



THE IMPORTANCE AND CHALLENGES OF LOW COST MOBILITY MODES FOR SUSTAINED SOCIOECONOMIC AND ENVIRONMENTAL DEVELOPMENT IN CITIES OF AFRICA; COMPARATIVE ANALYSIS OF BICYCLE TRANSPORT IN BAHIR DAR AND HAWASSA CITIES IN ETHIOPIA



By
Belew Dagnew Bogale
Ethiopian
Assistant Professor
Transport Professional

Transportation Management Department

Ethiopian Civil Service University

PO Box: 5648,

Email: beldagne@gmail.com,

Mobile: +251-911348754

25 July, 2012

ADDIS ABABA

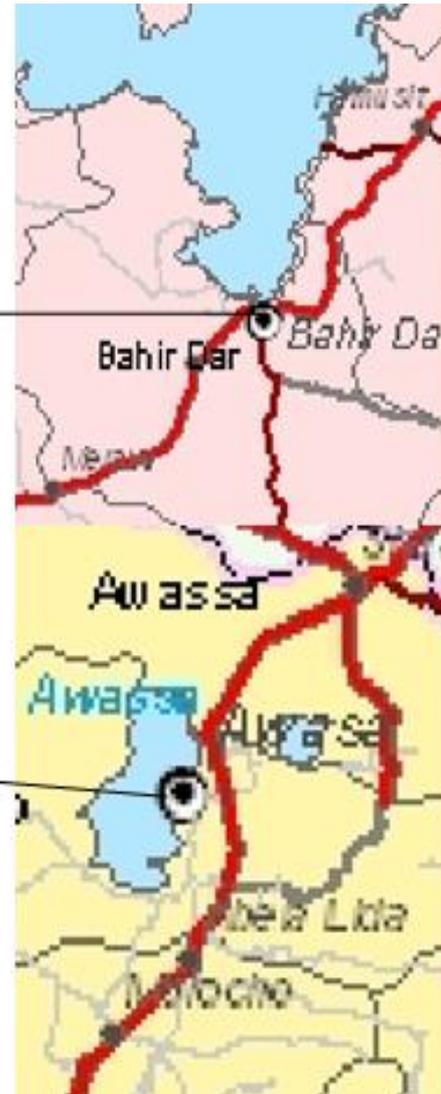
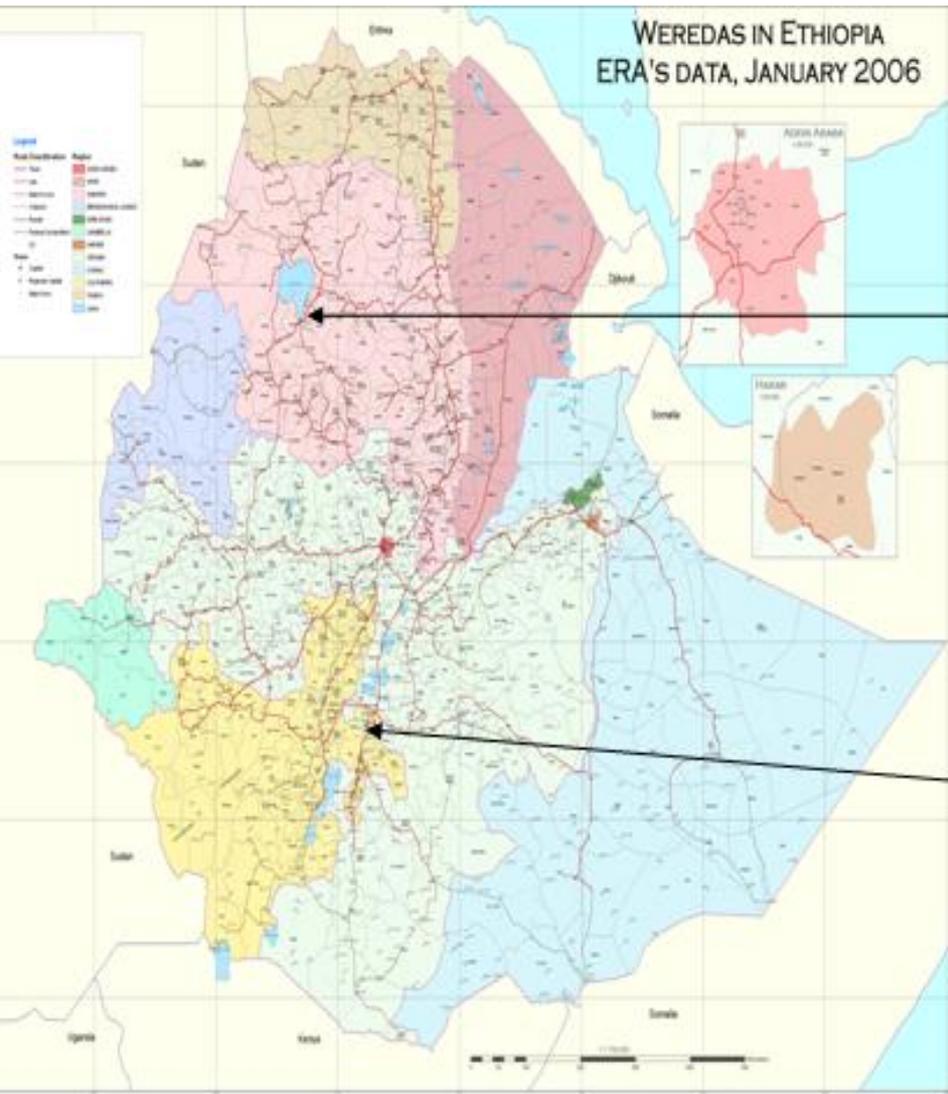
Ethiopia

