops were incorporated into the survey. They are a) time, b) physical and mental fitness in school, c) activities before and after school, d) security on the school journey as well as e) mechanical issues with the bicycle.

As an introductory remark, it should be noted that the length of a school journey depends highly on the level of education. The higher the level of education, the longer the school journey is likely to be as higher educational institutions are more dispersed in rural areas. Most villages however, have a primary school. The figure below schematically shows the different catchment areas for primary and secondary schools in Nshamba. Boarding schools are a potential option to evade the travel dilemma, though it comes at a cost that not everyone can afford, particularly in rural areas.

12.3.1 Time related aspects

12.3.1.1 Time to school

Bicycles help children cut the time needed to reach school. Only if there is a significant difference between bicycle users and non-bicycle users further conclusions can be drawn. The results from an unpaired t test are the following:

Table 12: Time to school with and without a bicycle

Value / Group	Bicycle Users (n=45)	Non-Bicycle Users (n=50)	Difference
Mean (min to school)	**65.78**	**102.74**	**36.96**
Standard Deviation	38.55	30.65	

Minimum value (min)	10	30	
Maximum value (min)	180	190	

The data reveals that the difference between time needed to reach school for bicycle users and non-users is very significant (p value < 0.0001). A student with a bicycle needs on average about 37 minutes less to travel school each day. Since this trip is done twice a day, this adds up to **1 hour and 15 minutes (74 minutes respectively) for each day of the week.** Within one week, students with a bicycle have more than **6 hours of additional time available**. This outcome is congruent with the results of the control question "how much faster are you with a bicycle compared to walking". 52 percent of the students with a bicycle and 58 percent without a bicycle mentioned that they save/would save up to 60 minutes for one way. The data also shows the substantial time participants need to reach school or home respectively. On average, it takes students (bike users and non-users) more than 90 minutes.

12.3.1.2 Punctuality

There was an overall consensus among the students that a bicycle helps them to reach school on time. 54 of the 100 interviewed students "strongly agreed" and 41 "agreed" that the bicycle helps/would help them to be punctual. Punctuality is not only a time factor. As the focus groups showed on a more qualitative basis, students usually associate "being late" with fear, anxiety, physical stress or anger. The reason behind these feelings is inevitable as students who are late for class/school usually get caned. Caning, where a teacher hits a student with a stick, is still a prevalent form of punishment in Tanzanian schools. The fear of being caned can even lead students to skip a class and not to show up for a whole day. The following two statements from the workshops highlight this critical issue.

"When I move with my bicycle I also feel less stress. I don't have to fear punishment. This same fear caused me to be absent." - Student K –

"For me personally, I decided rather to be punished for skipping class than being punished for being late. So when I skip class I can mentally prepare myself for the pain. I can make up my mind. Otherwise, the abrupt punishment is painful." – Student E -

As the bike helps students to reach school on time, the possibility of getting caned decreases. One student of the focus group reported having a bicycle opens new opportunities for "potential excuses" when arriving late. As some teachers are likely to assume that there must be serious reason for someone with a bicycle to be late, this can be used to the student's advantage. Tricks such as releasing air on purpose may cause a teacher to show mercy and save the student from painful caning. In this context it becomes obvious why students prefer to have a bicycle. The bicycle helps students to be more punctual where the physical component of caning (punishment) can be prevented.

12.3.2 Physical and mental fitness in school

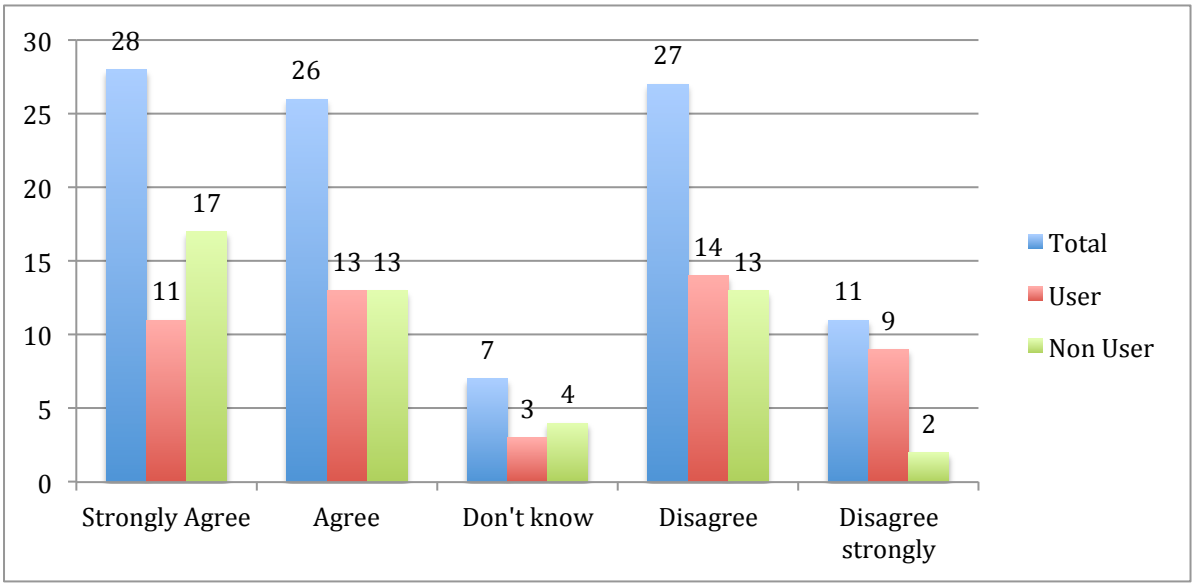
Another interesting aspect is whether having a bicycle has an influence on students' performance in class. There are some preliminary indications however from the focus groups, that having access to a bicycle may have indeed an impact on children's performance in school.

"It (the bicycle) helps me to reach school still fresh, less exhausted." – Student E -

As this statements shows, the reasons are largely related to physical and mental fitness in class. However, whether there is a true correlation is difficult to assess and needs further analysis, including a wide range of indicators.

This is particularly the case as the survey only confirmed a positive tendency towards this assumption. In fact, not everybody agreed that a bicycle lessens the physical strain on the school journey, as the bar chart below indicates. In fact, the result turned out to be very ambivalent.

Figure 20: Riding to school is less exhausting than walking (n=100)



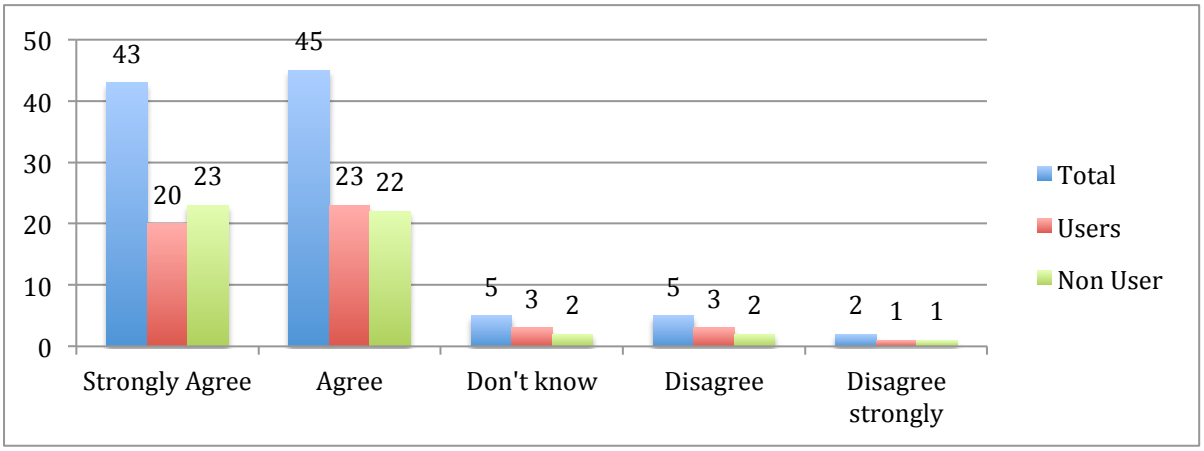
Reasons for these ambivalent results might relate to the fact that the bicycle is a means of transport and consequentially does not change the initial situation of long school journeys. It only increases the velocity children can move. The main advantage of the bicycle comes on downward slopes or flat terrain. However, Nshamba area is know for its hilly areas, which are equally exhausting for students to pass on foot or bicycle.

The second aspect with having a bicycle relates to the physical and mental fitness in the classroom. This impact is based on the assumption that riding a bicycle can preserve energy, as this student reiterated in the workshop:

"I feel better when I arrive at school. Even my senses are fresher on a physical and psychological level." – Student E -

As the second chart will show, most of the students agreed that coming to school with a bicycle preserves their concentration. Yet, there is no significant difference between students who have a bicycle and those who walk.

Figure 21: "I am more concentrated during class when I come to school with a bicycle than when I have to walk." (n=100)



Therefore, the bicycle can play a role with regard to physical and mental fitness by reducing the physical strain on the school journey. However, it must be kept in mind that the journey does not get shorter because someone has a bicycle.

12.3.3 Security

A third emergent theme out of the group discussions relates to security, that is the different forms of "dangers" that children have to deal with on their school journey. The safety issue gains additional importance as many students mentioned they would walk or ride (partially or the whole trip) to school alone. Children without a bicycle tend to be alone on their journey (57 percent of respondents), whereas those with a bicycle are more likely to ride in groups (68 percent). Traversing alone is a problem when children leave the house early in the morning, when it is still dark for school. Children were particularly concerned about meeting strange people on the way to school, be it "mad people, robbers, smokers or thieves." Such kinds of people not only disturb students on their way but they also pose a real danger for corporal violence or sexual assault, especially toward girls.

"When I am walking, there are places when I am worried. For example when three guys are chatting and have a smoke. I don't feel very comfortable passing them by foot. With the bike I have no problem". – Female Student E (female) -

Another danger relates to fierce animals on the school journey, such as dogs or snakes. Children who walk regularly use short cuts in order to reach to school faster. By doing so, they trespass on other people's property, forest or banana plantations and are likely to get attacked or bit by animals.

The bicycle was reported to help students combat these potential dangers, as they can move faster. And they are less likely to stop when someone tries to interrupt them or any animal tries to attack them.

"Sometimes someone could think of setting up a trap and convince me to stay with him for some minutes. He might say: "Hey, you, stop". On the bike I can reply: " No I don't have time." And rush home". – Student K (female) -

Conversely, by using a bicycle, short cuts are hardly possible. Children usually have to stay on the roadside. This makes it more difficult for someone to approach a kid on the open street than in a shady backyard. As one girl also remarked, it is more difficult for someone to "move away with a girl" if there is a bicycle involved. Other people may notice the abandoned bicycle and get suspicious.

Traffic accidents and security on the bicycle were hardly any issues. Although children were aware of the dangers as a result of traffic, no particular emphasis was given to that point. Compared to more urban areas, Nshamba has few motorized traffic (see traffic survey). However, it was noticed that both walking and using a bicycle with many other students can be risky as larger student groups would take up a lot of space on the road. This can be dangerous if vehicles pass in full speed.

The various benefits that a bicycle can deliver were reflected in the survey results. The two charts below confirm that in the eyes of both bicycle users and non-users, the bicycle increases (or would increase) the security of the user on the school journey. Again, there were no significant differences between boys and girls when asked the question 'Does the bicycle increase your security on the school journey?'

Figure 22: The bicycle increases my security on the school journey! (n=91, NA = 9)

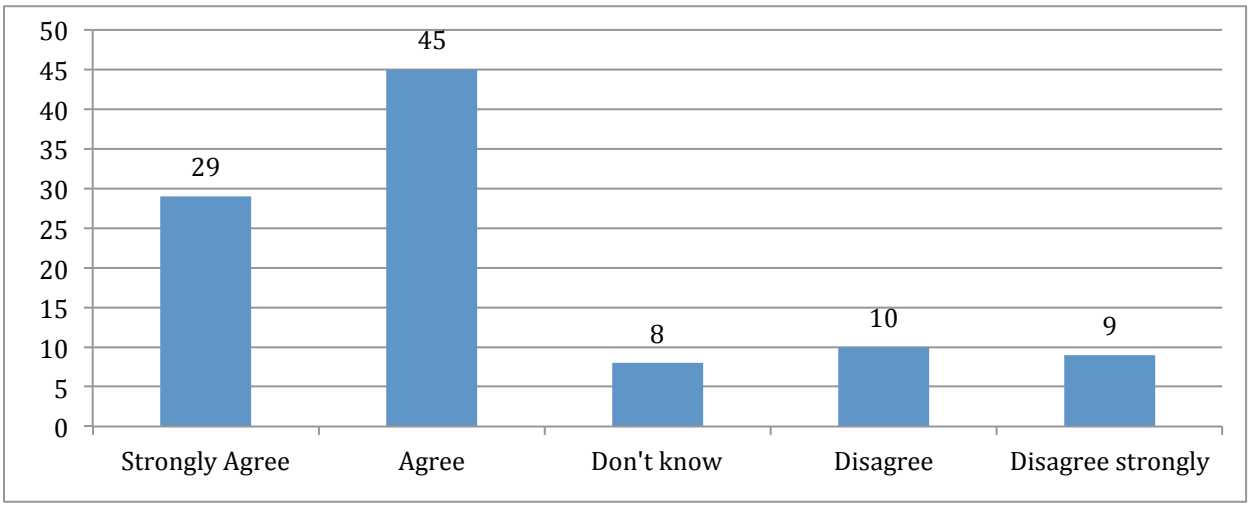
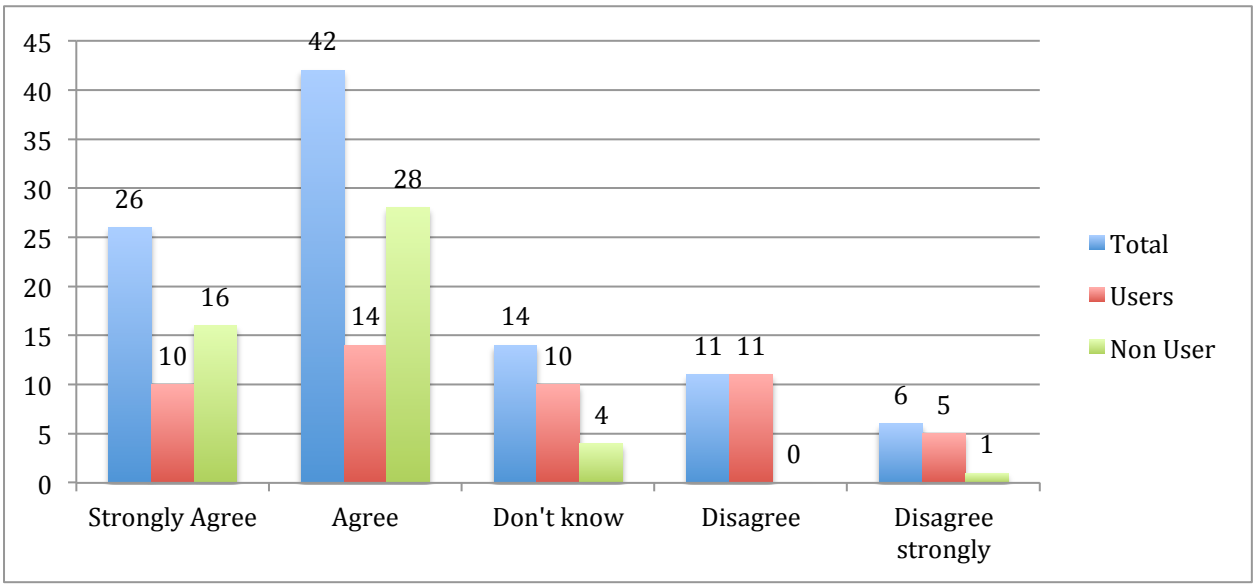


