EXPLORING THE POTENTIAL OF ITS IN IMPROVING TRAFFIC SITUATION IN METRO MANILA

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Abstract: ITS with particular focus on electronic road pricing, has the potential to improve mobility in terms of travel opportunities and benefits, as well as considerable improvement in transportation system operation. Recognizing the fact that the traffic situation in Metro Manila has significantly deteriorated in terms of worsening congestion, high accident rates, undisciplined road users' behavior and worsening environment, will ITS find its place in improving the situation? Initially, road users will lack the information with which to effectively evaluate these new technologies for adoption. It is important to properly anticipate the consequences of ITS before any benefit-cost analysis of these investments be carried out. The appropriate data for evaluating operational field test should be collected as one of the primary basis in the decision to engage in any ITS undertaking. What factors or conditions are favorable and unfavorable to the implementation of ITS in Metro Manila? Is the Philippines, being a developing country, ready to adopt systems such as electronic road pricing (ERP) or electronic toll collection (ETC)?

1. INTRODUCTION

Growing congestion on urban transportation facilities especially in Metro Manila has focused national efforts on congestion management. A number of factors such as continuous socio-economic growth over the successive years, rising population therefore increasing road transport demand. In contrast, the development of road network has not kept pace with road fleet. Construction of new roads in many cases may not be acceptable any more not only because of limited space and negative environmental impacts, but also because it generates increased driving, which eventually brings the situation back to congestion, but at an even greater scale.

This paper presents a thorough review of road pricing as a means of restricting car use in highly built up areas such as CBDs (central business districts). This is followed by an analysis of the criteria for the evaluation of candidate CBDs for electronic road pricing based on the change in travel characteristic (mode shift, departure, route choice, location and frequency of travel) expected.

2. RATIONALE

The presence of motor vehicle on a road slows other traffic. These delays may not be very serious when the traffic volume is well below the maximum capacity of the roadway. However, as volumes approach capacity, each additional motorist can significantly reduce average traffic speeds. If motorists are charged fees approximating the costs of the delays

they cause, then they will be encouraged to use the road only when and where the benefits they gain equal or exceed their own average costs plus congestion costs they impose on others.

One advantage of road pricing is that it encourages motorists to find ways to reduce congestion rather than promoting only a few. A significant change in modal switch to high occupancy vehicles (HOVs) such as mass transit and carpooling is expected. Aside from switching modes, pricing also promotes change in travel departure, route choice, location, and frequency of travel.

3. REVIEW OF OTHER COUNTRIES' EXPERIENCE

Singapore's Area Licensing Scheme(ALS) is the first large scale road pricing scheme. The idea of charging a fee to motorists entering a restricted zone in the Central Area of the city during peak hours was first implemented in 1975. And since then, it had encouraging results with regards to the reductions in vehicle use in the restrain zone. Developments with the procurement of an electronic charging scheme will provide Singapore with further opportunities for improving the problems caused by the simple zone and fee system currently in place. Another Asian city seriously considering electronic road pricing is Hongkong. Hongkong's transportation system, like Singapore's, has been affected by restricted geography and rapid economic growth. The Hongkong government conducted an extensive evaluation of a proposal for road pricing called the Electronic Road Pricing(ERP) pilot scheme. Under the proposal, state-of-the-art electronic equipment was to be used to identify and charge automobiles that crossed a series of cordons surrounding the dense commercial districts. The planning studies revealed that ERP would generate large travel time savings, and field tests demonstrated that the electronic equipment. Nevertheless, popular opposition eventually forced the government to abandon the scheme.

European countries such as Norway, France, Netherlands, and the United Kingdom has had ample experiences with the use of road pricing as a tool for congestion management. The Oslo Toll Ring of Norway in particular uses electronic toll stations register the traffic on access roads to the city center. Each toll station has lanes for normal payment and lanes for electronic payment by subscribers for which toll is automatically charged once they pass through the gantries. Benefits in terms of traffic regulation and environmental advantages have been achieved in addition to the financial returns of the project. Furthermore, the project has stimulated other modes of transport. Living in the city has been made more attractive with fewer negative impacts of traffic, and along with this the control of atmospheric pollution and eventual improvements in air quality. Other Scandanavian cities namely Bergen, Trondheim, and Stockholm in Sweden has had similar experience with the Oslo Toll Ring.

