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Project for the evaluation of the Economic and Safety situation of the street transportation using a cost-effective methodology: the case of Cameroon

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Abstract

This paper proposes a cost-effective project for the monitoring and evaluation of the street transportation's economic and safety situation. It provides a sampling methodology and three data sources for that purpose. Whilst there is an increasing need for quality information on the street transportation, Cameroon as many other countries is facing a tremendous shortage on accurate information on the sector. This may be due among other reasons to a shortage of resources and to methodological difficulties favored by the amount of informal activities. We have proposed and tested a cost-effective methodology that allows a better handling of the sector in Côte d'Ivoire. This methodology considers street's sections as a network where connection points are data collection areas (strata). It has been proven that these specifications make it possible to reduce some costs by halving the number of respondents for a given sample size. At a larger scale and with some technical improvements, we will apply it to Cameroon. Enterprises will be selected proportionately to their number exploiting a given street's section. Two other samples (drivers and rides) will be deduced from the enterprises' one. Managers of enterprises would be mainly answering questions regarding their feelings on the economic and safety tendencies of the sector. Drivers would provide for each way of their usual traffic lines, data on their personal and professional characteristics and their evaluation on several aspects of the risk accident in the country. Rides' follow-ups would provide data on the state of vehicles and drivers at the departure point and their mood and professional behavior during the ride.

Keywords: cost-effective, crossroad, statistical-unit, situation, safety

I. Context and justification

Most of Developing countries still don't accurately and regularly assess the situation of the street transportation [16], while a large priority is granted to other socio-economic surveys¹. The other huge challenge that researchers and surveyors face in the area of street transportation is the existence of a big proportion of informal activities making any attempt of proper evaluation hard and uncertain.

Economically, it is largely admitted that transports infrastructures and fluent traffic contribute significantly to decrease the time and the cost spent to movement of people and goods. Thus, a good transportation system make easier the access to services and goods or the delivery of local products to places (indoors and outdoors) where they are needed the most. These theoretical allegations are largely proven for both developed and developing countries. In the contrary, impaired driving and inadequate road infrastructures lead, for instance, to: human losses most concentrated in the working class, tremendous deficits in the car insurance market, etc. On that last aspect, high accident rates harden the indemnification and gives way to high insurance fares [16]. Safe and well organized road traffic [11] is therefore, fundamentally important to every country aimed at combining economic prosperity and social welfare (AFD, 2009) [1].

¹ See all "bulletin d'Afristat"

Furthermore, environmental issues dealing with transportation are more and more key topics in scientific and political debates. For instance, it is proven that private vehicles are at a certain level pernicious (environment safety [12], traffic jams, accidents, etc) in such a way that, sustaining the growth and a better management of public transportations is nowadays a much promoted option. As a matter of fact, projects on that area are easily proven SMART². Interestingly, environment safeguarding incentives and rulings [4] adopted in many countries convey a clear message about the fact that among transportation ways, street transportation is a priority that even the growing ICT [18] sector is barely an efficient substitute.

Regarding the health sector, it has been estimated that worldwide approaching 1 million people are killed in road crashes each year (Jacobs et al, 2000) [16] and road accidents will constitute in 2020 the third cause of burden of disease in the world putting it 'ahead' of respiratory infections, war and HIV (WHO/Harvard University, 1996&2004) [16] [22]. Human damages on road accidents are ranked from any sort of disability (for victims and their family members) to trauma and death. 70% of car accidents occur in Developing countries and this figure is rather increasing sharply [16]. The burden of trauma and death due to road accidents weighs in a disproportionate manner on low and middle income countries, therefore contributing to deepen poverty and welfare gaps due to healthcare catastrophic expenses and or income losses.

As a conclusion, road accidents are a major social and economic problem in developing countries. Unfortunately, among all public systems the large majority of people use every day, transports one is the most complex and hazardous (Peden et al., 2004) [21]. For developing countries-under constraints of fast growing populations and road traffic-, that complexity and hazardousness make the road transportation sector very difficult to accurately manage.

As a consequence, the management of the street transportation needs to be optimized at any level namely: *the information system*, the supply of infrastructure, etc. The first and foremost focus of any policy conception and or implementation on the issue has to be on a proper and continuous assessment of the situation. Methodological questions earn in such a context a primary interest. Interestingly, appropriate methodologies should allow overcoming all the bottlenecks while remaining affordable for public funds.

The context of this survey proposal is intended to be Cameroon⁴. Cameroon is a middle income country of 475,000 km² located in central Africa. It is constituted into 10 regions and contains about 18 million inhabitants. The country was traceable in 2001 on 50,000 km of street among which only 4,300 was asphalted⁵. The country was gathering a rolling stock of 183,000 vehicles in 1992. This rolling stock was estimated to 210, 000 in 2000. According to the Ministry of defense, the number of road accident's victims was 3,929 in 1995 (with 889 deaths). This figure has increased to reach the number of 4,222 victims in 1999 (with 686 deaths). Economically, the development of the continental, regional and sub-regional trade in Africa depends also on the existence of a viable common street network [9] and a better access to goods located in rural and hardly accessible areas [23]. Cameroon, with its strategic location in central Africa has to play an important role in the achievement of that challenge. Unfortunately, the street traffic is still mainly informal in rural areas [23]. The management of the traffic is still largely organized according to the rule "full before departure" and the public management of the sector is not well informed and seems not to be optimal.