1. Introduction

Bicycle transport is one of non-motorised transport which uses **human energy**.

- The range of cycling is between **10** and **15** kms per hour, as opposed to walking which ranges at an average between **5** and **6** kms per hour
- Cycling in **big cities** seems challenging, but possible through segregated lanes, and more encouraging along collector roads, through speed humps and raised pedestrian crossings.
- In other side, cycling in **medium size cities** is viable can be an attractive mode of urban travel
- The **modal share** of bicycling is the second after walking in the study areas Bahir Dar and Hawassa cities (secondary/medium) in Ethiopia

Description of the Study Area



- Population 191,000
- Area :165 Sq.km
- 45% built up
- 8 Sub Cities
- $11^{\circ}36'N$ $37^{\circ}23'E$
- Elevation: 1836
gentle

- Population 213,000
- Area :50Sq.km
- 83% built up
- 7 Sub Cities
- $07^{\circ}03'N$ $30^{\circ}29'E$
- Elevation: 1697
gentle

Objective of the Study

1. To identify advantages and disadvantages of bicycle transport
2. To assess best practice from bicycle friendly countries
3. To assess the extent of management and challenges of bicycle transportation in the study areas
4. Identify and recommend some best models to bring about safer and attractive bicycling

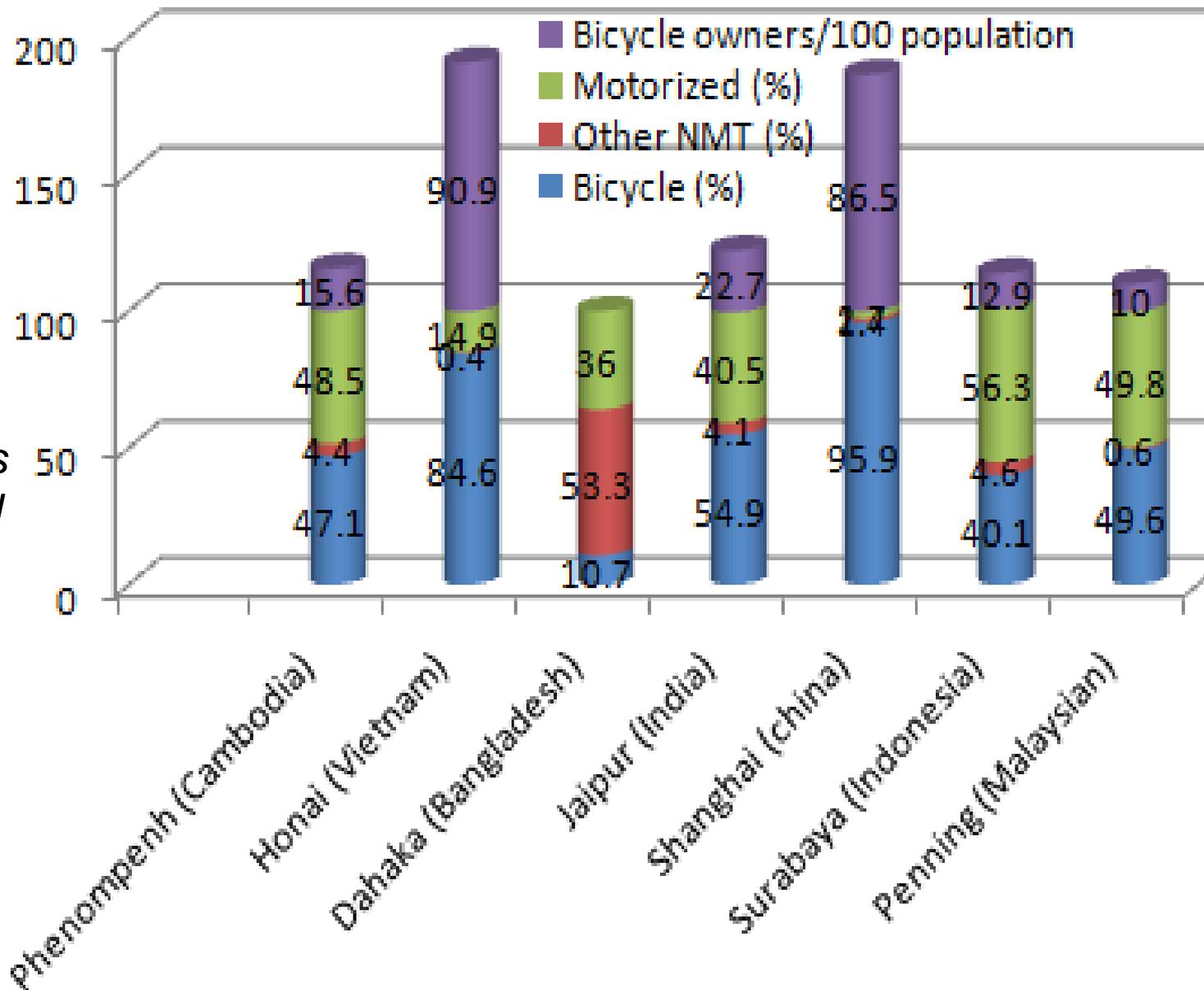
Methodology

- Both primary and secondary data are used
- Qualitative and quantitative
- 408 respondents