Figure 23: The bicycle increases the safety especially for girls (against violence, rape) (n = 99, NA =1)

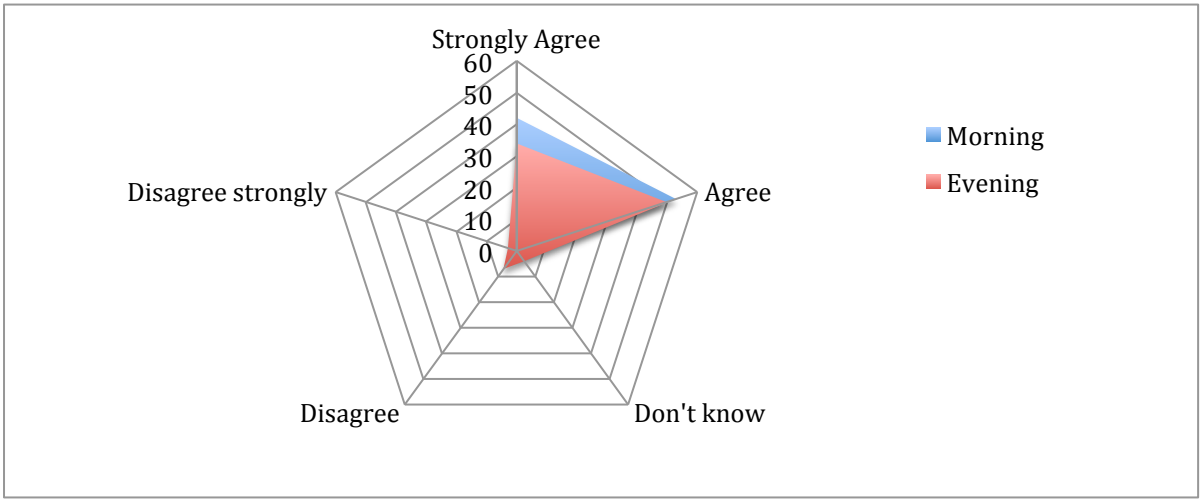


Security is a real issue for students on their long school journeys. The bicycle as a fast means of transport helps to reduce the risk of meeting strangers or facing dangerous animals along the way. This can be particularly relevant for girls who are more likely exposed to sexual or physical violence.

12.3.4 Scope of activities

Pre and after school activities is the last theme is of great importance, particularly for children. It has been shown that having access to a bicycle can free up over 75 minutes per day. To what extent do children make use of this additional time. The spider web below shows that the large majority tends to agree (strongly) with the statement that the bicycle enables them to have "more time for other activities"[57].

Figure 24: The bicycle's impact on children's' scope of activities (n=100)



The focus group discussions showed that the main activities in the morning include (apart from personal hygiene): revising for school and domestic work (cooking, fetching water, cleaning the house(s) or washing clothes). Students were asked to identify those activities, which they usually do before going to school. The table shows that the total number of activities for children with a bicycle is 24 percent higher compared to those who have no bicycle. In that sense, children with a bicycle (can/are able to) accomplish more tasks in the morning.

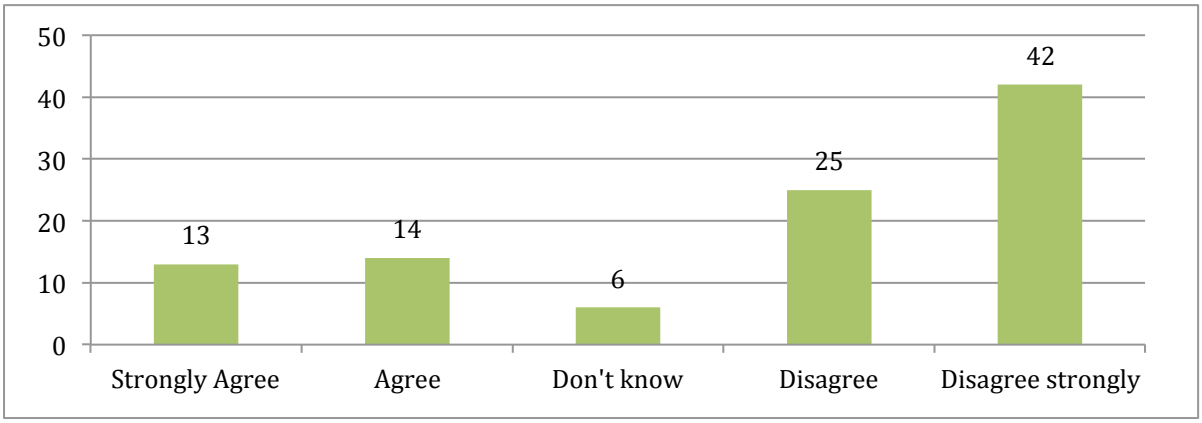
Table 13: Common chores before going to school. Number of mentions (n=100)

Activity / Amount	Revise	Cook	Fetch water	Clean house	Find grasses for animals	Wash clothes	Others	Total (absolute numbers)	Share in %
Users	40	4	17	17	4	8	5	95	62%
Non-users	42	4	7	5	0	1	1	59	38%
							Difference	Δ26	Δ24%

Most students mentioned that having or not having a bicycle does not influence the amount of sleep they would have. In other words, having a bicycle does not allow children to sleep substantially longer. The impact is more likely to be related to the amount of activities the student can do before leaving home for school. It should be noted that there was no significant difference in activities between boys and girls, except for the activities "wash clothes", which was only marked by girls.

[57] "Other activities" in that senses are not particularly related to the utilization of a bicycle, this follows in the next part.

Figure 25: Responses to the question: "With a bicycle, I can sleep longer in the morning compared to when walking to school" (users, non-users, n= 100).



The number of after-school chores children engage in are almost the same between those who have a bicycle and those who walk. 52 percent of non-bike users completed after-school chores. 48 percent of bike users did the same. Domestic tasks are done mainly by children (like fetching water, collecting firewood). Students with a bicycle are likely to accomplish some of these tasks in the morning, before going to school. They are left with less work in the evening. Having a bicycle too, is likely to be a sign of wealthier households. Children of poorer households are likely to be needed by their parents to engage in various chores after school in order to help the family income, including supporting the parents in domestic work or job-related activities (for example collecting grass for the cattle).

The data also reveals that boys and girls have different priorities for after-school chores. Girls are usually more involved in domestic work whereas playing with friends are activities reserved for boys.

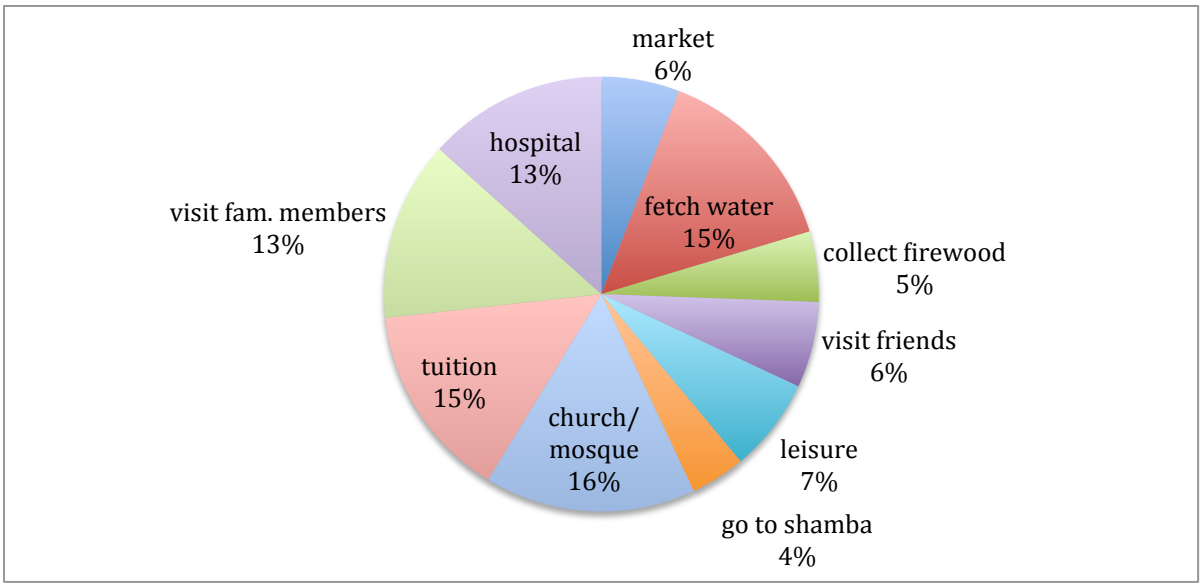
In summary it can be said that students attribute the bicycle to be responsible for the opportunity to engage in additional activities. There are indications that children with a bicycle do some of their regular daily activities in the morning, whereas students without a bicycle need to accomplish most of their activities when coming back from school.

12.3.4.1 Scope of other activities with the bicycle

The previous section tried to analyze the number of different chores and activities children do before and after school, including those with a bicycle. This section focuses on the bicycle and is interested in the types of activities students actually do by using a bicycle apart from going to school. As such, students were asked to choose from a list of common activities (predetermined with the focus groups) that they would use their bicycle for. The following pie chart shows the various options as well as the gradual usage patterns for the bicycle. The most prominent activity children would use their bicycle besides going to school is "visiting a religious institution". In this category, two thirds of the respondents were boys (63 percent to 37percent girls). Similarly, the bicycle is used for fetching water (60 boys to 40 girls) or for visiting tuition lessons after school[58] (56 boys to 46 girls).

[58] Tuition lessons can be held in the village itself or even back at school.

Figure 26: Other activities that the bicycle is usually used for by students



Children make use of the bicycle when it comes to visiting family members or patients in the hospital. Children are likely to be responsible to deliver food to patients in the hospital as a relief to their working parents. The bicycle is also used for several other domestic activities, such as collecting firewood, visiting local markets (in order to buy commodities for the family), or to reach the family owned field. Boys identified twice as much activities as girls (112 activities for boys to 60 activities for girls, total mentions), indicating the tendency that girls are less likely to use the bicycle for extra-curricular chores/activities. This might be linked to the fact that girls are generally more engaged in domestic work than boys.

Table 12 contrasts the perceptions students with no bicycle have on the type of activities students with a bike do and the actual field of activities students with a bicycle engage in. As the table shows, children with no bicycle expect to use a bicycle primarily for school related activities, be it to reach school or attend tuition lessons after school.

Table 14: Espoused activities versus actual activities

Potential Activity	Number of Marks		Actual Activity
Non Bicycle Owners		**Bicycle Owners**	
School	48	27	Church/mosque
Tuition	41	25	Fetch water
Hospital	30	25	Tuition
Fetch water	27	23	Visit family Members
Church/mosque	26	23	Hospital
Visit family members	14	12	Ride for fun
Agricultural plot	14	11	Visit friends
Market	7	10	Market
Ride for fun	7	9	Collect firewood
Visit friends	6	7	Agricultural plot
Collect firewood	5	1	Only school

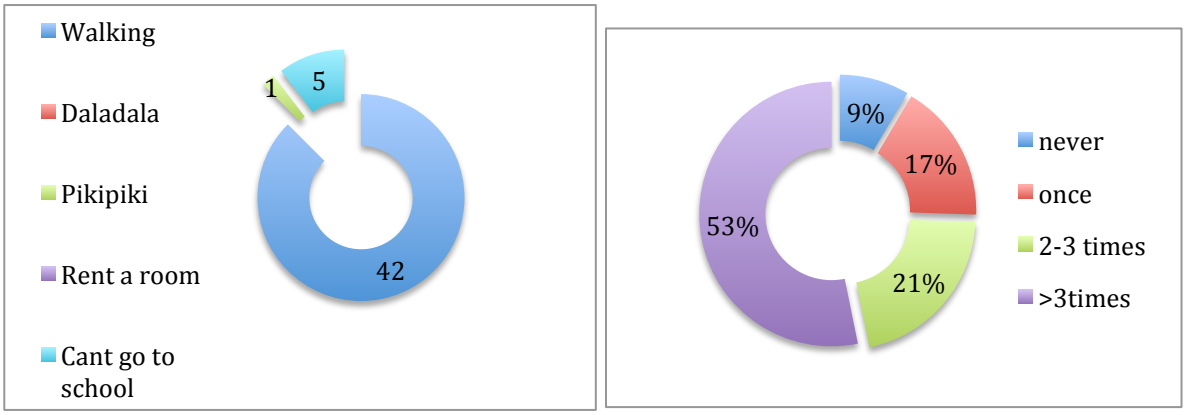
Visiting a religious institution is not mentioned very often, only ranking fifth. Children without a bicycle expect to use the bicycle in order to see someone at the hospital or fetch water. While children with an

actual bicycle attributed little use for it to reach the agricultural plot, children without a bicycle expect the bicycle to support them in this particular activity. Riding for fun, visiting friends and collecting firewood rank similar to the each group and thus can be seen as less important tasks when the bicycle comes into play.