In Cameroon, a couple of reports can be found dealing with the issue of street transportation. One of these is a survey on the traffic safety undertaken by the Ministry of transports on May 2007 [13]. The methodology used for that survey was the filling of rides' log-grid on the four main traffic sections of the country. Twenty formal transportation companies were part of the sample and 206 observations have been done. The survey does not attempt to present nationwide results but just an observation of interurban road sections considered the most hazardous of the country in a context of formality. Survey's results established that among vehicles observed, many were not satisfying the requirements of a trustworthy car (good tires, safe glasses, regular painting, etc). In terms of security disposals, the large majority was not equipped with tools like first aid kits, fire extinguisher, etc. Moreover, more than half the cars were overloaded during their journeys, the majority of drivers was not wearing their seat belt during the whole ride and many of them were in high speed at least once including on road curves or when passing. As a whole, the survey has alleged that 70% of public transportation car accidents may be due to faulty driver behaviors.

² Significant, Meaningful, Appropriate, Realistic, Trackable

⁴ The most recent figures on the situation of street transport are not available, from our source, since 2000. These figures are coming from secondary sources (administration), they may therefore contain some limits.

⁵ Data from the Ministry of Public Works in 2001

Another survey, *qualitative survey on companies' Managers and Drivers*, deriving from the conclusions of the above traffic safety survey has been conducted by sociologists [19]. O. Tatio and A Ngalamou, provided some results of focus group discussions with Drivers. The study had an objective of following-up the massive safety sensitization campaign of drivers undertaken by the Ministry. They found that, the knowledge of drivers on the issue of traffic safety was mostly either wrong or imprecise. Their awareness of the sensitization program put in place was not always clear and the observance of recommendations, insufficient. Some recommendations have finally been collected from drivers themselves. They recommended the insistence on the sensitization program, efficient street clearance (fallen trees, broken cars and trucks...), and the integration of safety management unit in their companies.

One other simplified survey was targeting “*buyers and sellers*”⁶ traffic. Through that survey, the problem of passengers and goods overloading was mainly underlined as a very hazardous issue especially in rural areas (V. Meli, 2003).

These studies lack methodological accuracy to be extended in a well defined population. The selection of samples are not reported to be randomized; sizes of samples are very small or too concentrated in a given location or aspect. Nevertheless, they have allowed us deciding to use pre-codified questions instead of opened ones in this project proposal.

The structure of this paper is the following: at section 2, we briefly present the objectives, interests and expected results of the project; the characteristics of the study are presented at section 3, while sampling methodologies and collecting tools are discussed at sections 4 and 5.

II. Objectives, interests and expected results

2.1 Objectives

The overall objective of the survey is to cost-effectively assess the economic and traffic safety situation of street transportation both in formal and informal sectors.

Specific objectives are:

- to produce tendencies on the economic activity of formal and informal street transportation and
- to evaluate main aspects surrounding accident's risks and accident's risks management.

2.2 Interests

The sector of street transportation is a cross-sector integrating Health (risk accident-emergency cares), Infrastructure (public works), small scale businesses (agriculture, trade), Tourism, Environment and some others.

Any long-term effective strategy to reduce impaired driving accidents and economic losses due to road traffic hazards in developing countries will need the support and encouragement of the government. In order to make politicians and policy makers support such activities it is necessary to persuade them about the ‘true’ size of the problem and provide convincing evidence about the social and economic cost. So, in addition to lower costs targeted by this project, proposing a cost-effective project for the proper assessment of the whole situation of street transportation could allow authorities to get access to a better information therefore giving way to better policies.

A well designed survey on the sector could also directly:

- Improve the standard of the dialogue between public authorities and transporters' unions;
- provide business opportunities and better safety management to companies or organization working on that issue, and
- be used as reliable datasets for various cross-sectional and time series analyses.

2.3 Expected results

Based on the objectives above, main results expected from the survey are the following:

- a description of the economic situation on the sector of street transportation in Cameroon by assessing the level of production, constraints linked to the activity, some improvements perspectives, etc;
- a detailed knowledge on the dynamic of the sector on a 12 trimesters period underlining seasonal influences;
- a report displaying the main causes of main risks' accident and
- a leaflet on the activity summarizing the main indicators at national and regional levels.

III. Characteristics of the survey

⁶ basic goods traders at a very small scale

3.1 Field and statistical units

Geographically, the field of the study is the national territory of Cameroon. The study will be focusing on all transportation enterprises. In stage 1, we will handle only interurban formal or informal enterprises while stage 2 will consider only the rural sector (inter-rural or urban-rural).

The first level's statistical unit is a transportation enterprise on a given street section. In the first stage, it will be all about any enterprise considered, formal or informal by the Ministry of Transports that is, being registered in the country's file and getting a tax registration number or not. We will undertake a check-up of the file of enterprises of the country to update it.

Individuals to be surveyed are: enterprises, drivers and rides. Therefore, cross-analyses through the three data sets will also be possible.

3.2 Stratum definition

Given that analyses will be held at national and regional levels, in order to consider regional disparities we have specified 5 strata (connection points or cross-roads) corresponding to 5 data collection points. These strata will be connecting the 21 street sections to survey. In fact, the interurban streets' network is defined as a set of streets connecting cities of at least 20,000 inhabitants.

3.3 Seasonality

Transportation activities are subject to important seasonal changes. In Cameroon, these seasonal changes obey to some key moments of the year (school start, national and or tribal celebrations, religious celebrations, massive holiday periods, etc.). In order to take into account this seasonality, that may otherwise affect our conclusions, the survey would be held within a four breaks timing (December, March, June and September). This timing would allow the proper computation of seasonal coefficients of the activity. At the enterprise level, the same units will be surveyed during the period in order to constitute a panel. Seasonality analysis will be realized upon every indicator using a two factors' ANOVA⁷ namely the periodicity of the survey within the year and the stratum.