2 LITERATURE REVIEW

2.1 Comparing Modal Share of Bicycles among Cities in Developing Countries

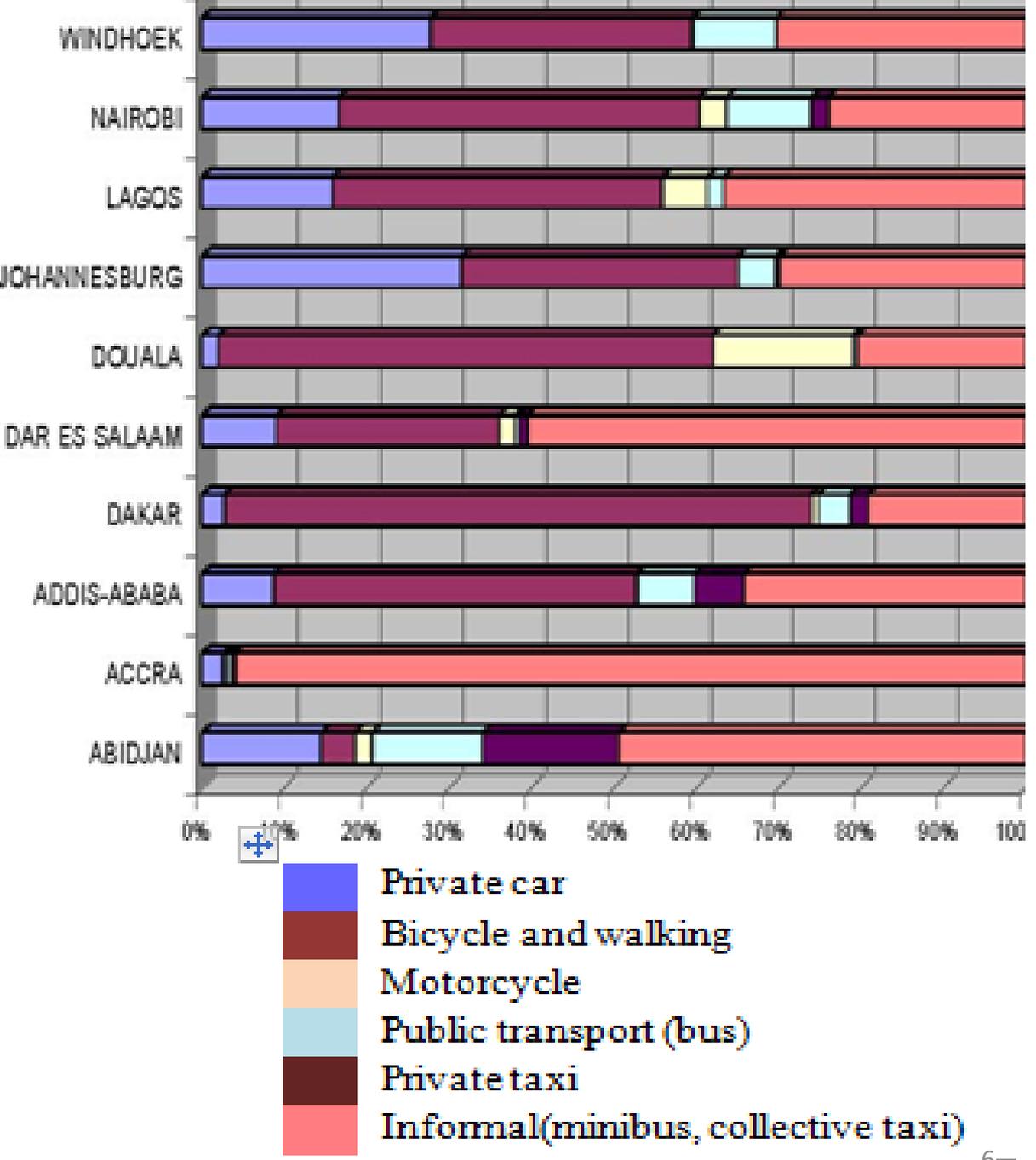
Fig.2.1 The graph illustrates transport modal share of cities' bicycles as compared to other non motorized vehicles and bicycle density per population in *Asian cities*



2.1 Comparing Modal Share of Bicycles among Cities in Developing Countries...Cont

Fig 2.2 The graph illustrates transport modal share of African cities.

Generally the ownership of bicycles in developing countries such as in China, Asia, Latin America and Africa is 53, 40, 16 and 0.4% of their total population (Heyen-Perschon 2001).



2.1 Comparing Modal Share of Bicycles among Cities in Developing Countries...Cont

- **Informal collective** transport is the main means of motorized transport across the whole of the African continent and accounts for around **35-40%** of most urban transport trips (Figure 2.2).
- NMT (walking and cycling) is the second most important group with a modal share of **30-35%** (with walking being the most dominant).
- Therefore as illustrated in both graphs above, motorization in developing countries is **less** accessible because of affordability.
- Hence; bicycles are alternative modes of transportation for the poor only where the track is available.