12.3.5 Issues with the bicycle

A last aspect of the bicycle is the mechanical vulnerability. This is an important issue as 42[59] (or 88 percent) of the student bicycle riders said that walking is the main alternative if the bicycle has a problem. Five students said that they could not go to school anymore (factor distance). Taking a minibus (0), using a motorbike (1) or even renting a room (0) near school are not valuable options (factor price).

Figure 27: Alternatives to taking a bicycle to school (left graph, n=48) and Number of reparations since a student has gotten his or her bicycle (right graph, n=47)

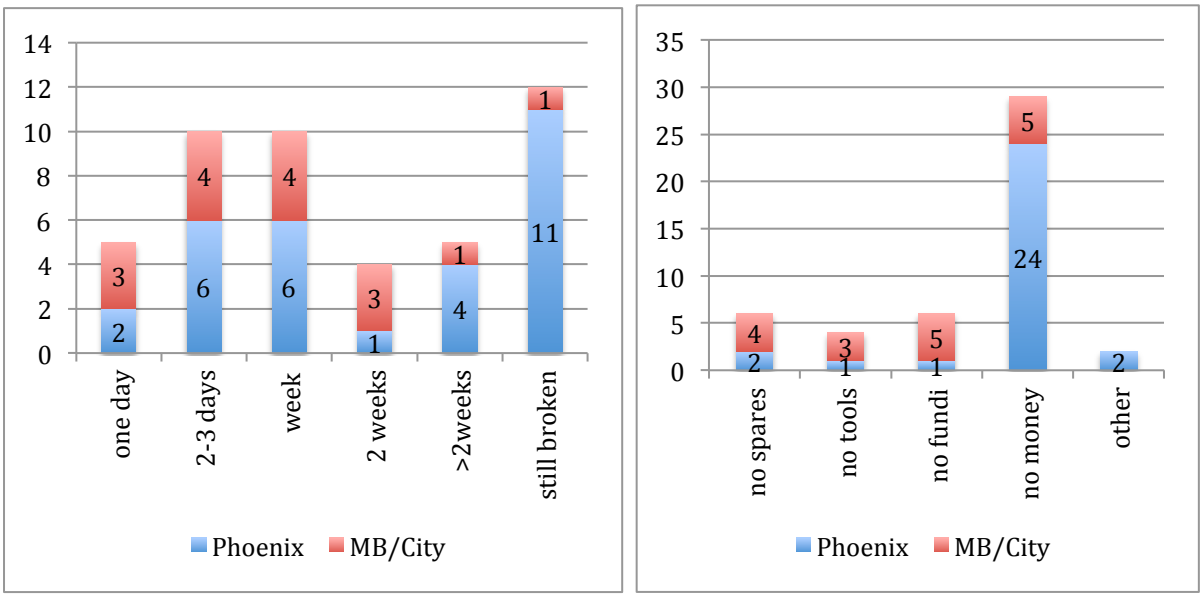


Mechanical issues are a relevant topic. Over 80 percent of the children needed some form of bike repair since they got their bicycle (the majority got the bicycle within the last three years). For over 50 percent, the bicycle had more than three times a technical problem. Repairs often could not be resolved immediately, as the right bar chart in Figure 27 indicates. It is common that households need two to three days (10 cases) or even one week (10 cases) to resolve the issue, if at all. As such, one out of five students claimed that their bicycle was still broken even at the moment that the survey took place. The inability to repair a broken bicycle is a serious problem for children with a Phoenix, as illustrated in Graph 27. It shows that "having no money" is the main reason for such a delay among households with a Phoenix, thus correlating with previous findings in section 11.2.1. Among VBC bike users, issues relate additionally to the availability of the appropriate spare parts, tools or even mechanics, who are able to fix it, again supporting argument earlier made.

[59] For bicycle specific questions, only the bicycle users were part of the assessment, i.e. 50 cases.

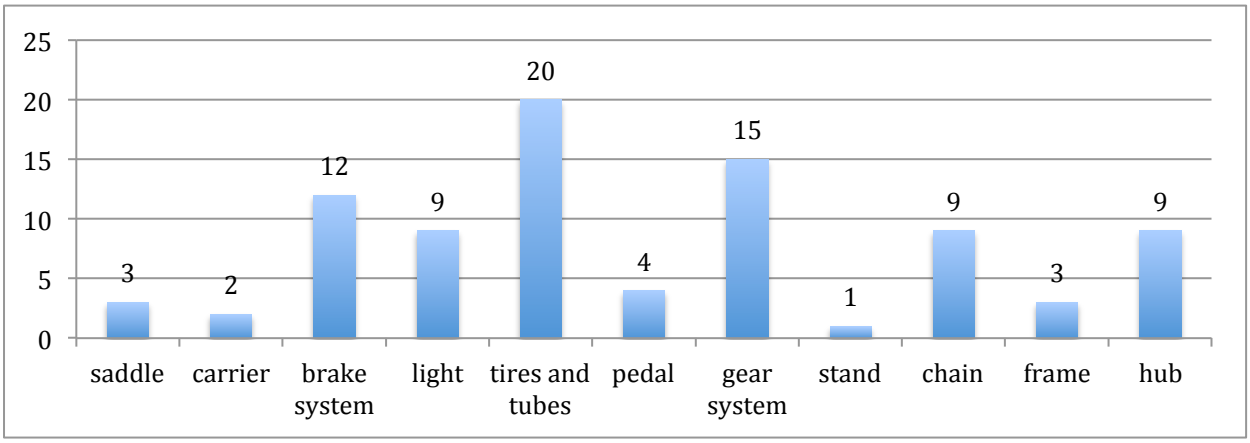
Picture 7: Shelter for bicycles at Nyakitaba Sec (left) and children after workshop (right)

Figure 28: Reasons for not being able to fix a broken bicycle (n=47) and the time needed until it is fixed (n=46)



With regard to mechanical problems, broken/flat tires and tubes (punched hole) were among the most prominent issues[60]. This is a consequence of the quality of the mud roads in the area. Secondhand bicycles, which rarely do come with new tires, are likely to burst quickly on this type of ground. The gear system, particularly the trailer, was another common issue susceptible to problems. Broken break cables or worn out break beams are a third common problem that affects a safe ride. Whilst a broken chain or a non-functioning hub can hinder children from using the bicycle to go to school, a defective light is less of a problem, though it can affect the safety, especially in the early morning.

Figure 29: Vulnerable parts of the bicycle (n=50); number of mentions



Of particular concern to the children was that they might face a problem with the bicycle on the school journey, causing them to be late. The top answer when asked about specific parts that children would be able to fix if the bike broke down on their way to school would be able to fix was “none”. Only few knew how to fix a punched hole (if they have the necessary spares) or set the chain if fallen out.

[60] See Annex VIII for an overview of the different parts mentioned.

12.4 Preliminary conclusion VI

The importance of the bicycle for schooling and healthcare has been underlined. It became evident that children benefit drastically from having access to an efficient mode of transport. The additional hour gained daily is likely to have an impact on children's daily structure and activities. There is a tendency for bicycle users to use this additional time in the morning to accomplish some of their regular family tasks, thus having more time in the afternoon for leisure or studying. Apart form time-related aspects, other factors include physical aspects, scope of pre and after school activities or security. Apart from going to school, there is a whole range of other activities that the bicycle is used for. Children without a bicycle expect slightly different activities to be done with a bicycle.

Given the importance of the bicycle for students described, the number of repairs needed since acquisition, combined with the delay of getting an issue solved, should be considered a real issue. A non-functioning bicycle clearly offsets the multiple benefits of having access to it. Apart from finding solutions on the technical/logistical site (spares, tools, mechanics), basic educational courses for students on how to fix simple problems might help considerably. As such, all students unanimously expressed their interest in learning more on this particular matter.

13 Vulnerability and Resilience

Vulnerability and resilience was another theme which emerged. Vulnerability is an important factor when discussing rural poverty. It relates to the *"unpredictable events that can undermine livelihoods and cause households to fall into poverty*" (Fao, 2013). Such shocks, hazards or stresses can either be external (affecting the whole community) or idiosyncratic (affecting only a particular household) shocks. The role of the bicycle in this regard turned out to be twofold:

1. The bicycle is key in accumulating assets, which in return is the basis for being able to cope with external or internal shocks
2. The bicycle is an asset in itself that can be sold in case of an emergency

13.1 The bicycle is key in accumulating assets

If people experience an unexpected event or crisis that demands additional money (e.g. illness or death of a family member), they are likely to be forced to sell family assets. Although borrowing might be a considerable option, only few people considered this. Borrowing money leads to debts and dependency, a burden that few interviewees were willing to take. As such, it was more common to sell personal assets, such as animals or even produce. Selling the bicycle is the last option. This highlights the relevance of the bicycle and the additional asset it represents as the *"means of resistance that individuals, households, or communities can mobilize and manage in the face of hardship*" (Moser, 1998, p.3). The more assets a household possesses, the greater is its resilience against unexpected happenings. The bicycle is at the beginning of such an accumulation process.

13.2 The bicycle is an asset in itself that can be sold in case of an emergency

The bicycle is also regarded as an asset to "store" money, that should only accessed if the situation is severe. However, people were generally reluctant to sell their bicycle, as already indicated by the statements above. As such, common reactions often included notions like "*nothing can make me sell it*", *"I am not willing to sell this bicycle"* or *"I can't sell my bicycle",* as exemplified by this statement of a teacher:

No, I cannot sell my bicycle. I would never sell it. It is a big help for me. Even if the life will be difficult for me, I keep it. – Teacher AM -

The argument *not* to sell the bicycle mainly related to its economic relevance. As has been shown, the bicycle is for many the most important tool to generate income and thus the basis for social and economic development.

"Nothing! (Not evening if somebody gets sick?). The reason why I cannot sell my bicycle is that the bicycle is the machine that produces money. So how am I going to support my sick family member if I sell this machine?" – B-man J -

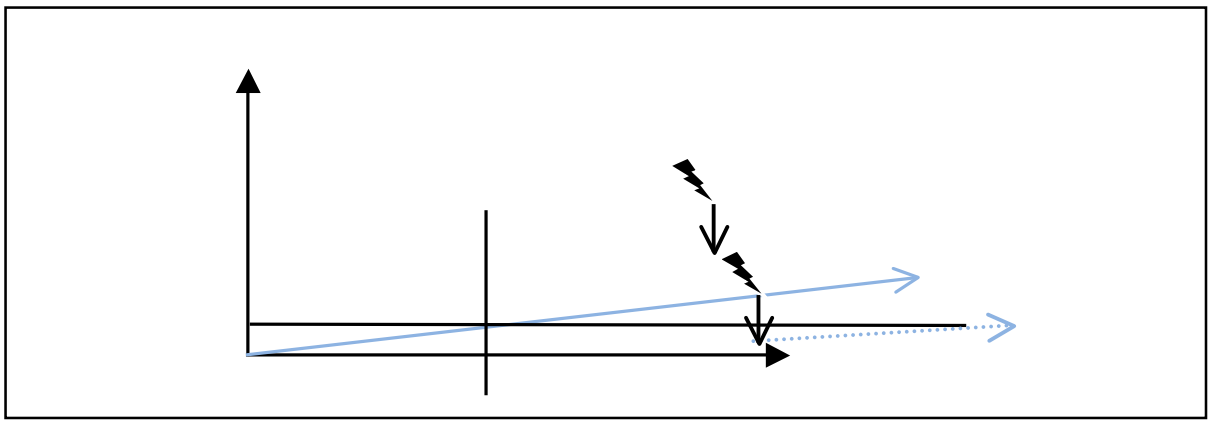
However, two potential reasons were yet mentioned that would cause people to sell their bicycle. As such, illness or death of a family member was one of the few events that could lead to the sale of the bicycle in order to have enough liquidity to pay for the hospital or treatment respectively.

"If my wife or my kid gets sick abruptly and I don't have money, I would probably have to sell it. This would be the only way, to help the family in an emergency." – Teacher D -

Few interviewees also mentioned the need for additional capital in order to do a specific investment. Replacing the old with a new bicycle was the common reply here from the few people who brought this issue up.

13.3 Preliminary conclusion VII

The bicycle is for many households a core prerequisite for economic growth and rising prosperity as it supports "asset accumulation pathways." Assets can be used to generate more income or can be regarded as forms of investments. As living standards rise, households incrementally move away from the poverty line. Assets are not only key to improving a household's socio economic status but also its resilience against external or idiosyncratic shocks. In case of such a shock, assets can be monetarised. Although such a sacrifice brings households back to a lower living standard, they still are not put under the poverty line, which is likely if no assets to sell. In the long run, this is likely to make fragile household "ecosystems" more stable and sustainable.



The bicycle can be considered a physical asset in itself that adds to the base stock of assets. However, the bicycle is only sold in case of a serious emergency when all other options have failed. People are seen to be reluctant in selling the bike as the benefits outweigh costs invested and households forbore a lot of amenities to buy the bike in the first place. People are aware that selling the bicycle would affect their livelihood at the most basic level, increasing the possibility to fall to the pre-bicycle period.

Picture 8: Proud women and their bicycle – although the share of female riders is low, it is commonly well accepted for women to ride bicycles in Nshamba

14 Institutional Aspects: Gender and Status

The previous chapters have extensively highlighted to what extent the bicycle can support people in their daily activities and what impact it has on a household. However, local institutions[61] are likely to have an influence on the acceptance of bicycle users and usage in general within a society. Hence, the question of gender aspects and status will be discussed as a last topic.

14.1 Gender aspects

It is often the male head of household who is enjoys the greatest benefits as the head income earner. Local institutions are likely to determine gender roles, that is, which activities are appropriate for women and men. This creates specific incentives to pursue activities and decisions regard to bicycle usage. The role of gender touched upon different, intertwining aspects. The topics can be summarized into three basic thematic groups:

1. Acceptance of women riding bicycles
2. Culture and tradition determine the sexual division of labor within a household
3. VBC as a catalyst for women's empowerment to use bicycles

14.1.1 Acceptance of women riding bicycles

There was an overall consensus among male and female interviewees that riding a bicycle is considered *"a normal thing" (Teacher A, Farmer O, B-woman L).* However, it was particularly recognized by female interviewees, who, similar to this businesswoman from Kanywangonge, reiterated this fact by saying that "*The bicycle is very popular among women" (B-woman J).* None of the interviewees (male nor female) denied it would be a benefit for a woman to have access to a bicycle. There was a general consensus that more women are riding bicycles today, and thus seen as a positive development that benefits not only women but the whole community as such.