IV. Sampling methodology

4.1 Methodological review

Statistical methodologies used to produce information on the movement of persons and goods are sometimes classified in a field called origin-destination surveys. These surveys are basically conceived in their aspects of persons transportation to be implemented on consumers, that is, citizens. Aspects traditionally evoked are: purposes of journeys, fares, characteristics of travelers, etc. Obtaining a sufficient and representative sample taking into account seasonal changes is time, resourceful and budget very consuming. Moreover, much basic information on the universe is required to constitute a sample likely to be extrapolated. In fact there is a need for an estimation of the number of journeys according to street' sections exploited and other basic traffic information distributed periodically [6]. In some developed countries (Canada, France), budgetary constraints oblige surveyors to phone respondents or to mail them questionnaires with all the limits that such an approach could hide [7]. For specific matters dealing with transportation of dangerous goods, some methodologies are taking transportation enterprises [14] as statistical units. In Developed countries, information regarding road safety are usually provided by national security agencies. These information are double-checked through field surveys. Developing countries are missing numerous of these requirements. Shortage in terms of budget, wrong or missing basic information on the universe and week or unavailable road safety information systems are some of the drawbacks preventing the total transposition of existing methodologies to many developing countries. Meanwhile, a former paper by us is presenting a cost effective approach tested in Côte d'Ivoire [24]. This methodology focuses on enterprises and seeks to provide among other aspects, data on origin-destination issues in countries facing shortage on basic reliable information and budget. It optimizes the budget's balance of the survey by exploiting the configuration of the traffic network, the mobility of drivers and the assumption that cities located on connection-points of the interurban street network are strata and transportation enterprises, the first level of statistical units. These guidelines allow distributing surveyors only on connection-points of the network instead of targeting every terminal. In fact, the implementation of that sampling method allows to save as we have shown, $\frac{1}{2}(an+bDS)$ CU (currency unit) from the traditional sampling method's budget. a here is the per unit fare of surveyors salary, b is the per unit fare of surveyors transportation, n is the sample size, D and S respectively the total distance ran by interviewers and the number of strata under the traditional methodology. See the proof below.

4.2 The cost-effectiveness of the methodology proposed

To show the cost-effectiveness of the methodology we are proposing, we will match the classical methodology (M_1) - consisting in targeting all terminals of the network for collection purposes - with the simplified methodology (M_2)

⁷ ANalysis of VAriance

targeting only strategic cross-roads. Therefore, we will establish the difference in terms of budget between the two [24].

We assume that the budget of a survey is constituted into: questionnaires printing costs (FQ), staffing costs (FPT), surveyors transportation costs (FD).

Notations with stars refer to M_2 and those without, to M_1 .

Let's call

B: the total amount of the budget,

n_i : the number of respondents, so that $n_i = n/2$,

S: the number of strata(provinces' terminals in M_1) targeted,

D: the total distance ran by surveyors in M_1 ,

Z: The number of strata in M_2 , so that $Z \leq S/2$ (assuming that every terminal is linkable through a direct or indirect path to another),

a: staff fare per surveyor,

b: transportation fare per surveyor.

The implementation of M_2 allows to deduce that : questionnaires fees are constant for the two methodologies, staffing cost are proportional to the number of respondents, that is, n for M_1 and n_i for M_2 , and these transportation fees are proportional to the number of strata, that is, S for M_1 and Z for M_2 .

For M_1 ,

$$B = FQ + FPT + FD = FQ + an + bSD$$

For M_2 ,

$$B^* = FQ^* + FPT^* + FD^* = FQ + \frac{an}{2} + bZD$$

From above, we can deduce that $B^* < B$.

As $Max(Z) = \frac{S}{2}$, we can therefore assess the minimal cost-saving (gem) that we earn using M_2 in function of n and S .

$$So: \quad gem = B - B^* = \frac{1}{2}(an + bDS)$$

4.3 The universe

The universe is constituted into interurban enterprises per section. These enterprises are to be collected at decentralized transport's public services and other sources (unions, referents at pick-up points, etc.). We will also estimate these size using nationwide surveys (EESI, CNPS enterprises' census). Table 1 shows for every stratum, all the targeted road's sections.

Table 1: Interurban streets targeted

| N° Collection points | Supervision City | Sections ⁹ |
|----------------------|------------------|---------------------------------|
| 1 | Bafoussam | Bafoussam-Bamenda |
| | | Bafoussam-Dschang |
| | | Bafoussam-Foumban |
| | | Bafoussam-Nkongsamba-Kumba-Buea |
| 2 | Bertoua | Bertoua-Ngaoundere |

⁹ See Cameroon's map in appendix 1

| | | |
|---|---------|-----------------------|
| | | Bertoua-Yokadouma |
| 3 | Douala | Douala-Buea-limbé |
| | | Douala-Edea-Yaounde |
| | | Douala-Nkongsamba |
| 4 | Garoua | Garoua-Maroua |
| | | Garoua-Ngaoundere |
| 5 | Yaoundé | Yaounde-Bafoussam |
| | | Yaounde-Bertoua |
| | | Yaounde-Ebolowa-Kribi |
| | | Yaounde-Edea-Kribi |

Source: Authors

4.4 Samples design

We applied a two level randomized sample design where strata are defined as above. At the first level, in every stratum, we will sample enterprises with respect to their section and their status (formal or informal). The sampling will be held without replacement with equal inclusion probability¹⁰. At the second level, two parallel samples will be withdrawn from the enterprises' one: a sample of drivers and one other of rides. The number of drivers to interview for each enterprise will be proportional to its size out of its stratum's one. The sample rate of rides will be computed after have collected from enterprises, estimations of the total numbers of rides operated during the trimester.