4. URBAN POLICY AND TRANSPORT AIMS FOR ROAD PRICING

a. **Conserve energy resources.** Seek optimum ratios of public/private vehicle-kilometer via changes in modal split, from cars to transit. Reduction of the vehicle-kilometers traveled by eliminating discretionary trips (unnecessary trips).

b. **Improve economic efficiency.** Reduce the need for new capital investments in transport. Generates funds for financing and/or maintenance of transit and other alternatives to the private car. Increase in the capacity and utilization of the existing transport investments.

c. **Improve urban environment.** Minimize motor vehicle emissions. Protection of sensitive areas from heavy vehicular traffic by entry charges. Reduce the consumption of land for urban transport facilities.

d. **Improve personal mobility.** Reduction of peak period congestion in the restrained area in particular. Minimize travel time.

e. **Improve public safety.** Minimize accident risks to urban trip makers.

5. THE STUDY AREA

Data samples taken for this study are those in residence within the study area as defined by Metro Manila Transport Integration Study (MMUTIS). Metro Manila was subdivided into 265 planning zones while there are 51 zones in the adjoining areas each corresponding to one municipality/city (Figure 1). Initially, three (3) candidate CBDs were considered for preliminary road pricing evaluation. They are Binondo CBD, Makati CBD and Ortigas CBD. Two candidates were eliminated namely Binondo and Ortigas on the basis that they do not meet geographical and traffic characteristics requirements.

The Makati CBD is represented by five (5) MMUTIS planning zones (Figure 2). There are at least three major roads that boarder the study area. EDSA from the southeast, South Superhighway from the southwest and Buendia Avenue covering the north side.

5.1 Existing Land Use

Of the 3.03 square kilometers total land area of the CBD, residential area comprised the biggest land utilization with a total of 0.967 square kilometers or 31.9%. The percentage commercial/business land use was estimated from Table 1 in proportion to the total area of zones within the CBD to be 28.7 (0.87 sq. km.) ranking second. Coming a close third is the area share for roads with 0.715 square kilometer.

Table 1. Land Use Share of Study Area

Land Use Class	Area (sq.m.)	% Use
Residential	967970	31.9%
Commercial/Business	870066	28.7%
Industrial	207207	6.8%
Government/Quasi-Public	65732	2.2%
Educational/Cultural	95798	3.2%
Transport/Service Facility	110529	3.6%
Road	715371	23.6%