2.2 The Significance of Bicycle Transportation

- Bicycles provide:
 - **direct** benefits : flexible, affordable ,door-to-door service, and
 - **Indirectly**: health, recreational, environmental and social benefits.
- **Generally they have the following importance:**
 - i. Travel Costs and Individual Mobility Benefits***
 - Its **nature** and **size** invites to door-to-door service
 - for each traveled kilometer, travel expenditure is **lower than any other means** of transport with the exception of walking

2.2 The Significance of Bicycle Transportation ...Cont

ii. Environmental Benefits

- **1%** shift of automobile travel replaced by cycling decreases by **2 to 4 %** motor vehicle emission(kumanoff and Roelofs, 1993 cited in VTPI, 2008)
- **Every kilometer** traveled by bicycle will be a **kilometer** without environmentally damaging emissions

iii. Health and Recreational Benefits

- Its replacement reduces **collision**
- keeps reasonable **body** fit and weigh to physically inactive and overweight people

2.2 The Significance of Bicycle Transportation ...Cont

- Overcomes medical problems :
 - **Cardiovascular**(relating to both the heart and the blood vessels)diseases
 - Cycling for half an hour every day **reduces** the chance of developing diseases such as **obesity** and **diabetes** (WHO, 2000; Grava, 2003; Litman, 2004).

iv. Economic Benefits

- Increasing **fuel costs**, **land consumption** for transport infrastructure and urban vehicle traffic **congestion** have diverted some countries policy attention towards less energy and space intensive forms of transport,
- A single bicycle occupies 2m^2 space when it is standing and 5m^2 when it is in movement as opposed to 25m^2 and 55m^2 for the private car respectively (Grava, 2003).

2.3 Challenges of Bicycling Transportation

Even though bicycling is very important to low income groups it has limitations and challenges some are overviewed as follows:

i. The Vehicle Itself

- not suitable for **drivers**
- difficult in **bad weather** conditions and on rugged **topography** where the slope is above **5%**.
- mostly causes fatigue

ii. Safety

- if an accident occurs at the speed **70 km/h**, the likelihood that the cyclist will be killed is estimated to be at **83%**; at **50km/h** speed, **37%** fatality, whereas at **30km/h** speed it reduces to **5%** (Hass-Klau, 1990, as cited in O'Flaherty, 1997).

iii. Affordability

- Though bicycle is the cheapest mode, **all people** can not afford it particularly in developing countries.
- For example in Malaysia and India the bicycle ownership becomes substantial 40% more of households owning a bicycles when income levels reach about **10 times** the cost of bicycles and in Nigeria households own bicycle had incomes of **19** times its cost.
- Therefore, affordability is a function of purchase price.

China + Other cities

- electric bicycling has been implemented in 2010 and the density is almost reached to **10 e-bike per 100** people.
- In **North America** e-bike is also common
- Bicycling with trailers