4.5 Extrapolation coefficients

At the first level, the probability to sample one enterprise k operating on the section j of the stratum i is:

$$P^1_k = n_{ji}/N_{ji}$$

Where N_{ji} = total number of enterprises operating on the section j of the stratum i ;

n_{ji} = number of enterprises sampled on the section j of the stratum i , $i=1 \text{ à } 5$.

The extrapolation coefficient of the enterprise k will be the inverse of the inclusion probability above: $C_k = N_{ji}/n_{ji}$

At the second level, the probability to sample a driver from the enterprise k is:

$$P^2_k = d_{ijk}/D_{ijk}$$

Where: d_{ijk} = number of drivers sampled and interviewed from the enterprise k operating on the section j of the stratum i and D_{ijk} = total number of drivers of the enterprise k operating on the section j of the stratum i .

The probability to sample a driver from a enterprise k operating on the section j of the stratum i is therefore:

$$P_{kD} = P^1_k P^2_k = n_{ij} d_{ijk} / N_{ij} D_{ijk}$$

We can deduce the extrapolation coefficient of a driver as the inverse of the inclusion probability to sample him from enterprise k , that is:

$$C_{kD} = N_{ij} D_{ijk} / n_{ij} d_{ijk};$$

The size of the sample of rides r_{ijk} will be obtained as follow. The data collection will happen all along the trimester. The surveyor will make a certain number of rides per week. He will alternate as much as possible his scheduling according to the beginning-middle-end of the week and according to beginning-middle-end of the day. The table below shows the number of rides to follow-up per week according to the distance to run per ride.

Table 2: Rating of number of rides to follow-up

| Distance | Number of rides per section |
|------------------|-----------------------------|
| Less than 300 km | 5 rides per way, per week |

¹⁰ for the first time we will still not know the size of enterprises to be able to use unequal probabilities

| | |
|------------------------------|---------------------------|
| More than or equal to 300 km | 4 rides per way, per week |
|------------------------------|---------------------------|

The inclusion probability will then be:

$$P_k^3 = r_{ijk}/R_{ijk}$$

Where: r_{ijk} = number of rides sampled from the enterprise k operating on the section j of the stratum i and R_{ijk} = total number of rides declared by the enterprise k operating on the section j of the stratum i .

The probability to sample a ride from an enterprise k operating on the section j of the stratum i is therefore:

$$P_{kR} = P_k^1 P_k^3 = n_{ij} r_{ijk} / N_{ij} R_{ijk}$$

As on top, we will deduce the extrapolation coefficient of a ride as the inverse of the inclusion probability to sample a ride of the Enterprise k , that is:

$$C_{kR} = N_{ij} R_{ijk} / n_{ij} r_{ijk}$$

Horvitz-Thompson estimators will be used for our totals and variances. For a given variable Y , we will have

$$\hat{Y} = \sum_{\pi} \frac{1}{\pi} y \quad \text{and} \quad \widehat{V}(\hat{Y}) = \sqrt{(N-n) \frac{\widehat{V}(y)^2}{n}}$$

π is a given inclusion probability.

V. Questionnaires and interviews

Three questionnaires [10] are designed for the project: enterprises' managers, drivers and rides.

Units of production (enterprises) will be mainly answering questions regarding the tendencies of the sector, their capacities (available fleet and staff), the labor force market, the costs of production and the accident risk management [8].

Drivers will be answering questions *for each way of their usual traffic line* on their personal and professional characteristics, the characteristics of their most usual car, variations on the level of activity and their appraisal of the risk accident management in their company and in the country.

Direct follow-ups grids filled by an unidentified surveyor during the ride (adapted log-book system [5]), will be providing the following items for the sample of rides: states of vehicles and drivers at the departure point and moods and professional behaviors of drivers during the ride. The follow-up process has to be operated by surveyors showing a driving license and some experience as a driver. The table below specifies better the various items included in the survey.

Table 3: Items to survey

| Items | Objective | Main indicators/variables |
|-----------------------------------|--|--|
| Characteristics of the enterprise | <ul style="list-style-type: none"> Listing of the characteristics of the enterprise | <ul style="list-style-type: none"> - Geographic situation ; - Enterprise size ; - Production capacity ; - Business turnover ; - Experience on the road section, etc. |
| Economic situation | <ul style="list-style-type: none"> Evaluation of the economic situation of the sector | <ul style="list-style-type: none"> - Tendency of the business during/for the last/for the next three months ; - Evolution of prices (upper and downward seasons) ; - Evolution of production costs - Evolution of the treasury, etc. |
| Safety management | <ul style="list-style-type: none"> Evaluation of the safety management | <ul style="list-style-type: none"> - Number of drivers (confirmed and temporary) ; - Evolution of the number of drivers per season ; - Difficulties to find experiment drivers; - Safety management standards. - Measures implemented for the security of passengers ; - Measures implemented to avoid overloads and speed excess. |