This teacher from Bugarama highlighted these two aspects: *"(…) we change gradually, every family now has a bicycle. So as women are making more and more use of the bicycle, this is an advancement/progress to another model. This is also an important step for women's' personal development" (Teacher O).* Focusing on

[61] Institutions in this context are mechanism of social order (e.g. traditions, customs).

the family per se, male heads of households underpinned the potentials of a bicycle for their wife. Teacher O for example raised the intention to buy a bicycle for the wife as soon as the financial situation allowed it. He said "*Actually I want her to buy a new bicycle (…). I cannot give her my bicycle as I use it to go to school. I can see her using the bike to buy commodities that are needed in the shop, or even to visit relatives here in the region".* However, the overall positive attitude towards women using bicycles as expressed in the interviews stands in contrast to the low share of female riders recorded in the traffic survey (10 percent compared to 90). Confronted with the results from the survey, interviewees identified "culture and tradition" and the sexual division of labor to be responsible for the lower share of women using bicycles.

14.1.2 Culture and tradition determine the sexual division of labor within a household

Culture and tradition has many aspects. They indirectly play a role as they define to a large extent the sexual division of labor within a household. If the man is responsible for income generation, it is he who is earning the primary income. This implies that the husband is privileged in using the bicycle. As the bicycle is mainly engaged in "transporting jobs" that happens outside the household, the bicycle is absent during the day and thus not available for the wife and other family members to use. This leaves women with no option other than walking in order to accomplish domestic tasks. Many of these tasks involve movements from one place to the other (visit plot, markets, water source) thus leaving the transport burden to the woman. As women do not generate their own income, they have limited funds available for their personal use. B-woman MA vocalized this as to why still a few women actually **possess** a bicycle:

"one reason could be that if a wife wants a bicycle, she has to pay for it on her own".

As overall family budgets are limited, financial resources are less likely to be allocated for a second bicycle that has no direct impact on the household budget. The lack of power in decision-making among women adds to this issue. Given the responsibility of the husband as the primary income earner, the acquisition of a bicycle for his wife bears the "danger" that this might undermine his authority or status in that role, as again B-woman MA noticed:

"*The husband may ask himself why the wife should earn money too as it is his responsibility to provide the family!"*

However, if women break away from normalcy, it happens that people get irritated, as this other businesswomen expressed: "*When you are riding a bicycle (Phoenix) and carry heavy cargo, some people laugh because a woman is not supposed to do such a job" (B-woman B).* This is a further manifestation of the traditionally engrained division of labor among sexes.

These various issues show that gender roles are highly respected and still determine what is appropriate in Nshamba society. Although women face little stigma or prejudice in riding a bicycle, gender roles within the family ultimately restrict their access and usage opportunity. This leads to the conclusion that women, although they bear the majority of the transport burden of a household, do not (yet) enjoy the full potential of a bicycle within a family.

14.1.3 VBC as a catalyst for women's empowerment

The heaviness of the Phoenix bicycle poses a natural technical barrier for women to use it. The lightness and the frame structure (no horizontal top frame) of the VBC female bikes are seen to enable an easier and more comfortable ride for women, as this businesswoman reiterated:

"Yes. It's true that the MB is light and easy to ride. Since I have this MB, I never used the Phoenix anymore. The Phoenix is so heavy." (B-woman L)

By providing "female friendly" bicycles, it was recognized that VBC has a substantial role to play in the empowerment of women through riding bicycles. Teacher A for example noticed this fact by comparing the share of female riders in more rural areas to the town of Nshamba: *"In this area, women have developed in this matter. They ride bicycles. I compare this to other places where VBC is not yet present. I can see that women are appreciating this service" (Teacher A).* Given that VBC bikes are hardly used for direct income-generation, the distribution of Mountain and Touring bikes are more likely to benefit women. They are less suited for heavy work, but they can still support women on a majority of their daily transport needs, including the transport of groceries or children. Taking into account the acceptance of female riders and the pervasive traditional barriers, it can be said that VBC and its female "friendly" bicycles are very likely to have a positive impact on the share of women using bicycles.

14.1.4 Preliminary conclusion VIII

The data shows that little discrimination exists towards women and girls riding a bicycle on the basis of gender. Female riders prefer VBC bikes, as they are lighter and easier to ride. Although there is a wide acceptance, there are some institutional and financial reasons that hinder more women from having access to a bicycle. However, the main burden relates to the persistent gender roles within a family. In many cases, the husband as the primary income earner enjoys the authority over the bicycle. This limits the access to the bicycle for women substantially. It is expected that the presence of VBC bikes and their suitability for women have the potential to ultimately accelerate the empowerment of women with regard to riding bicycles. And as the bicycle provides a substantial relief for women in their daily work, these newly gained capacities are likely to question the traditional sexual division between husband and wife in the long run.

14.2 Status and prestige

The bicycle an indicator of economic or social status within the rural community turned out to be a last topic. Among the 28 interviewees who addressed this topic, three camps of opinions can be identified. The first one, with 57 percent, regard the bicycle as something that people are proud of. It is a reflection of one's economic success. The second camp, with 29 percent, does attribute little prestige to the bicycle. As such, the bicycle is a functional tool, nothing more. The minority of 4 cases link someone's personality to whether someone sees the bicycle as a status symbol.

14.2.1 The bicycle as a status symbol

57 percent regard the possession of a particular mode of transport as a symbol that enjoys status and privilege. Having assets is generally seen as a sign of economic success and thus has the tendency to create

jealousy within the community. The bicycle as a visible asset is therefore predestined for this aspect. Teacher O put it that way:

"You know, when a person is possessing something in a certain environment. The one who is possessing such a good is superior."

This particular interviewee even rooted such a desire to display and 'show-off' the bicycle in some people's personality: *"And you know, it is also maybe how some Africans are. They do want to show off if they have something new" (Teacher L).*

Furthermore, different modes of transport are often contrasted against each other, with walking being the least desirable option. The motorbike is for most the highest level of achievement and a sign of success of someone's hard work. The bicycle takes on a intermediate positions as it is considered the means that provides the opportunity succeed, as one interviewee exemplified: *"Especially for the young people in order to be respected in the society, he needs to have a bicycle. This will help him to make a living and support the family" (Stonemason E).* In that sense, the bicycle is preferred to walking and portrays a picture of someone who has the potential to make money and sustain a family.

A divide between Phoenix and VBC bikes could also be identified. The VBC bikes are valued higher. It is less of the price difference and the limited prevalence of these bicycle types than the quality (light, fast, easy to ride). These characteristics make the VBC bikes an elegant and special vehicle for people to be proud of. Phoenix users however were likely to regard the VBC bicycles as a mode of transport solely for leisure purposes due to its in ability to transport commodities, and thus more of an item for wealthier people. One interviewee said that *"It (the MB) is like a small car that you use for the leisure purpose of the family" (Electrician E).*

14.2.2 A bicycle is a bicycle

The second camp of interviewees regards most of the points discussed above as of little relevance and wonder *"how can you show-off with a bicycle?" (B-woman F).* This camp sees the bicycle as a tool that simplifies the journey and work. It is one's financial and social situation that determines whether he or she can afford a bicycle. It was often mentioned among interviewees that it would "depend on someone's personality" if he or she would use the bicycle as a means to show off. This holds true for Mountain Bike and Phoenix users, as this statements summarizes: "*You know, all these means of transport have one common goal: to simplify the journey of the people. For the people who understand this, there are no classes between different types of users. There is no reason for someone with a Phoenix to feel inferior" (Teacher A).* People of this opinion reiterate that all the people of the community face the same severe conditions, and everyone is doing his or her best to cope with the situation.

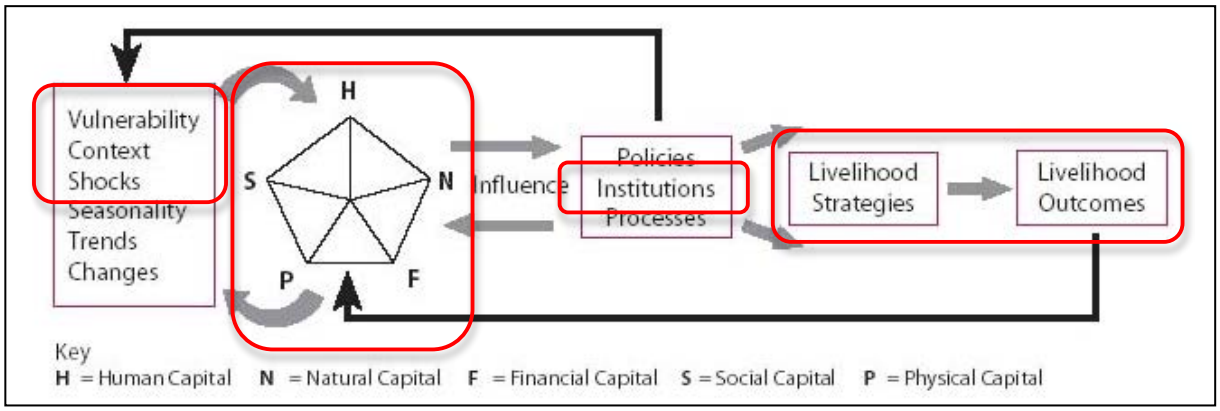
14.2.3 Preliminary conclusion IX

It cannot be denied that a certain status or feeling of prestige is attached to a bicycle. The bicycle is a valuable possession in every beneficiary's household. The majority argue that property, and the bicycle is regarded as such, has indeed the power to create a feeling of pride. As such, the bicycle is seen as the result of hard work and as an asset someone deserves to be proud of. However, there is a group of people who think that it is a matter of personality whether someone uses the bicycle as a status symbol, or emphasizes the prestige attached to it.

15 Final Conclusion, Limitations and Recommendations

As the case of Nashamba has demonstrated, rural and remote areas suffer from the inaccessibility to basic services, employment or information. The high cost in time, money and effort needed to satisfy basic necessities severely affects people's economic and social development. Mobility plays a crucial role in enabling pathways out of poverty. The bicycle as an intermediate means of transport has been shown to be beneficial and profitable. Using the livelihood framework as an established benchmark, it becomes evident the bicycle has a direct influence on the core pillars of this framework.

Figure 31: The role of the bicycle within the SLF



One of the core emergent themes attributed the role of the bicycle to its functionality with regard to the generation of financial capital. Phoenix and VBC bikes have distinctive qualities that make them suitable for specific types of work. The Phoenix is used as a vehicle to transport commodities, whereas the VBC bikes have the advantage of speed and lightness, which allows accessing customers or a workplace comfortably. Bicycles are thus seen as a tool at the most basic level that substitutes the tiring transport mode of walking. The interviews have shown that bicycles help to increase labor capacity and support income-generation in many ways, including time efficiency, productivity, business and marketing opportunities, transport expenditures, profits and also the ease of physical strain. The valuable role that bicycles play in income-generation reflects in a household's disposable income and time. Given the fragile ecosystem of a household, additional income and time have been shown to substantially impact their livelihood. Additional time is reinvested in domestic and productive activities that generate additional sources of basic goods and income. Financial capital is invested in physical capital, namely domestic and productive assets. In the absence of financial institutions, such investments are regarded as a practical way to store financial resources. This allows households to move incrementally away from the poverty line. Asset accumulation also cushions against internal and external shocks. Rural households in particular are prone to shocks, as hardly any social security networks exist. Assets in that sense increase the overall resilience capacity in the case of an emergency. The bicycle itself is regarded as the last hope that can be used as collateral for credit if all other options fail.

The fact that the bicycle is used extensively for income generation has consequences, particularly with regard to the extent others can benefit from it. Within a household, the primary income earner benefits the most. This person is likely to be the husband who holds control of the bike over the range of users. Despite this restriction, the bicycle is by no means seen as a tool for one person only. The majority of

interviewees (or primary income earner) said the bicycle serves an important role for other members of the family and within the close social environment. However, women and children are the main beneficiaries. For them, the purpose of the bicycle is to undertake domestic and social activities. Higher speed, bigger capacity to load and lower physical strain compared to walking make the bicycle the preferred mode of transport.

The bicycle is of utmost value to the improvement of human and social capital within a family, particularly by providing enhanced access to healthcare and schooling. The dispersed location of healthcare and educational institutions was confirmed to be a substantial burden that hinders user access. The bicycle as a fast and comfortable means of transport serves to overcome distance and enables people to deliver patients to hospitals more easily or also facilitates visits and food delivery to sick people more regularly. The bicycle also reduces the time and effort needed to for students to reach school. Students with a bicycle save more than 70 minutes per day. The bicycle also helps students with their physical and mental fitness in school, and increases their feeling of security on the journey. Ultimately, bicycles are also very likely to influence the scope of household and personal activities that students can engage in before and after school.

Given these positive outcomes, the bicycle is inevitably shaping rural communities' livelihood. However, local institutions influence the extent to which women can integrate the bicycle in their lifestyle strategies. The persistent understanding of gender roles influence how, where, when and by whom the bicycle is accessed, used and controlled. While little discrimination showed to exist towards women and girls riding a bicycle per se, restrictions were mainly a result of the sexual division of labor between husband and wife. The husband as the primary income earner enjoys in most cases authority over the bicycle. This instance is unlikely to change in the near future, as cultural issues are deeply engrained in people's traditions. However, improving women's access to bicycles will be core to the improvement of family livelihoods, as women still bear the majority of the household transportation burden. In this context, it is expected that the presence of VBC bikes has the potential to accelerate the pervasiveness of women riding bicycles and by example, the empowerment of women on the sexual division of labor. VBC bikes are described to be particularly suitable for women and children as they are lighter and easier to ride. In that regard, VBC bikes have the potential to empower women and girls and bring relief to their daily transport burden. This is likely to have far reaching consequences.

Despite the positive aspects of the bicycle, it should not be forgotten that the acquisition of a bicycle is a long and enduring process. Financially limited households bear risks and sustain substantial economic cutbacks. Both the organization (saving) and outflow of a substantial amount of money at once on the purchase of the bike presents for many households a huge hurdle, particularly in the presence of limited credit options. As such, the wait for harvest season or the participation in cooperatives are common options. However, the option to pay in monthly installment offered by VBC has been shown to be a pragmatic and well-perceived initiative that supports eager customers.