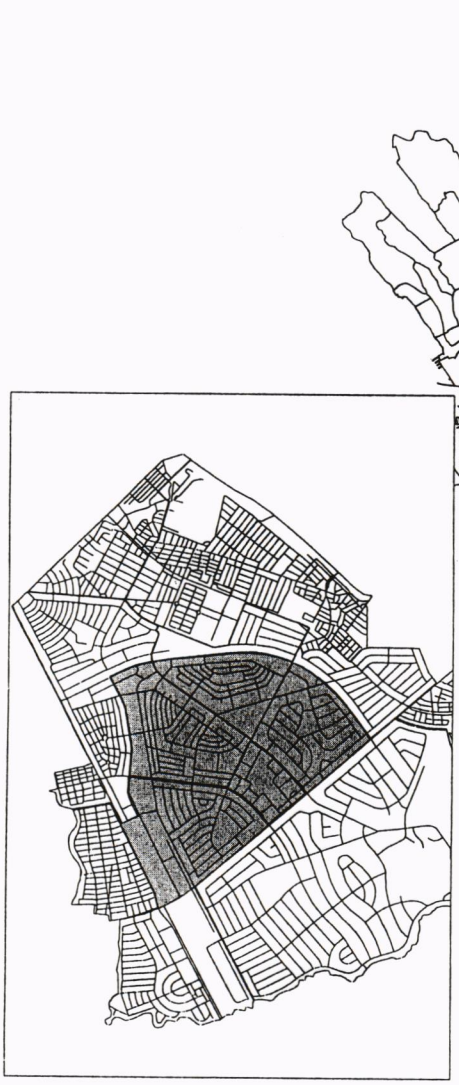

Figure 2. Makati CBD

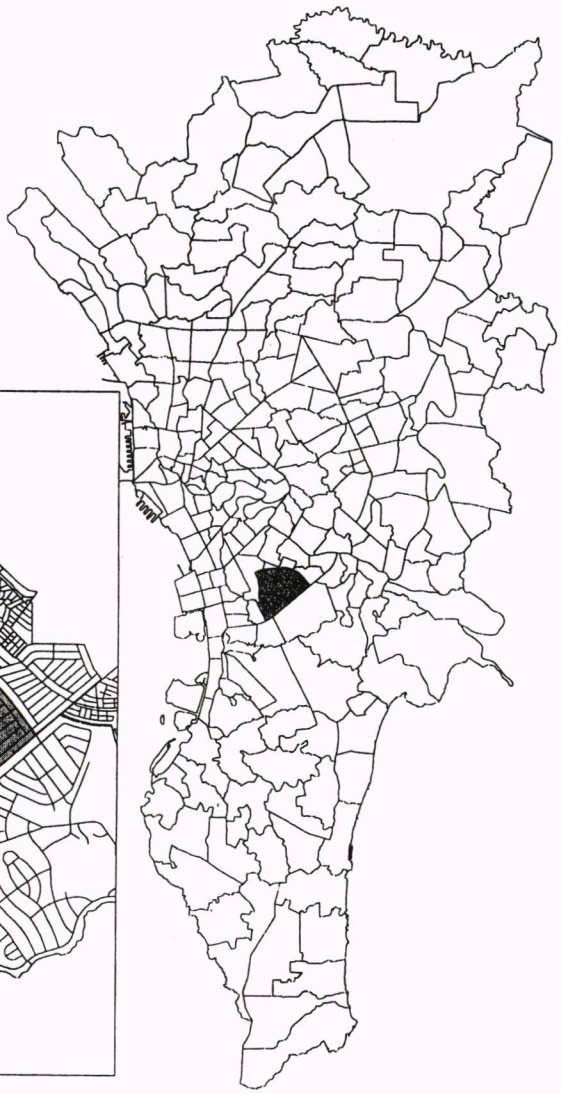

Figure 1. MMUTIS Zoning Map

5.2 Transportation and Traffic Characteristics

Buses and jeepneys provide the means of conveyance along most major corridors in the study area. The bulk of the traffic flow in the study area consists of private-owned cars. From the night-time vehicle count of 356,000, the volume increases to 1,407,438 during daytime. The major purpose of travel is primarily work-related which comprises 63% of all daily trips towards the CBD area (Figure 3). The standard working hours (8 am to 5pm) which is being adopted by most workplaces results in clogging of major roads leading to the CBD during peaks hours. Thus, the trip purpose that contributes to congestion during morning peak (7am to 9am) is To Work trips.

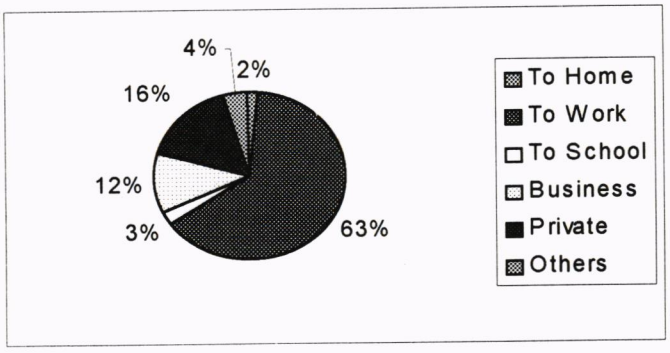

Figure 3. Trip Purpose towards CBD

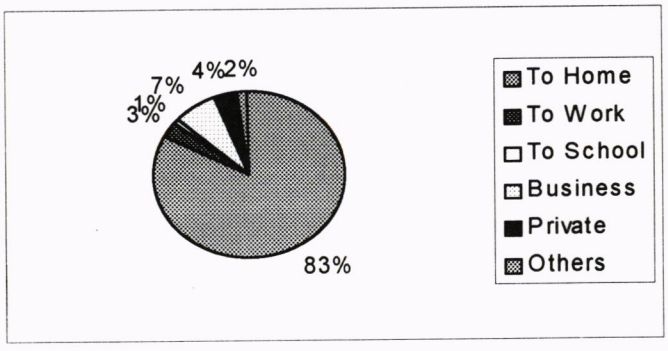

Figure 4. Trip Purpose from CBD

Based on the MMUTIS Origin-Destination (O-D) matrix for trip purpose, the proportion of To Home trip generated by the CBD is 83%. This occurs during evening peak (4pm to 7pm, TEC, 1996 Volume Data).