| | | |
|-----------------------------|--|---|
| Characteristics of Drivers | <ul style="list-style-type: none"> • Listing of the Drivers's characteristics | <ul style="list-style-type: none"> - Age ; Sex ; Level of schooling ; - Driving experience ; - Driving license category. |
| Characteristics of vehicles | <ul style="list-style-type: none"> • Listing of vehicle's characteristics | <ul style="list-style-type: none"> - Capacity ; - Weight capacity; - Equipment (outdoor rear-view mirror, luggage storage, etc |
| Health and safety | <ul style="list-style-type: none"> • Evaluation of the potential risks of accidents | <ul style="list-style-type: none"> - Standard of equipping (tires, rear-view mirror, luggage storage, etc.); - Availability of the maintenance certificate, - Availability of the first aid kit ; - Quality of the road and traffic signals according to Drivers ; - Density of the traffic during upper seasons; - Number of rides per Driver per day ; - Frequency of trainings and medical consultation per Driver; - Physical handicap situation of the driver ; - Mood of Driver ; - Number of extra-passengers embarked ; - Behaviors during rides (Drive left, speed limits, curve at high speed, seem tired, seem drunken, etc.) - Complaints of passengers, etc. |

Some of the questions asked to drivers are directly observed in the follow-up grid. The interest of such an approach is the double check of some answers. Similarly, we have decided to double check some structural and safety questions by asking them both to managers and drivers. The questioning process will be held as follow. A duo will go to a selected travel agency. One of them (predetermined) in the absence of the other will question the manager as well as the number of drivers sampled from the enterprise. Rides follow-ups will be done as described above (*4.4 extrapolation's coefficients*).

As we also seek to provide analyses linking rides to personal and professional drivers characteristics, we intend to achieve that by sorting rides followed-up according to these characteristics using the criterion of car registration numbers observed during the follow-up and the car declared to be most currently driven by a given driver. As one of registration numbers is based on a declaration, we will check the consistency of the sorting process by performing the same analyses on medians per enterprise.

Conclusion and discussion

Given the shortage of accurate information on street transportation in many developing countries like Cameroon, our aim in this project-paper was to build a cost-effective and extendable methodology facing as much as possible budgetary and technical constraints found in that part of the world. The *stage I's* methodology is considering the interurban street transportation of people in Cameroon to provide data and information every trimester on the economic and safety situation of the sector. It seeks also to build a three years panel on enterprises in the sector. This methodology considers street's sections as a network where connection points are data collection-points (strata) and enterprises, the first level of statistical units. It has been proven that these specifications make it possible to reduce some costs by halving the number of respondents for a given sample size. For Cameroon, this methodology will be using the set of cities of at least 20,000 inhabitants from which 21 street's sections corresponding to 5 connection-points are specified. Enterprises would be selected proportionately to the number of enterprises exploiting a given street's section at the second level of statistical units. Two parallel other populations will be deduced from enterprises one. Three main datasets for the interurban formal traffic are on target: representatives of units of production, drivers and a defined sample of rides follow-ups information. Enterprises will be mainly answering questions regarding the tendencies on the sector, the costs of production and the accident risk management. Drivers will be providing for each way of their usual traffic line, data on their personal and professional characteristics and the situation of infrastructure and traffic, etc. Rides' follow-ups will be providing data on the state of vehicles and Drivers at the departure point and the mood and professional behavior of drivers during the ride.

The methodology has some limits. Firstly, the extrapolation coefficient of rides is not very rigorous due to the difficult synchronization of the population estimation (obliging its post-sampling), follow-up data collection, other activities scheduled on the survey and the limited term to make a final report available on a situation survey. Secondly, the methodology will certainly not be able to fill the gap as a consumer sample would have done in an

origin-destination survey. Meanwhile, an approximation of that aspect will be obtained from the experience of drivers. Still, safety and economic aspects would be deeply informed at a lower cost.

The rural sector methodology will bind cities to rural areas or rural areas between them. It will require larger samples and presumably more resources than the interurban stage.