The introduction of new quality bicycles through VBC bikes has also shown to influence the perception and value of bicycles in the whole region. The bikes pose a real value-added concept to the rural communities. Particularly in the hilly areas, the VBC bikes allow faster movement from point A to point B

by using less energy. This makes the bicycle especially suitable for people who do not have to transport heavy commodities. However, it should be noted that the same unsuitability to transport cargo combined with the higher price that creates a perception among the locals towards VBC bicycles. As such, VBC bikes are likely to be seen as items of luxury and "egoistic" vehicles for wealthier. Whether these bicycles are mainly for leisure purposes must be relativized in the light of the substantial investment that is needed. It may be assumed that bicycles in rural areas are not bought for the sake of prestige but to incite economic development and stability.

VBC customers have faced availability problems with regard to spare parts, tools and knowledgeable mechanics. Maintenance and repairs issues are considered when buying a VBC bike. Missing spares are a serious risk given the important role of the bicycle. Used on a daily basis, the broken bike could lead to a financial loss for a household, which may be difficult to recover. Any developments of the bicycle program must inevitably find solutions for this issue.

The bicycle in Nshamba presents a huge potential to spur growth and development, linking communities and supporting women's empowerment. The bicycle stands at the beginning of economic and social development and thus serves as a tool at the most basic level to shape livelihood/lifestyle strategies. As a substitute to burdensome walking or costly public transportation, the bicycle presents an efficient and effective mode of transport that leads to higher production and income, better education and health accessibility. It makes households more resilient against internal and external shocks. The case of Nshamba has shown that the bicycle is inevitably the most modern, efficient and sustainable way of transport for rural households. The bicycle offers pathways out of poverty and puts development goals into reach. These promising findings underline the relevance of bicycle initiatives and incite existing and future programs to expand their service in respect of local conditions.

15.1 Limitations

Before closing with an outlook and recommendations, some limitations should be addressed. As a result of the time limit, this research was conducted on a small percentage of the population in one particular area of Tanzania. The results therefore reflect the local characteristics but may be harder to generalize or compare to a larger group or other rural areas.

Interviews were held with one particular family member, often the head of household. Drawing conclusions from their statements and perspective of other family members limits the validity and applicability to entire households. This may be reflected in the amount of information gathered on these second-level bicycle users.

The language barrier also cannot be ignored. As a large percentage of interviews were conducted in Swahili with a translator, and not in the researcher's native language, capturing the nuances were challenging and left mostly to the translator. As such, the depth of information may have been lost due to the paltry translation or varying cultural context which the researcher or translator may not grasp. Focusing on qualitative data analysis too, has limited the opportunity to draw quantitative findings.

15.2 Recommendations

The thesis has addressed many issues of bicycle usage. For existing and future bicycle programs, some recommendations to the key problems mentioned above should be presented as an outlook:

Implement credit systems for rural households: Any bicycle program must pay considerable attention to the difficulty in raising the initial investment for a bicycle. In the absence of financial institutions in small villages, households have difficulties in paying a substantial amount of money as a percentage of their income at once. Such long-term financial contracts may be difficult for smaller NGOs to manage**. Collaborations with micro finance institutions** can be an alternative. **Installment or hire purchase-whether monthly or weekly,** is another option. **Credit periods and installments must extend** over a longer time period, such as several periods of harvest. It is possible to consider just 'holding' the bicycle at the shop until full payment is done.

Guarantee availability of spare parts and tools: Missing spare parts and tools are one of the key issues identified as a barrier to using the bike, particularly secondhand models. Therefore, the availability of spares and tools must enjoy highest technical priority**. Replacement or exchange systems of bicycles** in case spares cannot be delivered must be offered in any bicycle program. Furthermore, an approach towards **lowering the number of different modes of bicycles models** should be envisaged to streamline costs for the centre.

Improve availability of mechanics and fix-it-shops: Limited access to mechanics is another serious issue. M**obile mechanics** as piloted by VBC can provide a handy solution to the issue. Customers should be informed about upcoming visits of these mobile units to remote areas, particular at the weekly markets. Here, the widespread use of mobile phones serves as the basis for marketing. Regularity of the mobile unit can ensure the spreading of information by word-of-mouth.

Improve load-carrying capacity of Touring and Mountain bikes: VBCs MB and TB bikes lack the capacity to transport heavy load. **Technical improvements or adaptations** that strengthen the carrier and frame would substantially add to the utilization of such bicycles for day-to-day usage and the movement of subsistence goods.

Improve durability of tires and tubes: Tires and tubes are the most vulnerable parts of a bicycle (VBC and Phoenix). Focus should be given to the development of new technologies that eliminate the burden of costly and frequent repairs. Care should be taken to invest in the "Milele tube", developed by Baisikeli Ugunduzi. **This solid tube never flats and does not need air.** Implementation and promotion of such a specific type of tube should further be tested in existing and future bicycle programs.

Promote bicycles for women: The promotion of **female-friendly bicycles** has the potential to contribute to women's empowerment by encouraging women to feel more secure as they travel and assisting in their subsistence/economic needs. Development of **bicycle related income activities** for women are an approach to foster both empowerment among women and female bicycle usage. **Long-term studies** should also assess thoroughly the impact of bicycle for women with regard to their transport burden. Here, mechanical adaptations to existing models that fit specifically to women's duties such as carrying water and collecting wood should be developed. Such models should be offered in combination **with**

credit systems designed for women. Other options could be to establish a **cooperative that provides bicycles for women to share**. This limits the financial burden of women, who are likely to lack the financial or decision-making power within a household to purchase a bicycle on their own. **Meetings and seminars for women** that address the beneficial role of the bicycle for domestic work can support the spread of bicycles among women.

Provide bicycles for students: The benefit of bicycles for students is impressive. Therefore, promotion of student bicycles should be done actively, combined with (**quantity) discounts for families**. **Schools should also provide a set of bicycles** for students who suffer from particularly long school journeys. Furthermore, **workshops on how to fix simple bicycle problems can** increase students' flexibility and security on the school journey.

Improve footpaths (and roads): Bike users ride on roads and footpaths alike. **The improvement of such routes** is likely to have a positive impact on the load-carrying capacity and reduce the frequency of bicycle breakage. Such **initiatives are mainly to be promoted by local leaders or community groups on a self-help basis for action from the local government council**. However, bicycle programs can have an influential role to play in educating and influencing these groups

Bibliography

African Union & UN Economic Commission for Africa. (2005). *Transport and the Millennium Development Goals*.

Albright, A., Howard-Pitney, B., Roberts, S., & Zicarelli, J. (1998). *Using Case Studies to do Program Evaluation*. Retrieved from www.case.edu/affil/healthpromotion/ProgramEvaluation.pdf

Attride-Stirling, J. (2001). Thematic networks: an analytic tool for qualitative research. *Qualitative Research*, *1*(3), 385–405.

Banjo, G., Gordon, H., & Riverson, J. (2012). *Rural Transport. Improving its Contribution to Growth and Poverty Reduction in Sub-Saharan Africa*. Washington: SSATP.

Barwell, I, & Dawson, J. (1993). *Roads Are Not Enough: New Perspectives on Rural Transport Planning in Developing Countries*. London: Intermediate Technology Publications.

Barwell, I., & Leggett, I. (1986). *Study on Promotion of rural transport in Tanga Region*. Consultancy Report by I.T. Transport Ltd.

Barwell, I., & Malmberg-Calvo, C. (1989). *The transport demand of rural households: Findings from a village level travel survey*. Geneva: International Labor Organization.

Barwell, I (1996). *Transport and the Village. Findings from African Village Level Travel and Transport Surveys and Related Studies*. Washington DC: The World Bank Discussion Paper 344.

Barwell, I., Edmonds, G. A., Howe, J., & de Veen, J. (1985). *Rural Transport in Developing Countries*. London: Intermediate Technology Publications.

Barwell, I., & Howe, J. (1979). *Appropriate Transport Facilities for the Rural Sector in Developing Countries*. Geneva: International Labor Organization.

Beebe, J. (2001). *Rapid Assessment Process: An Introduction*. Walnut Creek: Altamira Press.

Bicycles for Africa (2012). *Progress Report.* Internal document.

Boyatzis, R. E. (1998). *Transforming qualitative information: thematic analysis and code development*. California: SAGE.

Bryceson, D., Bradbury, A., & Bradbury, T. (2008). Roads to Poverty Reduction? Exploring Rural Roads' Impact on Mobility in Africa and Asia. *Development Policy Review*, *26*(4), 459–482.

Bryceson, D., & Howe, J. (1993). Rural household transport in Africa: Reducing the burden on women? *World Development*, *21*(11), 1715–1728.

Bryceson, D., Mbara, T. C., & Maunder, D. (2003). Livelihoods, daily mobility and poverty in Sub-Saharan Africa. *Transport Reviews*, *23*(2), 177–196.

Chambers, R. (1995). Poverty and livelihoods: whose reality counts? *Environment and Urbanization,* 7(1), 173-204

Chambers, R. (1997). Responsible well-being – a personal agenda for development. *World Development*, (25), 743– 1745.

DeCuir-Gunby, J. T., Marshall, P., & McCulloch, A. (2011). Developing and using a codebook for the analysis of interview data: An example from a professional development research project. *Field Methods*, 23(2), 136-155.

Dennis, R. (1998). *Rural Transport and Accessibility*. Washington: International Labor Organization.

Dorsey, B. (2008). Sustainable intermediate transport in West Africa : Quality before quantity. *World Transport Policy & Practice*, *14*(2), 8–20.

Downing, A., & Sethi, D. (2001). *Health Issues in Transport and the Implications for Policy*. Retrieved February 24, 2014, from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.12.6649&rep=rep1&type=pdf

Edmonds, G. (1998). *Wasted Time : The Price of Poor Access*. Geneva: International Labor Organization.

Edmonds, G., & Relf, C. (1987). *Transport and Development*. Geneva. International Labor Organization.

Essakali, M. D. (2005). *Rural Access and Mobility in Pakistan: A Policy Note*. Washington. World Bank.

Ethiopian Roads Authority. (2005). *Role of Road Transport Sector in Achieving the Millennium Development Goats (Ethiopian Case)*. Washington: SSATP

Filmer, D. (1999). *The Structure of Social Disparities in Education : Gender and Wealth*. Washington. World Bank.

Gauthier, A., & Hook, W. (2005). Tapping the Market for Quality Bicycles in Africa. *Sustainable Transport*, (17), 8–11.

Gerring, J. (2004). What Is a Case Study and What Is It Good for? *American Political Science Review*, *98*(2), 341–354.

Government of Tanzania. (2012). *National Sample Census of Agriculture, 2007/2008*. Retrieved February 15, 2014, from http://www.nbs.go.tz/index.php?option=com_content&view=category&id=78&Itemid=131

Grieco, M., Ndulo, M., Bryceson, D., Porter, G., & McCray, T. (2009). *Africa, Transport and the Millennium Development Goals*. Washington: World Bank.

Guitink, P., Holste, S., & Lebo, J. (1994). *Non-Motorized Transport: Confronting Poverty Through Affordable Transport*. Washington: World Bank.

Gwilliam, K. M. (2002). *Cities on the move: A World Bank urban strategy review*. Washington: World Bank.

Hammond, A. L., Kramer, W. J., Tran, J., Katz, R., & Walker, C. (2007). *The Next 4 Billion: Market Size and Business Strategy at the Base of the Pyramid*. Retrieved February 21, 2014, from http://pdf.wri.org/n4b_full_text_lowrez.pdf

Hammond, A. L., & Prahalad, C. K. (2004). Selling to the Poor. *Foreign Policy Magazine*. Retrieved from http://www.foreignpolicy.com/node/66887

Heierli, U. (1995). *Environmental Limits to Motorisation: Non-motorised Transport in Developed and Developing Countries*. Dehli: Har-Ananad Publications.

Heyen-Perschon, J. (2001). *Non-Motorised Transport and its socio-economic impact on poor households in Africa Cost-benefit analysis of bicycle ownership in rural Uganda Results of an empirical case study Results of an empirical case study in cooperation with FABIO/BSPW.* Hamburg.

Hine, J., & Rutter, J. (2000). *Roads, Personal Mobility & Poverty: The Challenge*. United Kingdom: Transport Research Laboratory.

Holt, D., & Littlewood, D. (2014). *Social Purpose Ventures, BoP Communities and Rural Exclusion in the Developing World*. Retrieved January 22, 2014, from http://www.isbe.org.uk/Social-Purpose-Ventures-BoP-Communities-and-Rural-Exclusion-in-the-Developing-World.

Howe, J., & Barwell, I. (n.d.). *Study of Potential for Intermediate Means of Transport.* London: Intermediate Technology Publications.

Howe, J., & Richards, P. (1984). *Rural roads and poverty alleviation*. London: Intermediate Technology Publications.

Interface For Cycling Expertise. (2000). *The significance of non-motorized transport for developing countries*. Utrecht: Interface For Cycling Expertise.

Interface For Cycling Expertise. (2007). *Locomotives Full Steam Ahead*. Utrecht: Interface For Cycling Expertise.

International Finance Corporation (2014). *Defining the Base of the Pyramid*. Retrieved January 4, 2014 from http://www.ifc.org/wps/wcm/connect/as_ext_content/what+we+do/inclusive+business/news+a nd+highlights/defining+the+base+of+the+pyramid

Krantz, L. (2001). *The Sustainable Livelihood Approach to Poverty Reduction*. Swedish Int. Dev. Cooperation Agency. Retrieved January 8, 2014, from http://www.forestry.umn.edu/prod/groups/cfans/@pub/@cfans/@forestry/documents/asset/cfans_asset_202603.pdf

Leinbach, T. R. (2000). Mobility in development context: changing perspectives, new interpretations, and the real issues. *Journal of Transport Geography*, *8*(1), 1–9.

Leipziger, D., Fay, M., Wodon, Q., & Yepes, T. (2003). *Achieving the Millennium Development Goals: The Role of Infrastructure*. Washington: World Bank.

Lema, C. (2007). *Makete integrated rural transport project: A Case Study of MIRTP and its Impacts on Rural Transport Policies in Tanzania*. Dar Es Salaam.

Litman, T. (2014*). Evaluating Active Transport Benefits and Costs.* Victoria Transport Policy Institute.