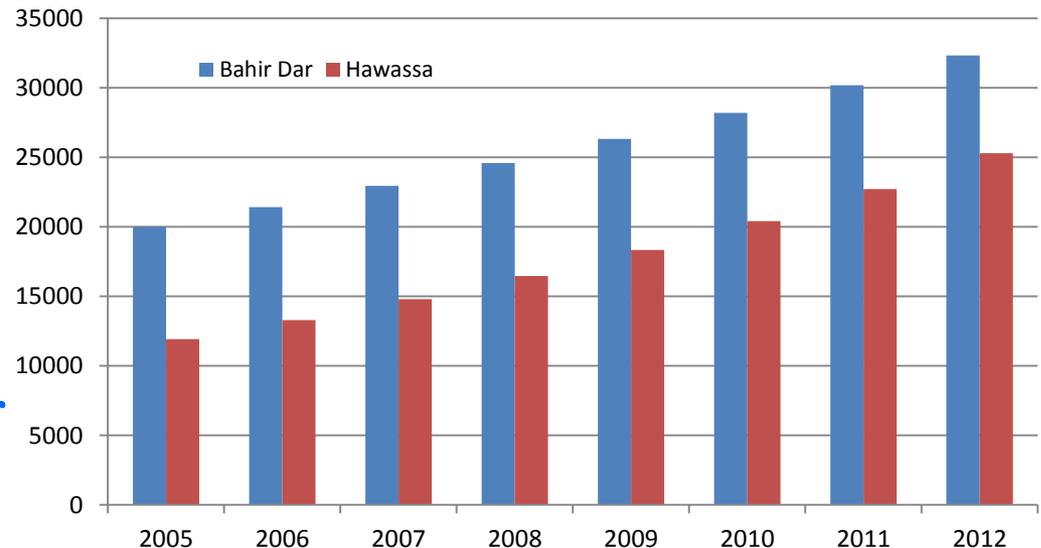
Africa and Other Cities

- Common in medium cities, Morgoro and Eldort
- In most collector roads of big cities: Nairobi and Dar es Salaam
- Many arterial roads have been converted from **4- to 3 lane** or **4 to 2-lane reductions to accommodate bike lanes as** part of road diet treatments

3.DATA ANALYSIS AND INTERPRETATION

- Registered bicycles in both cities, raised from 20,000 in 2005 to 24,571 in 2008(22.86%) in **Bahir** Dar (CAGR of **7.1%**). This shows that the number of bicycles in 2012 is 32,326.
- Similarly in **Hawassa**, it has raised from 11,926 in 2005 to 16,458 in 2008(73.94%) with CAGR of **11.33%**. This raises the number of bicycles to 25,280 in 2012.

As the interview conducted, about **30.8** and **36.8%** of bicycles are not registered in **Bahir Dar** and **Hawassa** respectively.



3. DATA ANALYSIS AND INTERPRETATION

Table 3.2 Comparing Bicycle Density in the Study Area (2012)

Study area	Population (2012)	Area (km ²)	Population density	No. of bicycles registered	No. of bicycles (+ unregistered estimation)	Bicycle density/ 1000 people (registered)	Bicycle density/ 1000 people (including unregistered)
Bahir Dar	191,016	160	1194	32,326	42,347	169	222
Hawassa	215,396	50	4308	25,280	34,886	117	162

...Cont

- Out of 408 bicycle users in both study areas, the younger bicycle users dominated.
- Users between 15-35 age group were 75% and the use of bicycle decreased with an increase of users' age.
- 27% and 21% of the total respondents were females in Bahir Dar and Hawssa respectively
- The most frequent bicycle users in the cities are government employees (46.15% in Bahr Dar and 42% in Hawassa).

3.4 Challenges of Bicycle Transportation

i) Bicycle theft:

- Fear of **theft** due to **lack of facilities** are major obstacles to own bicycle
- Out of 408 respondents **34%** replied that their bicycles were stolen (i.e., **32 %** in Bahir Dar and **35%** in Hawassa)
- From stolen bicycles,
 - **19 %** replied that their bicycles were returned through formal **legal** process,
 - **20%** replied that bicycles returned through **negotiating** with bicycle thieves and

3.4 Challenges of Bicycle Transportation...Cont

- **61.31%** reported that their bicycles were not returned at all (**83.6%** in Bahir Dar and **40.0%** in Hawassa).
- Moreover, respondents explain that formal legal process to return stolen bicycles is **time taking** and the police members were **not cooperative**.