Acknowledgements

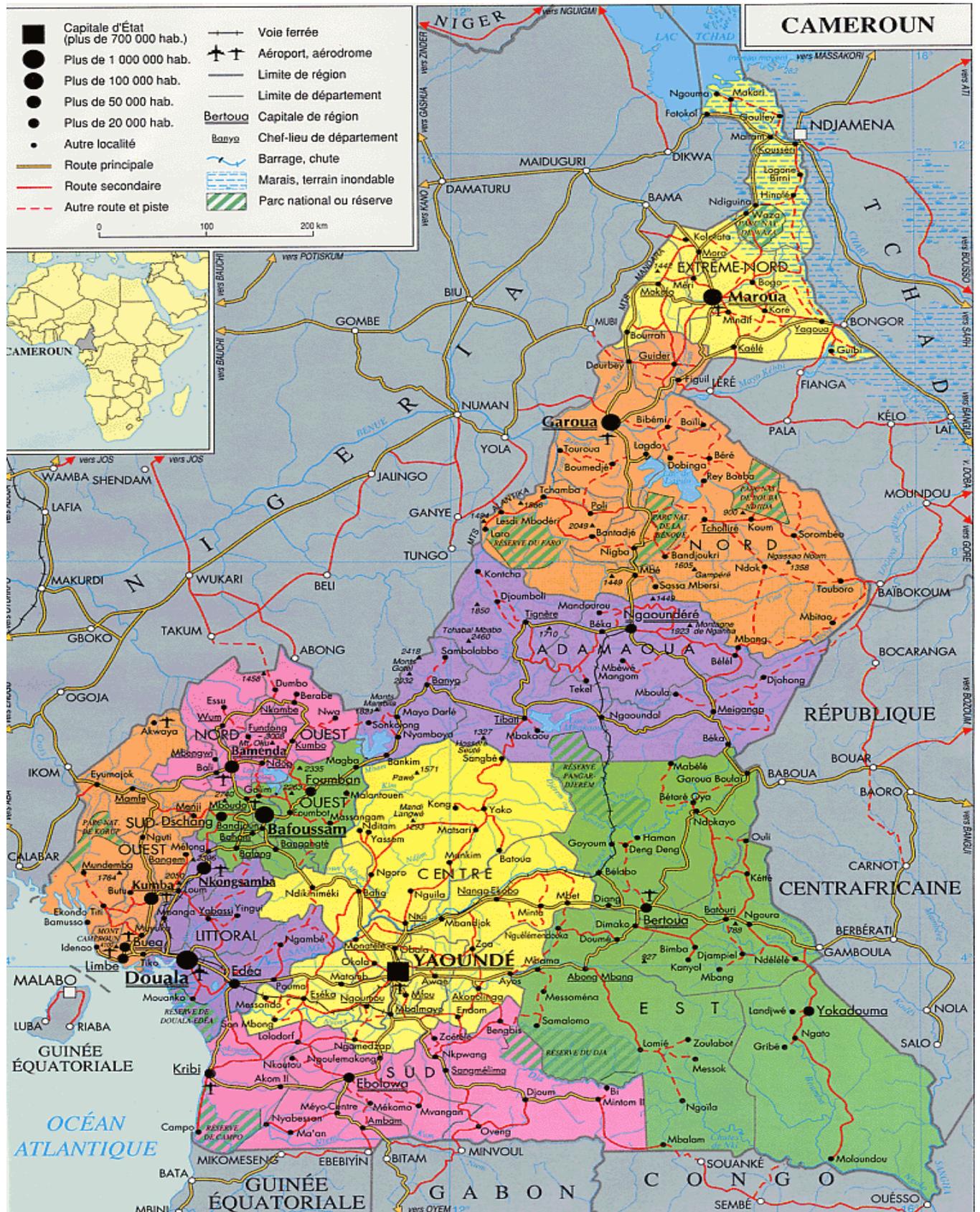
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Appendixes

Appendix 1: Cameroon's map



Source: NIS-Cameroon

4 DRIVERS

| S4Q1 | Attributed section | Confirmed | Temporaries |
|------|---|-----------|-------------|
| | From.....to..... | | |
| S4Q2 | How do you forecast any staff modification for the three coming months in your enterprise ? (1. Increasing 2. Identical 3. Decreasing) | □□ | |
| S4Q3 | If increasing or decreasing, please precise the percentage (with a + or a -)? | □□□ | |
| S4Q4 | Are you facing any difficulty to find qualified Drivers? (1. Yes 2.No) | □□ | |
| S4Q5 | Are you facing any difficulty to find experienced Drivers? (1. Yes 2.No) | □□ | |
| S4Q6 | How many Manager(s) out of the whole staff do you hire in your enterprise? (Write the number) | □□□□ | |

5 PRODUCTION CAPACITIES AND NUMBER OF RIDES

| | | | |
|------|---|----------------------|-----------|
| S5Q1 | Number of cars Gas Gas-oil | □□ □□ | |
| S5Q2 | Please estimate the rate of exploitation of your available cars? | □□□ | |
| S5Q3 | Please what is the number of rides you perform a trimester? | □□□□ | DK → S5Q4 |
| S5Q4 | Average number of rides per day on the last three months 1 st month 2 nd month 3 rd month | □□□□ □□□□ □□□□ | |

6 SAFETY MANAGEMENT

| | | | |
|------|--|-----|----------|
| S6Q1 | How many car accidents involving one of your cars have been notified during the last three months? | □□□ | 0 → S6Q3 |
| S6Q2 | If any, what was the nature of the damages? (1. Material 2. Human 3. Material & Human) | □□ | |
| S6Q3 | Do you trust the Insurance arena in Cameroon? (1. Yes 2.No) | □□ | |
| S6Q4 | Do you implement any road safety policy in your enterprise? (1. Yes 2.No) | □□ | 2 → END |
| S6Q5 | If yes, please mention some key elements: 1 2 3 | | |
| S6Q6 | Departure policy: □□ (1. Scheduling, 2. Full before departure) | | |

Survey on the economic and safety situation of the street transportation

Sample 2: Drivers

The information collected during this survey are strictly confidential according to the law N° 91/023 of December, 16 th 1991

0 LOCATION

| N° | Questions | Codes | Go to |
|------|--|-------|-------|
| S0Q1 | Questionnaire number | □□□□ | |
| S0Q2 | Date : □□□□□□□□ | | |
| S0Q3 | Surveyor's name: | □□□□ | |
| S0Q4 | Supervisor's name | □□ | |
| S0Q5 | Transportation enterprise: | □□□ | |
| S0Q6 | Town..... | | |
| S0Q7 | Place of interview (1. Headquarters 2. Agency 3. Elsewhere) | □□ | |
| S0Q8 | Way : From.....to..... | | |