5.3 Current Traffic Management Measures

Existing vehicle restraints which discourages the use of private car are currently in place. The Unified Vehicle Volume Reduction Program (UVVRP) sometimes referred to as Color Coding System bans all motor vehicles from all Metro Manila roads from 7 a.m. to 7 p.m. one day per week (weekdays) based on the last digit of their license plate number. Exempted from the scheme are government vehicles, emergency vehicles, school buses, and vehicles carrying perishable goods and also public transportation (buses, jeepneys and taxis). Saturdays and Sundays also have a separate scheme similar to that of the Color Coding although restriction is limited to the morning and afternoon peak. Large trucks are controlled by truck route and truck ban.

6. THE PRE – ERP SCENARIO

Metro Manila has grown fast and large to megacity proportion with a population of 9.5 million as of 1995, from 1.6 million in 1948, 2.5 million in 1960, 5.9 million in 1980 and 7.9 million in 1990. Actual metropolitan area has expanded beyond the municipal boundaries and includes most of the municipalities in the adjoining areas of Cavite, Laguna, Rizal and Bulacan. The whole MMUTIS study area now has a total of 14.4 million population and has been growing at a significant rate of 4.2% per year. With the expected growth in population, is the increase in the number of trips within the metropolis.

At present, car use frequency of car owning household members is very strong regardless of trip purpose and destination. This is presumably due to lack of public transportation which is, except for the LRT 1, faster and more comfortable than car. Ongoing projects such as the Light Rail Transit 3 (along EDSA) would give motorists an alternative mode of transport which has a comparable level of service with the car.

7. POTENTIAL FOR ERP

7.1 Mode Shift

Although 80% of all trips (excluding walk trips) in at present uses public transportation, bulk of the vehicle volume leaving the Makati CBD is car (Figure 6). Figure 6 was computed from Figure 5 by dividing the corresponding average occupancy (MMUTIS, 1996) of the modes. For bus, average occupancy for inside Metro Manila is 50, 15 for jeepney and 2.2 for taxi. Conservative estimates were assumed for car, HOV taxi and others occupancy (1.5, 9.5 and 2.6, respectively). For vehicles entering the CBD, the same trend is observed. There is not much change in the mode choice of To Work trips (which constitute most of the traffic entering) from the To Home trips (traffic leaving).

Road pricing makes the use of private vehicles less attractive by imposing additional cost to the car user who will single handedly shoulder it.

7.2 Change in Travel Time (Departure/Arrival)

The present distribution of trip with time (arrival and departure) is one of the cause of congestion in Metro Manila. Arrival of trips in the study area is concentrated in a short period from 7:30 am to 9:30 am (Figure 7). A better spread of the time of arrival to a longer interval will contribute to the alleviation of traffic congestion. Road pricing does just that by charging a fee to any vehicle entering the restraint zone depending on the level of congestion in the area.