ii) Traffic Accident

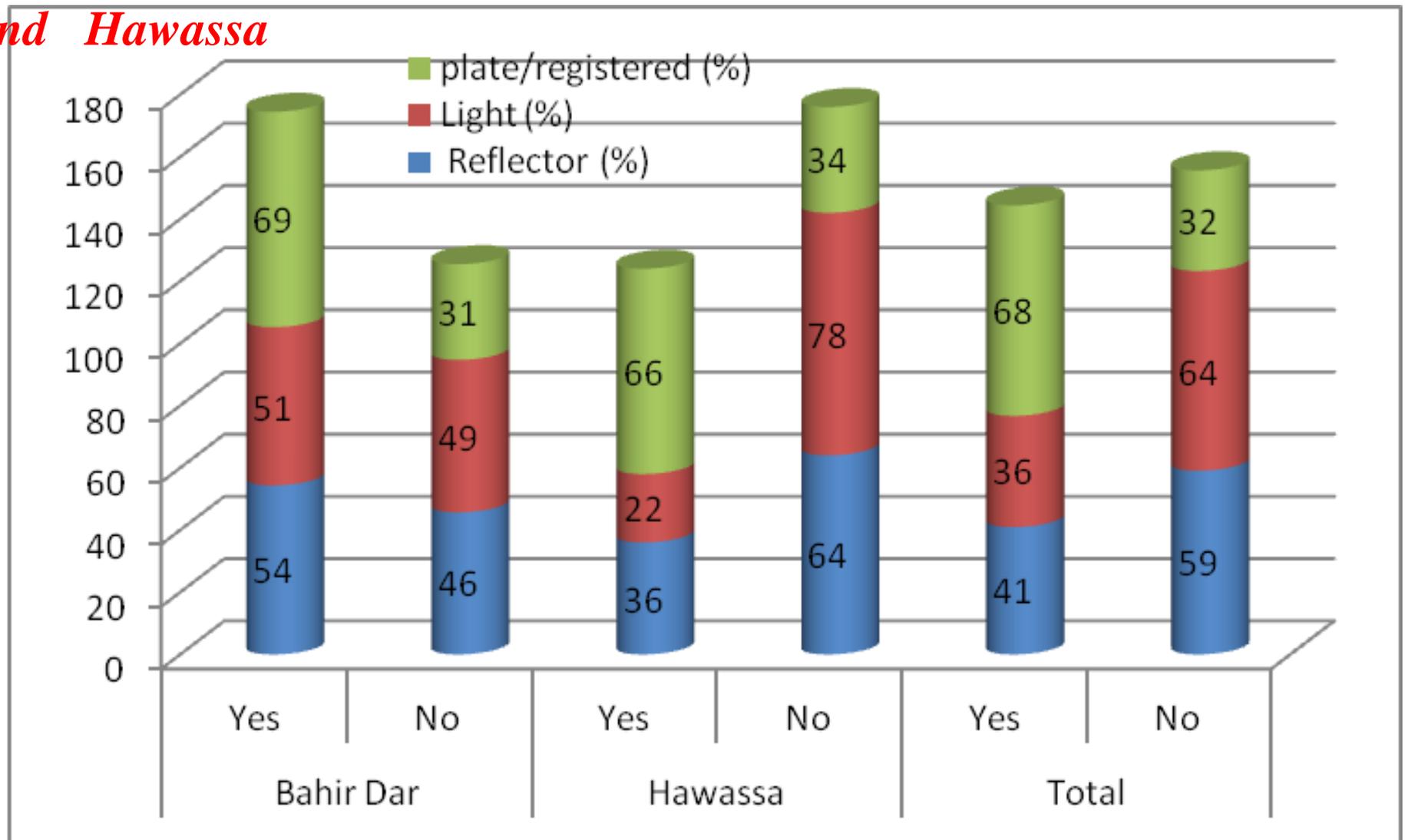
- more than **29%** of total bicycle users had been encountered with traffic accidents.
- In Bahir Dar for instance, among various problems, traffic accident is the **second largest** rank after bicycle theft.

3.4 Challenges of Bicycle Transportation...Cont

- Reasons for the victimization:
 - i) They do **not follow the traffic laws** while they are riding bicycle; **alcoholic***
 - ii) Bicycles don't have **lights** and **reflector** mounted on their bicycles while they are riding at night time;*

3.4 Challenges of Bicycle Transportation...Cont

Equipment and Registration Status of bicycles in Bahir Dar and Hawassa



3.4 Challenges of Bicycle Transportation...Cont

iii)Lack of Availability of Bicycle Facilities

- Non-existence of parking with guards, in size and quality of right-of-way, road markings, lights along the roads, road signals and signs etc has increased the risk of bicycling.