1 IDENTIFICATION AND CHARACTERISTICS OF THE DRIVER

| | | | |
|------|---------------------------------|-----|--|
| S1Q1 | Name: | | |
| S1Q2 | Age: | □□□ | |
| S1Q3 | Sex: (1. Male 2. Female) | □□ | |
| S1Q4 | Last class attended (SEE CODES) | □□□ | |

| | | | |
|-------|---|----------------------|--|
| S1Q5 | Marital status (1. Married 2. Single 3. Widow/widower 4. Divorcee/Separated) | <input type="text"/> | |
| S1Q6 | Driving license category (A, B, D or E) | <input type="text"/> | |
| S1Q7 | Primary occupation | | |
| S1Q8 | Secondary occupation | | |
| S1Q9 | Union affiliation (quote the name of the Union) | | |
| S1Q10 | Are you affiliated to the social security? (1.Yes, 2. No) | <input type="text"/> | |
| S1Q11 | Years of experience in the driving profession | <input type="text"/> | |
| S1Q12 | Years of experience in this enterprise as a driver | <input type="text"/> | |
| S1Q13 | Is your salary satisfying you? (1.Yes, 2. No) | <input type="text"/> | |

2 CAR DESCRIPTION

| | | | |
|-------|---|----------------------|-----------|
| S2Q1 | Is a car attributed to you by your enterprise? (1.Yes 2. No) | <input type="text"/> | |
| S2Q2 | Describe the car you drive the most, What is- its brand? | | |
| S2Q3 | -its Registration N° ? | | |
| S2Q4 | -its capacity (number of seats) (1. Less than 20; 2. 20- 35; 3. 36- 50; 4. More than 50) | <input type="text"/> | |
| S2Q5 | -its transportable weight displayed in tons: (1. Less than 3; 2. 3- 10; 3. 11-20; 4. More than 20) | <input type="text"/> | |
| S2Q6 | Is your maintenance certificate always updated? (1.Yes, 2. No) | <input type="text"/> | |
| S2Q7 | Is the vehicle has a luggage storage (1.Yes, 2. No) | <input type="text"/> | 2 → S2Q9 |
| S2Q8 | If yes, which type? (1.On top of the car; 2. Hold down the car) | <input type="text"/> | |
| S2Q9 | How are the tires looking like? (1.all of them are good; 2. Only part of them is good; 4. All of them are not good) | <input type="text"/> | |
| S2Q10 | How is the windshield looking like? (1. Without stain and without crack 2. Cracked but clean 3. Cracked and stained) | <input type="text"/> | |
| S2Q11 | How is the car painting and shape looking like? (1.Good and trustworthy; 2. Fairly good with some damages; 3. Bad and worrisome) | <input type="text"/> | |
| S2Q12 | Which impression is the snoring of the car suggesting? (1. Smooth and trustworthy; 2. Too noisy and worrisome) | <input type="text"/> | |
| S2Q13 | Is the car equipped with outdoor rear-view mirror at each side? (1.Yes, 2. No) | <input type="text"/> | 2 → S2Q15 |
| S2Q14 | If yes how are these rear-view mirrors looking like? (1. Without stain and without crack; 2. Cracked but clean; 3. Cracked and stained) | <input type="text"/> | |
| S2Q15 | Is the car equipped with an indoor rear-view mirror? (1.Yes, 2. No) | <input type="text"/> | 2 → S3Q1 |
| S2Q16 | If yes, how is this rear-view mirror looking like? (1. Without stain and without crack; 2. Cracked but clean; 3. Cracked and stained) | <input type="text"/> | |

3 DRIVERS' PERFORMANCES

| | | | |
|------|---|----------------------|----------|
| S3Q1 | Do you have an Assistant for every ride? (1.Yes, 2. No) | <input type="text"/> | 2 → S3Q3 |
| S3Q2 | Can he or she drive? (1.Yes, 2. No) | <input type="text"/> | |
| S3Q3 | How many days do you work a week? | <input type="text"/> | |
| S3Q4 | As an average, how many rides do you make per day | <input type="text"/> | |
| S3Q5 | Time of the beginning in the morning :.....h.....min | | |
| S3Q6 | Time of the beginning in the evening :.....h.....min | | |
| S3Q7 | Frequency of training per year | <input type="text"/> | |
| S3Q8 | Frequency of medical consultation in the enterprise per year? | <input type="text"/> | |

4 SECURITY DURING THE RIDE

| | | | |
|------|---|----------------------|--|
| S4Q1 | Which measures are implemented for the security of passengers at the embarkation point? (if there is none write down 0 in the box) 1 2 3 | <input type="text"/> | |
| S4Q2 | Which measures are implemented to avoid overloading of vehicles? (if there is none write down 0 into the box) 1 2 3 | <input type="text"/> | |
| S4Q3 | Which measures are implemented to avoid speed excess? (if there is none write down 0 into the box) 1 2 3 | <input type="text"/> | |
| S4Q4 | Do you have any fire extinguisher in your car? (1.Yes, 2. No) | <input type="text"/> | |
| S4Q5 | Do you have a first aid kit in your car? (1.Yes, 2. No) | <input type="text"/> | |
| S4Q6 | Can you provide the first aid? (1. Not at all, 2.Well 3. Very well) | <input type="text"/> | |