MacQueen, K.M., McLellan, E., Kay, K., Milstein, B. (1998). Codebook development for team-based qualitative research. *Cultural Anthropology Methods Journal*, 10(2), 31-36.

Malmberg-Calvo, C. (1994). *Case Study on Intermediate Means of Transport Bicycles and Rural Women in Uganda*. Washington: World Bank.

Mamdani, M., & Bangser, M. (2004). Poor People's Experiences of Health Services in Tanzania. *Reproductive Health Matters*, *12*(14), 138–153.

Marshall, M. N. (1996). Sampling for qualitative research. *Family practice*, *13*(6), 522–5. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/9023528

Mayala, B., Mcharo, J., & Nyigo, V. (2014). *Distance to basic services and Retention of Health Workers in Tanzania: A multivariate logistic and GIS Model Approach*. Retrieved from http://ghf.global healthforum.net/2014/02/25/distance-to-basic-services-and-retention-of-health-workers-in-tanzania-a-multivariate-logistic-and-gis-model-approach/#.U0xEnBaD68o

Miles, M., & Huberman, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*. California: SAGE.

Ministry of Health, Tanzania. (2014). Ministry of Health, Tanzania. Access under http://www.moh.go.tz

Ministry of Works, Tanzania. (2014). Ministry of Works, Tanzania. Access under http://www.mow.go.tz

Mozer, D. (2000). *Bicycles & Development In Africa : Progression Or Regression*. Seattle: International Bicycle Fund.

Mulisa, M. (2014). *Tanzania: Kagera Per Capita Income Increases*. Retrieved January 28, 2014, from http://allafrica.com/stories/201401200312.html

National Bureau of Statistics (2013a). *KEY FINDINGS 2011 / 12 HOUSEHOLD BUDGET SURVEY*. Retrieved January 24, 2014, from http://www.nbs.go.tz/index.php?option=com_content&view=article&id=457:201112-household-budget-survey-hbs-key-findings-report&catid=54:hbs&Itemid=153

National Bureau of Statistics (2013b). 2012 POPULATION AND HOUSING CENSUS. Retrieved January 24, 2014, from http://www.nbs.go.tz/sensa/new.html

National Bureau of Statistics (2013c). *EMPLOYMENT AND EARNINGS SURVEY 2012 ANALYTICAL REPORT* Retrieved January 24, 2014, from http://www.nbs.go.tz/index.php?option=com_content&view=article&id=398:employment-and-earnings-survey2012analyticalreport&catid=100:employment-and-earnings&Itemid=135

National Bureau of Statistics (2013d). *Results from the 2011-12 Tanzania HIV / AIDS and Malaria Indicator Survey and Malaria Indicator Survey*. Retrieved January 24, 2014, from http://nbs.go.tz/takwimu/this2012/HIVFactsheetbyRegion.pdf

Porter, G. (2002). Living in a Walking World: Rural Mobility and Social Equity Issues in Sub-Saharan Africa. *World Development*, *30*(2), 285–300.

Priyanthi, F. (1998). Gender and Rural Transport. *Gender, Technology and Development*, *2*(1), 63–80.

Ravallion, M., Chen, S., & Sangraula, P. (2008). *Dollar a Day Revisited*. Washington: World Bank.

Riverson, J., Gaviria, J., & Thriscutt, S. (1991). *Rural Roads in Sub-Saharan Africa: Lessons from Experience*. Washington*: World Bank.*

Scoones, I. (1998). *Sustainable Rural Livelihoods: A framework for analysis*. London: Institute of Development Studies.

Sen, A. (1984). Rights and capabilities. In: *Resources, Values and Development,* (pp. 307–324). Oxford: Basil Blackwell.

Sen, A. (1987). *The Standard of Living*. Cambridge: Cambridge University Press.

Sieber, N. (1998). Appropriate transport and rural development in Makete district, Tanzania. *Journal of Transport Geography*, *6*(1), 69–73.

Starkey, P. (2006). *The Rapid Assessment of Rural Transport Services*. Washington: World Bank.

Starkey, P., Ellis, S., Hine, J., & Ternell, A. (2002). *Improving Rural Mobility: Options for Developing Motorized and Nonmotorized Transport in Rural Areas*. Washington: World Bank.

The World Bank. (2008). *Safe, Clean, and Affordable...Transport for Development. The World Bank Group's Transport Business Strategy for 2008-2012*. Washington: World Bank.

The World Business Council for Sustainable Development. (2004). *Mobility 2030: Meeting the challenges to sustainability*. Retrieved January 24, 2014, from http://www.wbcsd.org/web/publications/mobility/mobility-full.pdf

The World Business Council for Sustainable Development. (2007). *Mobility for development*. Retrieved January 24, 2014, from http://www.wbcsd.org/Pages/EDocument/EDocumentDetails.aspx?ID=45

Valdés, A., Foster, W., Anríquez, G., Azzarri, C., Covarrubias, K., Davis, B., … Zezza, A. (2009). *A Profile of the Rural Poor Background Paper for Chapter 1: "Setting the Scene" IFAD Rural Poverty Report 2009*. International Fund for Agricultural Development.

Victoria Transport Policy Institute (2013). *Improving Transportation Efficiency and Diversity in Rural*

Areas. Retrieved January 19, 2014, from http://www.vtpi.org/tdm/tdm87.htm

Victoria Transport Policy Institute (2014). *Transportation Affordability. Strategies To Increase Transportation Affordability*. Retrieved January 8, 2014, from http://www.vtpi.org/tdm/tdm106.htm

Wagle, U. (2002). Rethinking poverty: definition and measurement. *International Social Science Journal*, *54*(171), 155–165.

World Health Organization. (2013). *Transport for Health Access.* Retrieved January 15, 2014, from http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTTRANSPORT/EXTTSR/0,,contentMDK:20835940~menuPK:2274762~pagePK:210058~piPK:210062~theSitePK:463716,00.html

Annex I: Guiding questions for interviews and overview interviewees

Administrative information

1 Date of the interview
2 Location of meeting
3 What type of bike → □ Mountain □ City (m / f) □ Phoenix □ Touring

Personal information □ Male □ Female Age of interviewee _____

1. Opening: How do you see the development of bicycle usage since the last 3 to 5 years?
2. When did you get your bike?
3. What was the consideration of buying this bicycle?
4. What kind of expectations did you have? What were you hoping for?
5. How did these expectations turn out? Has something substantially change?
6. Lets take a jump into the here and now: For which income generating **activities** as well as others do you personally use this bicycle today?

Economic Factors

7. **How does the bicycle support you in your job?**
   a. Example for fetching water: how many canisters/day; how much money; nr. of customers,
   range/distance, time spent on bike, transported capacity, new markets reachable,
   would you do this business without a bike?
   b. **What are the pros/cons of having a bike in your job?**
   c. Which items do you usually carry? Items that cannot be carried, other vehicle needed?

8. **Do you save money on transportation?**
   a. If yes: Where do you save exactly, which trips does the bicycle replace?
   b. How much money per day/week, could you give an estimate?

9. **Overall, I can see there is more money available, true?**
   a. What does this additional money allow you to pay for? (household needs, new business, school fees, to save (what saving for)
   b. Is saving an issue? What for?

10. **Would you say you also save not only money but time to the bicycle?**
    a. What does this additional time allow you to do?

11. **In case of reparations:**
    a. How did this affect your earning and other activities? (Hire charges, no income…)

Social/Healthcare Factors

   b. Could you tell me something about the role of your bicycle(s) in your family?
   c. Who else uses it and what for?
   d. Has it happened that you forewent to use the bike in order for someone els of your family to use it?
   e. **Who** decides actually who can use it?
   f. Do you remember a situation when it was difficult to balance interests?
   g. Are there days in the week/months when the bicycle is used more often? Why?
   h. Does the bicycle support your family in healthcare related issues? What? When?

i. Do you think that having a bicycle has affected your family coherence/spirit in some way?
j. If other means of transport are available in the family, what is the role/importance/benefits of the bicycle compared to those?

Gender

12. What do men in Nshamba think of women who ride a bike?
    a. Do you know households where women possess a bike?
    b. Do you know households where women ride bicycles? What for?

Status within the community

13. How do you see the status among means of transport here (ask to make a classification between motor bikes, Phoenix bikes, Mountain bikes and walking)

VBC relevant info ACQUISITION

14. Did you buy it from VBC? (Yes / No)
15. What was the price you paid?
16. How did you pay for it? → Cash vs Installment (savings at VBC)
17. (If you are to buy a new bicycle, how would you prefer to pay?)
18. How long was the saving period? Did you have to forego anything?
19. How do you view the costs for your bike?
20. What is the maximum price that you can afford to pay for a bicycle?

QUALITY AND MAINTENANCE

21. QUALITY
    - Are you happy with the quality of the bicycle? What do you like most?
    - What would you say if I exchanged this bike with a Mountain bike/Phoenix?

22. REPAIR and MAINTENANCE issues
    - What are the most frequent mechanical problems you face with your bicycle?
    - How many times did you have to see the fundi since you bought it?
    - What were the costs so far?
    - What was the longest period you could not use your bike?
    - Reason for not being able to use it (money, spare parts etc)
    - Are there any repairs you can do yourself?
    - How do you view the prices that are charged for the spare parts?
    - If there was a mobile service mechanic offered by VBC, what would you think about that?

REGIONAL LOCAL CONTEXT

23. Do you see "regional specific" challenges here in Nshamba that might inhibit the effective use of your bicycle? (infrastructure, weather, terrain, season)

Block D: Final

24. If you had to name the greatest benefit of having a bicycle? Which one would it be?
25. Under which circumstances would you be willing to sell your bicycle
26. Do you regard your bike as a "mtaji" (local term = essential for your survival)?
27. Do you wanna add anything, last comment

ID	ID Mark	Date of the interview	Duration	SEX	Age	Mountain/ Phoenix	Type(s) of bike usually used	Other means of transport within the household	New/2ndhand	HHS	Region	Profession
VBC Bike Users												
22	Teacher A	2013-11-21	1.06.30	M	25	1	City Men	none	2nd	3	Kishanda	Teacher
43	Photographer E	2013-10-10		M	27	1	City Men	none	2nd	12	Kashanda	Photographer
10	Photographer B	2013-11-09	50.09	M	38	1	MB M	1xPH/ 1x broken MB	2nd	5	Ihangiro	Photographer
1	Paster B	2013-11-05	23.30	M	28	1	Mountain	none	2nd	5	Bea	Pastor/ Preacher YW
2	Teacher O	2013-11-05	36.55 3.23	M	26	1	Mountain	none	2nd	3	Nshamba	Teacher
3	Guard S	2013-11-06	52.06	M	54	1	Mountain	none	2nd	7	Rubya	Guard/Farmer
4	Photographer K	2013-11-06	42.31	M	27	1	Mountain	none	2nd	1	Nshamba	Photographer
8	Teacher Am	2013-11-08	36.41	M	29	1	Mountain	1x PH	2nd	4	Humura	Teacher
9	B-man B	2013-11-08	35.32	M	33	1	Mountain	none	2nd	3	Mugabe	Kiosk/PH fundi
11	Photographer L	2013-11-11	1.06.04	M	34	1	Mountain	1x PH	2nd	4	Nshamba	Photographer / Farmer
12	Electrician Z	2013-11-11	30.13 31.31	M	46	1	Mountain	1x PH	2nd	5	Muzinga	Carpenter/ Electrician
13	NGO Worker M	2013-11-12	39.55	F		1	Mountain	1 PH 2 Kids bikes	2nd	4	Nshamba	Kwa Wazee
16	Teacher S	2013-11-14	46.45	M	26	1	Mountain	none	2nd	1	Nshamba	Teacher
17	Doctor R	2013-11-14	35.19	M	47	1	Mountain	none	2nd	N/A	Nshamba	Doctor
20	Agent E	2012-11-20	1.28.37	M	42	1	Mountain	Car, Motorbike, 1 MB	2nd	4	Bukoba	VBC Agent
21	Ndizi Agent J	2013-11-20	1.20.30	M	31	1	Mountain	none	2nd	2	Nshamba	Ndizi Agent
23	Teacher D	2013-11-23	50.22	M	27	1	Mountain	none	2nd	4	Nshamba	P Teacher
27	Housewife L	2013-11-26	1.02.41	F	40	1	Mountain	1x PH	2nd	5	Rubya	Housewife

37	Farmer O	2013-12-06	58.17	M	25	1	City Men	1x PH	2nd	2	Bugarama	Farmer
41	Salesman	2013-10-29		M	35	1	Mountain	none	2nd	N/A	Ngenge	ChruchWorker / Salesman
42	Teacher N	2013-10-29		M	29	1	Mountain	none	2nd	N/A	Ngenge	Prim School Teacher
						21						
Phoenix Bike Users												
5	Banana Dealer P	2013-11-07	40.19	M	39	2	Phoenix	none	2nd	14	Kashanda	Banana Dealer
6	Banana Dealer R	2013-11-07	34.37	M	52	2	Phoenix	none	2nd		Nshamba	BD/Broker
7	Banana Broker R	2013-11-07	27.48	M	34	2	Phoenix	none	2nd	3	Nshamba	BD/Broker
14	B-woman MA	2013-11-13	49.45	F		2	Phoenix	1x PH	new	8	Nyakitaba	B-woman
15	Painter M	2013-11-14	1.19.53	M	37	2	Phoenix	none	new	6	Rubya	Pastor/Painter
18	Water Seller J	2013-11-15	43.01	M	39	2	Phoenix	none	new	5	Nshamba	Maji Seller
19	Water Seller A	2013-11-15	19.32 20.08 13.44	M	42	2	Phoenix	1x PH	2nd	5	Nshamba	Maji Seller
24	B-man E	2013-11-25	29.39 24.46 11.43	M	35	2	Phoenix	none		6	Kashanda	B-man
25	Dagaa Seller H	2013-11-25	1.30.10	M	40	2	Phoenix	none	new	4	Muzinga	Dagaa Seller
26	Stonemason E	2013-11-26	59.52	M	42	2	Phoenix	none	new	9	Nshamba	Stone Seller
28	B-woman F	2013-11-27	1.00.35	F	35	2	Phoenix	none	2nd	4*	Kashanda	Farmer/ B-woman
29	B-woman J	2013-11-27	1.08.21	F	32	2	Phoenix	1x PH	new	5	Kanywan-gonge	Farmer /B-woman
30	B-woman B	2013-11-28	1.03.34	F	32	2	Phoenix	none	2nd	5	Kashanda	Farmer/ B-woman
31	B-woman M	2013-11-30	35.34 32.48	F	40	2	Phoenix	1x Pikipiki	2nd	9	Rushwalunga	Farmer/ B-woman
32	Dagaa Seller D	2013-11-30	1.03.28	M	30	2	Phoenix	none	2nd	4	Kashanda	Dagaa Seller
33	Water Seller JO	2013-11-02	18.32	M	28	2	Phoenix	1x Pikipiki	new	4	Nshamba	Maji Seller
34	Ex Pastor E	2013-12-02	1.07.20	M	70	2	Phoenix	mind. 1x Pikipiki	2nd		Kihumolo	Retired / Ex Pastor