Iv)Lack of Proper Management

- No motivation related to bicycling
- Non implementation of rule and regulations
- Problem of structural set up
- No loan access to purchase bicycle

2.5 Some Models (Opportunities) to Bring Safer and Attractive Bicycling

Bicycle right-of-way (segregation) is essential and practical in bicycle friendly countries., In Chinese urban roads bicycle facilities were appropriately divided into five types with the first **two types being recommended** for large and medium size cities.

1. ***Special bicycle roads***, independent of the road network and dedicated to bicycle use only;
2. ***Semi-independent bicycle roads***, positioned on one or two sides of motor vehicle lanes with physical separation;
3. ***Non-independent bicycle roads***, positioned on one or two sides of motor vehicle lanes but without physical separation;
4. ***Mixed traffic roads***, where motor vehicles and bicycles share the same right-of way;
5. ***Pedestrian-bicycle roads***, where bicycles and pedestrians share the same right-of way.

2.5 Some Models (Opportunities) to Bring Safer and Attractive Bicycling...Cont

Bicycle storage (parking). Litman and et al. (2002) classified bicycle parking facilities in to two:

- ***Long-term (Class I) parking*** is needed at **residences, employment centers, schools,** and transportation **terminals** to safely **store** bicycles for several hours or days at a time. It must be fully protected from the weather, and enclosed in a secure space. This includes lockers, storage rooms, or fenced areas with restricted access.
- ***Short-term (Class II) parking*** is needed at commercial and recreation centers. It should be as accessible (close to destinations) as possible. At least some short-term bicycle parking should be protected from the weather (a portion can be unprotected, since demand tends to increase during dry weather), and it should be visible to by-passers to discourage theft. Bicycle racks should support the frame of the bicycle and provide something to lock the frame and wheels.

2.5 Some Models (Opportunities) to Bring Safer and Attractive Bicycling...Cont

- ***Visibility, security*** (adequate lighting and close watch), ***weather protection*** (where possible to protect bicycle parking from the weather) and ***adequate clearance*** are the required factors considered when locating bicycle parking facilities

**Traffic Management and Traffic Calming:
Encouraging bicycling**

Conclusions

- Though bicycling is not this much an advanced technology, it has never lost its utility.
- Promotion of bicycle traffic means they use human energy, no emission and noise, require very small parking space, cheap to own and operate, offer door to door service, and keep the rider in a good health, safe when they are segregated from fast traffic.
- In Ethiopia, medium sized cities are the most bicycle-friendly. Primate City, Addis Ababa, and tertiary cities are deficient of this mode.
- In medium sized cities of Ethiopia more dominant users of bicycles are found to be government employees relatively who are medium and low income as well as 15-45 age groups. But there are various challenges which need mitigations:

Recommendations

- Improving conditions for bicycling often require public resources (money and land devoted to bike lanes and parking), the public cost per trip is usually less than that of automobile travel (money and land devoted to roads and parking facilities); and so such improvements can be considered to increase horizontal equity,
- Creation of awareness to politicians, administrators, professionals and stakeholders to benefit from low cost mobility options to alleviate poverty, gain economic and social development in the cities and towns is very essential,

Recommendations...Cont

- Many communities have significant latent demand for bicycle transport. That is, people would bicycle more frequently if they had suitable facilities and resources. But these needs have been covered by various challenges: Bicycle thefts are prevalent in the study areas. Hence, based on strong institutional setups, the police should work together with bicycle maintainers, justice and user parties.

Recommendations...Cont

- All bicycles should be registered and regularly inspected. Promotion to form their own association and keeping their rights and legal coverage is very essential. Besides, transportation safety problem solutions should also be action based in: legislation, regulation, enforcement, education, engineering, and encouragement



Thank You

ՀԳՍՍՊՊԳԸԴՉ