5 THE STATE OF THE ROAD AND ACTIVITY

| | | | |
|-------|---|----|--------------|
| S4Q7 | How do find your everyday the road? : (1. Not good 2. Fairly good 3. Good) | | 2, 3 → S5Q10 |
| S4Q8 | if not good, quote some of the problems: 1 2 3 | | |
| S4Q9 | How do you find the distribution of traffic signs? (1. not good 2. fairly good 3. good) | __ | 2, 3 → S5Q10 |
| S4Q10 | if not good, quote some of the problems 1 2 3 | | |
| S4Q11 | How many emergency care services do you know on your everyday way ? | __ | |
| S4Q12 | Can you propose for the last three months upper and downward seasons of the activity ? (please specify the way of the traffic)(1.up, 2.down) 1. from..... to 2. from..... to 3. from..... to | | |
| S4Q13 | what is, as an average, the number of rides you make a day during upper seasons | | |
| S4Q14 | what is, as an average, the number of rides you make per day during downward seasons | | |
| S4Q15 | how is the density of the traffic during upper seasons: (1. Almost unmanageable 2. Manageable 3. Not a problem) | | |
| S4Q16 | which fares are practiced during upper seasons?:.....fcfa | | |
| S4Q17 | which fares are practiced during downwards seasons ? :fcfa | | |
| S4Q18 | which luggage do you usually carry on : your way going __ and your way back __ ? (fill the blank by one of the following answers 1.travelers suitcases and bags, 2. manufactured goods, 3. crops, 4 animals (livestock), 5.flammable products) | | |

Survey on the economic and safety situation of the street transportation

Sample 3: Rides' follow-up

The information collected during this survey are strictly confidential according to the law N° 91/023 of December, 16th 1991

0 IDENTIFICATION

| N° | Questions | Codes | Go to |
|-------|---|-------|-------|
| S0Q1 | Questionnaire number | __ | |
| S0Q2 | Date : ____ | | |
| S0Q3 | Surveyor's name: | __ | |
| S0Q4 | Supervisor's name | __ | |
| S0Q5 | Transportation enterprise: | __ | |
| S0Q6 | Embarkation point | | |
| S0Q7 | Way : From _____ to _____ | | |
| S0Q8 | Car registration N°:..... | | |
| S0Q9 | Departure time: ____ | | |
| S0Q10 | Arrival time: ____ | | |
| S0Q11 | Is the car is going on due time: __ (1. Yes, 2. No) | | |

1 PORTRAIT OF THE DRIVER BEFORE THE DEPARTURE

| | | | |
|------|--|----|--|
| S1Q1 | How can you describe the build of the Driver? (1. Big; 2.Normal; 3. Small) | __ | |
| S1Q2 | Is the Driver having any physical handicap? (1. Yes; 2. No) | __ | |
| S1Q3 | Is the driver participating to the boarding of passengers and to the loading of luggage? (1. Yes; 2. No) | __ | |
| S1Q4 | Does he seem to have drunk alcohol? (1. Yes; 2. No) | __ | |
| S1Q5 | What is his mood? (1. Calm; 2. Excited; 3. Angry) | __ | |
| S1Q6 | How is he behaving with passengers? (1. Gently 2. Distantly; 3. Aggressively) | __ | |

2 DESCRIPTION OF THE CAR AT THE DEPARTURE POINT AND EXTRAS

| | | | |
|------|---|----|--|
| S2Q1 | Are luggage secured before the departure? (Hold well closed and covered)? (1. Yes; 2. No) | __ | |
| S2Q2 | How do you appreciate the weight of luggage loaded? (1.below the capacities; 2. Normal; 3. Beyond capacities) | __ | |
| S2Q3 | How many extra-passengers are embarked at the station? (write down zero if none) | __ | |
| S2Q4 | How many extra-passengers are embarked on the way? (write down zero if none) | __ | |
| S2Q5 | How are extra-passengers seating in the car? (1. On an extra bench designed for that purpose; 2. By tightening other people in the car; 3. By tightening the driver himself; 4. Somewhere on the car's floor) | __ | |

3 FOLLOW-UP DURING THE RIDE (COUNT DOWN EVENTS)

| | Attitudes and reactions of Drivers How many times during the ride, does the driver : | Number | |
|-------|---|--------|--|
| S3Q1 | Has stepped on or over lines on the street? | □□□ | |
| S3Q2 | Has drove on the left side? | □□□ | |
| S3Q3 | Has drove beyond the speed limits (120 km/h)? | □□□ | |
| S3Q4 | Has followed too closely the car before him? | □□□ | |
| S3Q5 | Has lost control of the car? | □□□ | |
| S3Q6 | Has taken a curve on high speed? | □□□ | |
| S3Q7 | Has unduly crossed over a car? | □□□ | |
| S3Q8 | Has crossed over a car at a curve or a pick? | □□□ | |
| S3Q9 | Has denied the priority to another street user? | □□□ | |
| S3Q10 | Has done non-signalized steerages? | □□□ | |
| S3Q11 | Has unwisely faced the appearance of an animal on the way? | □□□ | |
| S3Q12 | Has unwisely faced the appearance of a person on the way? | □□□ | |
| S3Q13 | Was talking with passengers about money or luggage, etc, during the ride? | □□□ | |
| S3Q14 | Seemed more often distracted during the driving? | □□□ | |
| S3Q15 | Seemed tired during the ride? | □□□ | |
| S3Q16 | Has drank alcohol during the ride or a stop? | □□□ | |
| S3Q17 | Has stopped the car abusively? | □□□ | |
| S3Q18 | Is the Driver has his seat belt fasten? (1. yes, since the departure and the entire ride 2. Yes only at near police station 3. No, never) | □ | |
| S3Q19 | | | |

4 REACTIONS OF PASSENGERS

| | How many times does passengers complained about : | | |
|------|---|-----|--|
| S4Q1 | Speed excess? | □□□ | |
| S4Q2 | Hazardous steerages? | □□□ | |
| S4Q3 | Uneasiness due to excess number in the car? | □□□ | |