35	Dagaa Seller J	2013-12-03	1.01.39	M	40	2	Phoenix	none	new	8	Nshamba	Fresh Dagaa Seller
36 33		2013-12-06	56.37 9.49	M	28	2	Phoenix	none	new	4	Nshamba	Maji Seller
39	B-man V	2013-12-11	49.59	M	19	2	Phoenix	none	2nd	2	Nshamba	All Rounder
						20						
Field Experts												
40	VBC	2013-12-12	41.47	M		3						VBC CEO
38	Fundi S	2013-12-06	42.18	M	52	3	FUNDI				Nshamba	Phoenix Fundi

Annex II: Schedule of workshop with children

Session 1:

- Participating Schools: Bunyagongo Sec (8) / Nshamba Sec (5)
- Total Number of Kids: Invited: 20 / Attended: 13
- Date: Saturday, 16. November 2013
- Time: 10am – 2pm

Schedule:

1. Introduction / Game
2. 5 Dino Pictures: How does the dino feel when he thinks of his school journey?
3. Children put beans on the dino
4. Discussion: What could make the dino feel like this?
5. How can a bicycle help him?
   -- TEA BREAK –

6. Circles on Flipchart: What other activities can be done: Mark what you do!
7. Only bike users: Who else uses the bicycle?
8. Bicycle Picture: Where do you face problems? What can you fix?
   -- Lunch --

Session 2:

- Participating Schools: Nshamba Sec (3) / Apex Sec (9)
- Total Number of Kids: Invited: 20 / Attended: 12
- Date: Wednesday, 19. November 2013
- Time: 10am – 2pm

Schedule:

1. Introduction / Game
2. Task I: I want to buy a bicycle (pros/cons)
3. 3 Dino Pictures: How does the dino feel when he thinks of his school journey
4. Children put beans on the dino
5. How can a bicycle help?
   -- Tea Break --
6. Activities before and after going to school: fill out cards
7. Only bike users: Who else uses the bicycle? Indicate by signs (form)
8. Bicycle Picture: Where do you face problems? What can you fix?
   -- Lunch --

Annex III: School questionnaires - bicycle users and non-users

Note: Questionnaire for bicycle users

Jinsia: ☐ Msichana Miaka: ____ Jina la Shule: _____

☐ Mvulana

Kidato cha: _____ Jumla ya watu unaoishi nao muda wote nyumbani kwenu: _____

Ulipata lini baiskeli (mwezi/muaka): _____

*** **Maelezo: Namna ya kujaza** ***

1. Weka alama hii kwa jibu husika X
2. Kuna sehemu nyingine ambazo utatakiwa kuweka alama zaidi ya moja. Weka kama ulivyoulizwa!
3. Ukiweka jibu la "mengineyo", tafadhali weka maelezo husika, si maelezo mengi sana.

1. Aina ya baiskeli uliyonayo?

A) ☐ Mountain bike/la milima

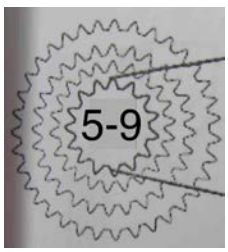
B) ☐ City bike MEN/la mjini mwanaume

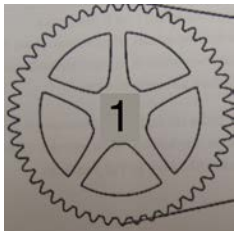
C) ☐ City bike WOMAN/ la mjini mwanamke

E) ☐ Aina nyingine……

2. Aina ya gia nyuma?

☐ Gia nyingi nyuma ☐ Giatatu nyuma ☐ Gia moja nyum





3. Huwa unatumia mda gani kwenda na baiskeli Shuleni?	Takribani dakika _____ hivi!
4. Unakomboa muda gani unapotumia baiskeli ukilinganisha na kutembea kwa miguu.	**Ninaweza kukomboa** □ mpaka dakika 30 □ dak 30 mpaka dak 60 □ dak 60 mpaka dak 90 □ dak 90 mpaka dak 120 □ zaidi ya dakika 120/masaa 2 
5. Ikitokea kwamba baiskeli haipo au imeharibika, huwa unaendaje shulen?	□ Natembea □ Nachukua daladala □ Nachukua pikipiki □ Natafuta chumba karibu na shule □ Siwezi kwenda Shuleni bila baiskeli
6. Huwa unaendesha na nani wakati wa kwenda shuleni?	□ Peke yangu □ Mwanafunzi mwenzangu /rafiki na majirani zangu
7. Huwa unambeba yeyote kwenye baiskeli yako wakati unaenda shuleni?	□ Ndiyo, na ndugu □ Ndiyo, na mwanafunzi mwenzangu/rafiki na majirani zangu □ Hapana

*** Next Section ***

Maelekezo: Tafadhali onesha kwa ufasaha namna gani unakubali au unakataa katika usemi huu: weka alama hii (x) ndani ya kiboksi.

	Nakubali sana	Nakubali	Sijui	Sikubali	Nakataa kabisa
8. Kwenda na baiskeli shuleni kunanifanya nisiwe na uchovu wa aina yoyote na ninakuwa makini darasani	☐	☐	☐	☐	☐
9. Muda wote nina uchovu kidogo darasani pale ninapoenda shuleni na baiskeli tofauti na pale ninapoenda kwa miguu.	☐	☐	☐	☐	☐
10. Ninaweza kusinzia sana asubuhi pale ninapoenda na baiskeli shuleni tofauti na pale ninapotembea kwa miguu.	☐	☐	☐	☐	☐
11. Baiskeli inanisaidia kufika shuleni kwa muda muafaka	☐	☐	☐	☐	☐
12. Baiskeli inaongeza usalama wangu njiani kwenda shuleni naweza kuepukana na (Wanyama, majambazi,wezi,na wabakaji	☐	☐	☐	☐	☐
13. Baiskeli inaongeza usalama hasahasa kwa wasichana.(vitendo vya ubakaji)	☐	☐	☐	☐	☐
14. Nilivyo na Baiskeli, nina muda mwingi asubuhi unaoniwezesha kufanya kazi kabla ya kwenda shuleni.	☐	☐	☐	☐	☐
15. Nilivyo na Baiskeli, nina muda mwingi jioni unaoniwezesha kufanya kazi baada ya kutoka shuleni	☐	☐	☐	☐	☐

*** Next section ***

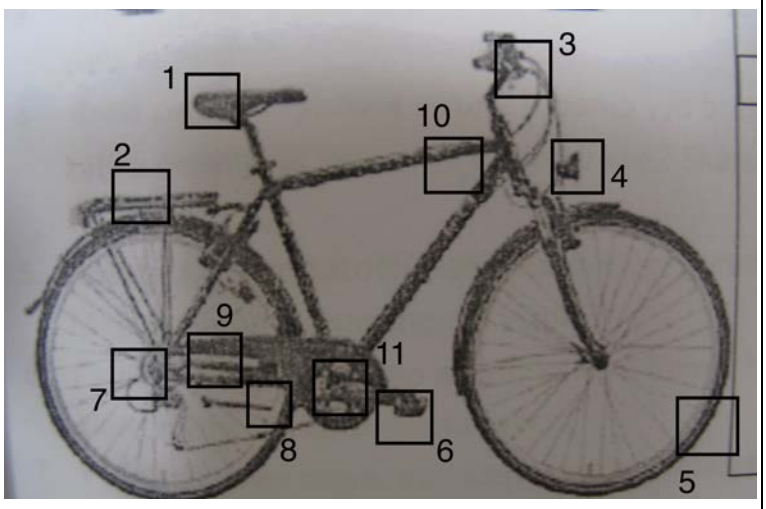
16. Kabla ya Kwenda Shuleni wakati wa asubuhi huwa nafanya kazi zifuatazo: **Weka tiki kwa mambo yote yanayokuhusu.**	□ Huwa najisomea kabla ya kwenda shuleni □ Napika chakula kwa ajili ya familia yangu □ Nachota maji □ Nasafisha Nyumba asubuhi □ Natafuta majani ya ng'ombe/natembeza maziwa □ Nafua nguo □ Kazi nyinginezo._____
17. Ninaporudi kutoka shuleni huwa nafanya kazi zifuatazo: **Weka tiki kwa mambo yote yanayokuhusu.**	□ Huwa najisomea kabla ya kwenda shuleni □ Napika chakula kwa ajili ya familia yangu □ Nachota maji □ Natafuta Kuni □ Naenda Tuition (masomo ya ziada) □ Naenda gulioni □ Naenda kazini shambani □ Nacheza na rafiki zangu □ Natafuta majani kwa ajili ya ng'ombe □ Kazi nyinginezo _____

18. Tofauti na kuiendea shuleni, baiskeli yako unaifanyia kazi zipi nyingine? **Weka tiki kwa mambo yote yanayokuhusu.**	□ Naenda gulioni □ Nasaidia familia kuchota maji □ Nasaidia jamaa kutafutia kuni □ Natembelea nyumba ya rafiki yangu □ Naitumia katika matembezi kama kwenda mpirani □ Naiendea shambani □ Naiendea kanisani/Msikitini □ Naiendea Tuition □ Naitumia kutembelea ndugu wakati wa likizo □ Natembelea ndugu na jamaa wanapolazwa hospitalini □ Kwa kazi nyinginezo_____ □ Naitumia tu kwa ajili ya shule.
19. Watu wengine katika familia yenu huwa wanatumia baiskeli yako muda mwingine? **Weka tiki kwa mambo yote yanayokuhusu.**	□ Ndiyo, baba yangu □ Ndiyo mama yangu □ Ndiyo kaka yangu □ Ndiyo dada yangu □ Ndiyo watu wengine_____ □ Hapana, ni mimi huwa natumia baiskeli yangu nenda kwenye swali 18)
20. Jamaa huitumia baiskeli yako kwa mambo yapi? **Weka tiki kwa mambo yote yanayokuhusu.**	Muda mwingine jamaa zangu hutumia baiskeli yangu kwa ajili ya: □ Kutafuta kipato/kazi □ Kuendea gulioni □ Kuendea shambani □ Kutafutia kuni, kuchotea maji □ Kubebea wagonjwa hospitalini □ Kutembelea jamaa hospitalini □ Mengineyo:_____
21. Muda mwingine watu wengine hutumia baiskeli yako? **Weka tiki kwa mambo yote yanayokuhusu.**	□ Ndiyo rafiki zangu □ Ndiyo jirani zangu □ Ndiyo wengine: _____ □ Hapana, ni mimi anayeitumia baiskeli!

22. Ni eneo gani la baiskeli ambalo huaribika sana sana?

Weka tiki kwa chombo kimoja ambacho kinaharibika mara kwa mara.

□ Kiti
□ Karia
□ Mfumo wa breki
□ Taa
□ Matairi na matyubu
□ Pedeli
□ Mfumo wa gia, mbele na nyuma
□ Standi
□ Mnyororo/chain
□ Fremu/frame
□ Kyoto



23. Kuna chombo au tatizo lolote unaloweza kulitengeneza? **Ndiyo naweza kutengeneza…..**

Weka tiki kwa lile unaloweza kulitengeneza

1 □ Kiti
2 □ Karia
3 □ Mfumo wa breki
4 □ Taa
5 □ Matairi na matyubu
6 □ Pedeli
7 □ Mfumo wa gia, mbele na nyuma
8 □ Standi
9 □ Mnyororo/chain
10 □ Fremu/frame
11 □ Kyotos

□ Hapana, sijui kutengeneza chochote!

24. Tangu upate baiskeli yako, umeifanyia matengenezo ya kuweka chombo kipya au kizee mara ngapi?	□ Hakuna (nenda kwenye swali 28) □ Mara moja □ Mara 2-3 □ Zaidi ya mara 3
25. Ulipokuwa na tatizo kwenye baiskeli yako, uliacha kuitumia kwa mda gani mpaka matengenezo?	□ Siku moja tu (ilitengenezwa siku iliyofuata) (nenda swali la 28) □ Siku 2-3 □ Takribani juma 1 hivi □ Takribani majuma 2 hivi □ Zaidi ya majuma 2 □ Bado imeharibika mpaka sasa.
26. Ni sababu gani ilikufanya usiitengeneze baada ya kuharibika na ukailimbikiza?	□ Spea hazikuwepo madukani □ Spana za kuitengenezea, mafundi hawakuwa nazo □ Hapakuwa na mafundi katika eneo langu □ Hakuna hela ya kutosha kuwalipa mafundi na kununua spea □ Matatizo mengineyo
27. Nimuhimu kwako kujifunza matengenezo madogo madogo kwenye baiskeli?	□ Ndiyo, ningependa kujifunza matengenezo madogo □ Hapana sitaki kujifunza.

***** Kazi njema, asante kwa ushirikiano wako! *****

X

Note: Questionnaire for non-bicycle users

Jinsia: □ Msichana □ Mvulana

Miaka: ____

Jina la Shule: _____

Kidato cha: _____

Jumla ya watu unaoishi nao muda wote nyumbani kwenu: _____

*** **Maelezo: Namna ya kujaza** ***

1. Weka alama hii kwa jibu husika ☐
2. Kuna sehemu nyingine ambazo utatakiwa kuweka alama zaidi ya moja. Weka kama ulivyoulizwa!
3. Ukiweka jibu la "mengineyo", tafadhali weka maelezo husika, si maelezo mengi sana.