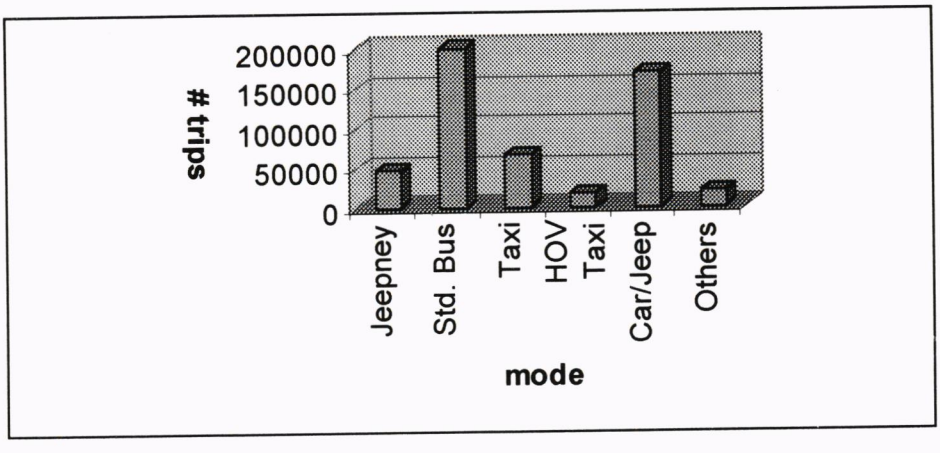

Figure 5. Trip Distribution by Mode

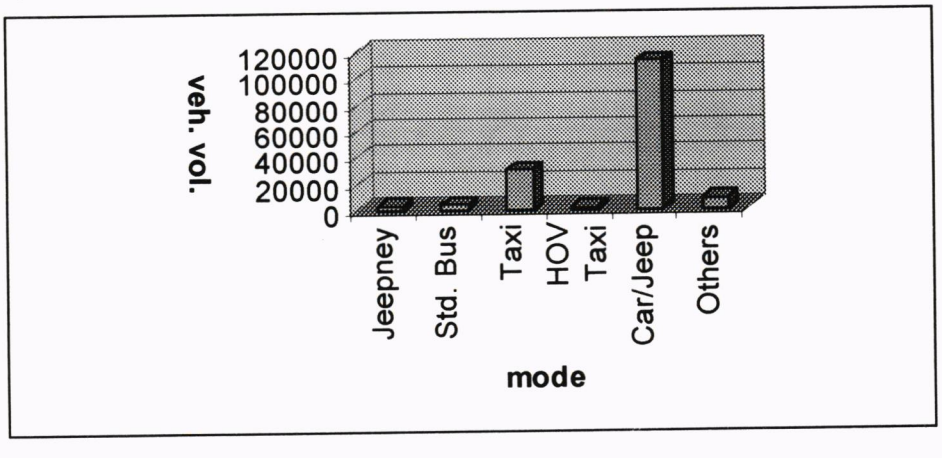

Figure 6. Vehicle Volume by Mode

Investigating the distribution of trips with time leaving the CBD, it was found out (from Figure 4) that the dominant purpose is To Home. But unlike time distribution of arrival, departure time is more wide spread (Figure 8).

7.3 Frequency of Travel

Investigating trip pattern from the CBD (departure), it was found out that road users make from 1 to 7 trip destinations within and outside the CBD area. An increase in the cost of travel within the area will greatly affect the frequency of travel. Unnecessary trip purposes are eliminated