1. Huwa unatembea na nani wakati wa kwenda shuleni?	□ Peke yangu □ Mwanafunzi mwenzangu /rafiki na majirani zangu
2. Muda mwingine huwa unaendesha baiskeli la mwenzako au unabebana na mtu nyuma ya baiskeli lake wakati wa kwenda shuleni?	□ Ndiyo, muda mwingine huwa natumia baiskeli ya mtu □ Ndiyo, muda mwingine huwa naenda na jamaa □ Ndiyo, naweza kwenda na rafiki zangu □ Ndiyo naweza kwenda na wanafunzi wenzangu □ Hapana, muda wote natembea kwenda Shuleni
3. Inakuchukua muda gani kwenda shuleni kwa miguu?	**Kama dakika……hivi**
4. Unakomboa muda kiasi gani pale unapoenda na baiskeli kulinganisha na pale unapotembea?	**Naweza kukomboa….** □ mpaka dakika 30 □ dak 30 mpaka dak 60 □ dak 60 mpaka dak 90 □ dak 90 mpaka dak 120 □ zaidi ya dakika 120/masaa 2 
5. Kutembea na miguu kunakufanya uchelewe ukilinganisha na pale ambapo ungeenda na baiskeli?	□ Ndyio, huwa ninachelewa mara kwa mara ukilinganisha na pale ambapo nigeweza kwenda na baiskeli □ Hapana huwa ninawahi ukilinganisha na pale ambapo ningeweza kwenda na baiskeli □ Hamna tofauti.

*** Next Section ***

Maelekezo: Tafadhali onesha kwa ufasaha namna gani unakubali au unakataa katika usemi huu: weka alama hii (x) ndani ya kiboksi.

	Nakubali haswa	Nakubali	Sijui	Sikubali	Nakataa haswa
6. Kwenda na baiskeli shuleni kunanifanya nisiwe na uchovu wa aina yoyote na ninakuwa makini darasani	☐	☐	☐	☐	☐
7. Muda wote nina uchovu kidogo darasani pale ninapoenda shuleni na baiskeli tofauti na pale ninapoenda kwa miguu.	☐	☐	☐	☐	☐
8. Ninaweza kusinzia sana asubuhi pale ninapoenda na baiskeli shuleni tofauti na pale ninapotembea kwa miguu.	☐	☐	☐	☐	☐
9. Baiskeli inanisaidia kufika shuleni kwa muda muafaka	☐	☐	☐	☐	☐
10. Baiskeli inaongeza usalama wangu njiani kwenda shuleni naweza kuepukana na (Wanyama, majambazi,wezi,na wabakaji)	☐	☐	☐	☐	☐
11. Baiskeli inaongeza usalama hasahasa kwa wasichana.(vitendo vya ubakaji)	☐	☐	☐	☐	☐
12. Ningekuwa na Baiskeli, ningekuwa na muda mwingi asubuhi wa kuniwezesha kufanya kazi kabla ya kwenda shuleni.	☐	☐	☐	☐	☐
13. Ningekuwa na Baiskeli, ningekuwa na muda mwingi jioni wa kuniwezesha kufanya kazi baada ya kutoka shuleni.	☐	☐	☐	☐	☐

*** Next Section ***

14. Kabla ya Kwenda Shuleni wakati wa asubuhi huwa nafanya kazi zifuatazo:	□ Huwa najisomea kabla ya kwenda shuleni □ Napika chakula kwa ajili ya familia yangu □ Nachota maji □ Nasafisha Nyumba asubuhi □ Natafuta majani ya ng'ombe/natembeza maziwa □ Nafua nguo □ Kazi nyinginezo._____

15. Ninaporudi kutoka shuleni huwa nafanya kazi zifuatazo: **Weka tiki kwa mambo yote yanayokuhusu.**	□ Huwa najisomea kabla ya kwenda shuleni □ Napika chakula kwa ajili ya familia yangu □ Nachota maji □ Natafuta Kuni □ Naenda Tuition(masomo ya ziada) □ Naenda gulioni □ Naenda kazini shambani □ Nacheza na rafiki zangu □ Natafuta majani kwa ajili ya ng'ombe □ Kazi nyinginezo _____
16. Kuna baiskeli yoyote ndani ya familia yenu?	□ Hapana, hatuna baiskeli katika familia yetu (nenda swali la 16) □ Ndiyo!
17. Kama unaweza kutumia baiskeli hii huwa unaitumia kuifanyia nini? **Weka tiki kwa mambo yote yanayokuhusu.**	□ Naenda gulioni □ Nasaidia familia kuchota maji □ Nasaidia jamaa kutafutia kuni □ Natembelea nyumba ya rafiki yangu □ Naitumia katika matembezi kama kwenda mpirani □ Naiendea shambani □ Naiendea kanisani/Msikitini □ Naiendea Tuition □ Naitumia kutembelea ndugu wakati wa likizo □ Natembelea ndugu na jamaa wanapolazwa hospitalini □ Kwa kazi nyinginezo_____ □ Siwezi kutumia baiskeli ya nyumbani kwetu.
18. Ungekuwa na baiskeli ungeitumia kwa matumizi gani? **Weka akama kwa yote yanayokuhusu.**	□ Kwenda shuleni □ Kwenda gulioni □ Kusaidia familia kuchota maji □ Kusaidia jamaa kutafutia kuni □ Kutembelea nyumba ya rafiki yangu □ Kuitumia katika matembezi kama kwenda mpirani □ Kuiendea shambani □ Kuiendea kanisani/Msikitini □ Kuiendea Tuition □ Kuitumia kutembelea ndugu wakati wa likizo □ Kutembelea ndugu na jamaa wanapolazwa hospitalini □ Kwa kazi nyinginezo_____

***** Kazi njema, asante kwa ushirikiano wako! *****

Annex IV: Banana rapid assessment questionnaire

1. AGE / Place of Living	
2. Personal Bike? Rented	□ Personal □ Rented Costs:
3. Banana producer/transporter v transporter?	□ Producer □ Transporter
4. For how long in this business?	
5. Where did you buy these bananas? Farthest you go?	Farthest:
6. To whom are you going to sell now?	
7. How many times per week you go to Muleba? **Seasonal Differences?**	
8. Is this the normal quantity you sell a day?	□ Yes □ No / Nr: Min/Max:
9. How long does it approximately take you to get there with your cargo of bananas?	
10. Do you visit other markets apart from Muleba during the week to sell bananas?	

11. Do you take any goods back from Muleba?	□ Yes □ No What:
12. You have other jobs when you reach home?	□ Yes □ No What:
13. Do you consider your work as physically demanding?	□ Yes □ No
14. What are vulnerable parts? Estimate of costs per week?	Parts: Costs:
15. What do you do if your bike is not available or broken on a day?	
16. Bicycle your mtaji	□ Yes □ No

Annex V: Map and road structure of Nshamba

Annex VI: Different bicycle models: a brief overview

The Phoenix Bicycle

Carrier max load: approx. 150kg

Kickstand that places the bike at 90 degrees to the ground

Reinforced front forks

Tire size: 28" / Weight: about 25kg

Chain case and steel mudguard

Price: TSH 150'000 (new)

Note: It is common to strengthen weak parts or replace them with

more durable parts from other bicycles. Most of the local mechanics (fundi) offer these modifications (e.g. carrier, front fork, frame)

Secondhand Mountain bike

No carrier & mudguard

Tire size: 26 x 1.95 / 26 x 1.3

Gears: 3 x 7 / 3 x 8

Brakes: Cantilever / V-Brakes

Derailleur system

Open diamond frame

Price: TSH 150'000 – 250'000, depending on quality

Secondhand Touring, Male / Female

Carrier, mudguard

Tire size: 28 x 1.375 / 28 x 1.625

Gears: 3 x 7 / 7 (in hub) / 3 (in hub) / 1 x 6

Brakes: Cantilever / V-Brakes

Derailleur system

Frame with horizontal top tube / Frame with open top tube

Price: TSH from 100'000 onwards, depending on quality

Annex VII: Traffic Survey Data

Counting Criteria

Traffic inflow was counted applying three different levels of analysis: gender, mode of transport and cargo. The table below explains these variables.

Table 15: Applied criteria for counting traffic

Criteria	Within criteria distinction	Remarks
Gender	Male versus female users	An additional distinction (kids) was made for pedestrians. This differention based on the judgment of the enumerators
Mode of transport	Distinction between walking, Phoenix bicycle users, Non-Phoenix user, Motorbike user (single or sekido), Dala-Dala (full/empty), Car, Truck, other vehicles	People pushing a bicycle were counted as „bicycle users“
Cargo	Cargo versus no cargo transported	Information on cargo was additionally collected on a random basis in order to get an idea of the commodities moved around

Counting took place on two days in December 2013.

Table 16: Counting specifics

	Day 1	Day 2
Date	Wednesday, December 4th	Saturday, December 7th
Time	7am – 12pm	7am – 12pm
Weather Condition	sunny/hot	sunny/mild
Remarks	Non-Market Day Meeting at Kwa Wazee; 300-400 people gathering in Nshamba	Market Day in Nshamba

The following six routes have been chosen for assessment. Given the in-depth pre-analysis of traffic movements in preparation of the actual survey, it can be confidentially said that the main routes have been covered.

Table 17: Location of enumerators

NR	Code of Location	Road Types	Catchment area	Catchment area radius
1	Office, Big Tree	Feeder/Footpath	Rushwa, Ngenge, Kishuro	NW - W
2	Kamachumu Road	Good Earth/Mud Road	Mulela, Kishanda **Kamachumu**, Muhutwe	NW – NE
3	Red Building	Good Earth/Mud Road	**Muleba**; Kigando	E
4	Wakati Bar	Good Earth/Mud Road Footpath/Trail	**Bunyagongo**, Kashanda	W

5	Mali Juice	Small Footpath	Mulela, Muizinga	NW-N
6	Kwa Wazee	Good Earth/Mud Road	Bugarama, **Biirabo,** Kihumulo	SW-SE

Statistics

The two tables show the traffic flow for the two days as recorded.

Table 18: Nshamba traffic survey: (non-market day, December 4th, 2013)

		Pedestrians	Bicycles		Piki-Piki		Daladala		Car	Truck	Total vehicles
			Phoenix	Non-Phoenix	Single/ cargo	Sekido	Full	Empty			
Ngenge	Male Female Kids	137 261 198	332 47	94 51	77	72	2	0	1	1	1273
Kamachumu	Male Female Kids	76 80 126	109 6	26 5	127	196	14	1	22	1	789
Muleba	Male Female Kids	211 151 162	85 5	15 0	126	124	0	9	17	8	913
Wakati	Male Female Kids	238 279 168	194 16	20 1	66	34	0	0	3	4	1023
Mali Juice	Male Female Kids	164 200 104	119 11	12 1	52	22	0	0	0	0	685
Biirabo/Kwa Wazee	Male Female Kids	200 189 308	195 9	13 2	105	165	0	1	6	2	1195
TOTAL		3252	1128	240	553	613	16	11	49	16	5878

Table 19: Nshamba traffic survey: (market day, December 7th, 2013)

		Pedestrians	Bicycles		Piki-Piki		Daladala		Car	Truck	Total vehicles
			Phoenix	Non-Phoenix	Single/ cargo	Sekido	Full	Empty			
Ngenge	Male Female Kids	123 84 57	148 8	15 2	60	65	0	1	0	1	564
Kamachumu	Male Female Kids	55 51 39	75 10	27 6	154	140	12	7	20	6	602
Muleba	Male Female Kids	159 101 118	74 1	21 5	120	99	0	3	9	7	717
Wakati	Male Female Kids	136 126 174	184 6	32 12	62	64	0	0	4	3	803
Mali Juice	Male Female Kids	75 55 69	52 5	11 1	39	25	0	0	1	0	333
Biirabo/Kwa Wazee	Male Female Kids	119 139 289	75 2	16 2	90	119	0	0	2	0	853
TOTAL		1969	640	150	525	512	12	11	36	17	3872

Annex VIII: Cost- Benefit Analysis Banana Transporter

Simple cost-benefit analysis	TSH/ bunch	% of selling price
Farmer		
Selling Price	10000	
Bicycle Transporter		
Purchasing Price	10000	
Selling Price	15000	
Gross margin	**5000**	**33.3%**
Market Costs / Reparations	500	
Estimated Net Margin / bunch	**4500**	**30%**

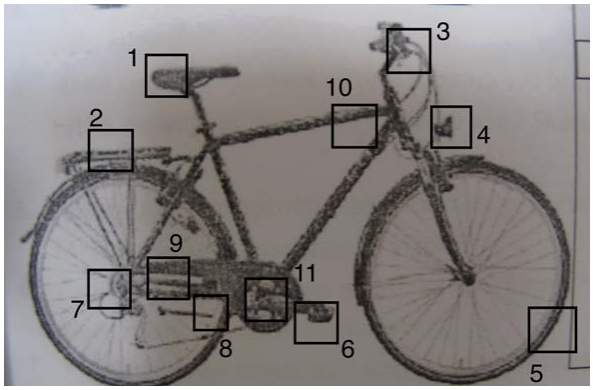
Annex IX: Examples of fragile businesses

Banana Transporters: Many people involved in the banana value chain. Since some time, a banana disease (locally called mnyauko) is affecting the plantations and risks plunging the whole region into poverty (external, natural shock). This of course is a big threat to the local people, as stated by this banana transporter: *"(…) the matoke business can stop abruptly. I do fear that one day the business is dead. And then, how do I survive? I do expect the matoke business to be over any time." - R* - Already now, the amount of bananas is substantially reduced, increasing competition for accessing bananas. Under these circumstances, it will be inevitable for some to lose their jobs in the near future if no remedy is found. In this context, the bicycle offers the opportunity for a job changeover. People may switch to another "transportation" business in order to sustain the family.

Water Selling Business: The second example in this regard is the water selling business, where people fetch water on a commercial basis. It is an important, profitable and exhausting business, as these numbers indicate: 25 liters (with one canister) are sold for TSH 200[62]. Experienced water sellers can transport five canisters at the same time. With up to 15-20 trips a day, this adds up to daily profits of roughly 15'000 – 20'000 TSH. However, as the government plans to construct a water pipeline to Nshamba, the water delivery business is in danger and can stop in the near future. This would be a severe external (institutional) shock and likely bring about the end of water delivery employment for the 89 water sellers in Nshamba

[62] As of December 2014.

Annex X: Overview bicycle parts



1. Saddle
2. Carrier
3. Brake Cable/Brake System
4. Light
5. Tire/Tube
6. Pedal
7. Gear system
8. Stand
9. Chain
10. Frame
11. Hub