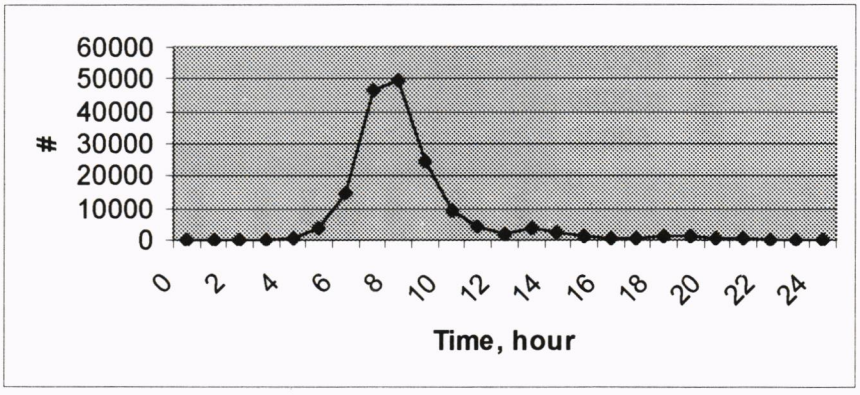

Figure 7. Time Distribution of Arrival

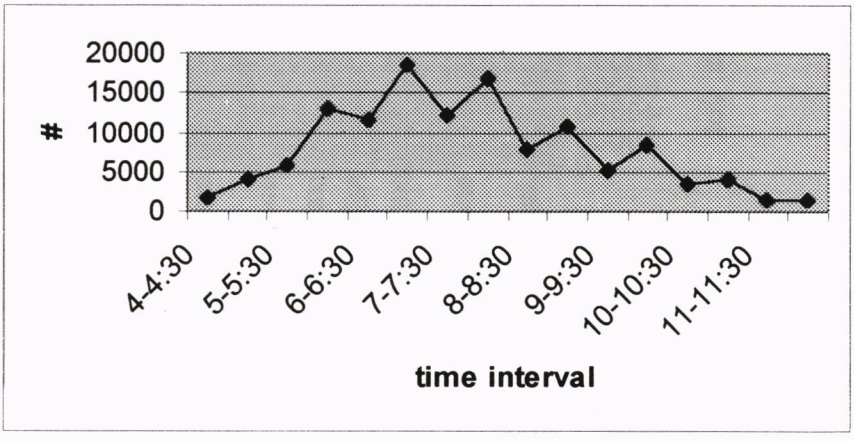

Figure 8. Time Distribution of Departure

7.4 User Perception

In terms of concerns, a questionnaire was used relating congestion and how concerned the respondents are/were about certain road pricing issues. The questionnaire was constructed in the Likert scale method wherein 1 represents for Strongly Disagree and 5 Strongly Agree. There are 219 respondents comprising of 124 noncar users and 95 car users. Both car and noncar users perceived that the level of traffic congestion in the CBD area is very serious thus, the high mean generated from the scale (Figure 9). Also, respondents agreed about the notion that those who cause the problem (congestion) should be the ones to be charged for the discomfort they contribute. Although there is a great disparity in the volume of vehicles entering the study area, car being the highest, bus was the main contributor to congestion. As expected, car users blamed primarily public transport as the culprit (Figures 10 and 11). The mean is just slightly above the median value mainly because most of the respondents answered Undecided. Comments were noted as relative to the amount of charging to be collected.

	Car Users	Noncar Users
The current levels of traffic congestion in the Makati CBD is very serious	4.41	4.54
Charge a certain fee to those who cause the congestion	3.71	3.54
It is fair for a taxpayer from the province to pay for an infrastructure that he/she does not use	2.65	1.80

Figure 9. User's Response on Certain Road Pricing Issues

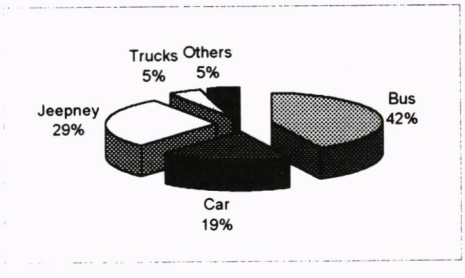

Figure 10. User-Perception on Traffic Congestion Contributor/s (Car Users)

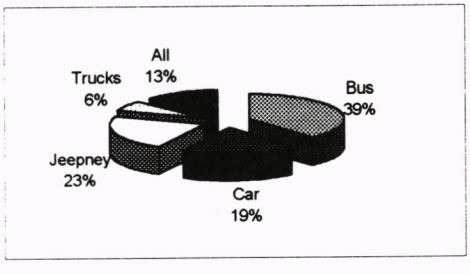

Figure 11. User-Perception on Traffic Congestion Contributor/s (Noncar Users)

8. CONCLUSIONS

This paper presents a simple overview that identifies and discusses possible impacts associated with road pricing in Metro Manila particularly the Makati CBD. At this point in time, relatively few quantitative estimates can be made regarding its actual impacts with regards to economic efficiency, environmental and safety. The evaluation of macroeconomic impacts relating to implementation of road pricing schemes is a complex issue that requires detailed information of the travel pattern of concern roads user.

Road pricing should not be viewed as the only means in attaining an efficient transportation system. Other transportation system management measures are also needed to compliment road pricing. Alongside road pricing is the need to develop the public transport system as the alternative means of transport to car. And this alternative should be competitive (level of service, fare, etc.) enough so as for road users to clearly see the benefits they get.

The potential for road pricing in solving the problems of congestion in the streets of Metro Manila is very promising. It not only discourages unnecessary use of the car but also has the potential in the generation of funds for other infrastructure projects.

9. RECOMMENDATIONS

Political opposition to such charges by the public is unavoidable. Lack of understanding of this complex scheme, which even in highly developed countries is still found. The argument that paying for what was previously free is unacceptable. A solution to this is a detailed and thorough investigation of all possible implications of this scheme. Extensive data gathering is needed in order to model the actual outcome of the scheme. A comprehensive stated preference survey specifically design for road pricing is enough to identify possible scenarios where it is applicable. And also a concrete framework wherein to evaluate the data gathered. Simulation using computers is also needed in order to foresee the implications of the scenarios identified. And lastly, a massive information campaign should be carried out regarding the scheme so that the users can react correctly to the changes the scheme brings.

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