

The Price of Winter – Roads, Snow and Road Pricing. The Feasibility of a Winter Snow Charging System in Sapporo

Hokkaido University
Hokkaido University
Hokkaido University
Hokkaido University

○ Arshad Baharudin
Professor Seiichi Kagaya
Research Associate Ken-etsu Uchida
Associate Professor Toru Hagiwara

1. Introduction

In Sapporo, annual snowfall often exceeds 5 meters. Citizens have identified snow removal as their main civic concern for the past several decades, and their overall satisfaction with it is low despite the large financial resources the city spends on it (Some 2% of the city's total annual budget). Budget constraints prevent the city from increasing expenditures on snow removal. Consequently, more efficient and effective removal is required if the city is to satisfy the demands of its citizens

However, without financial relief, efficiency can only go so far. Both local tax revenue and central government funding are expected to shrink, despite growing demands for various social services and overall growth in the city's fiscal obligations. In the three decades from 1965, the population more than doubled from 820,000 to 1,750,000. Vehicle ownership jumped from 830,000 vehicles in 1995 to 940,000 vehicles in 2000 and continues to grow. It is in the last statement where we believe salvation can be found to combat the city's snow woes.

In recent years, researchers have become increasingly interested in the effects of introducing different road pricing measures on transportation networks. However, examples of implemented urban road pricing projects are relatively rare. Examples of road pricing as a means of collecting revenue for winter road maintenance is non-existent. Nevertheless, it is to investigate this possibility that drives us to write this paper.

It is our observation however, that promoting road pricing is doomed to failure other than in the most unusual of cases (London, Singapore). Sapporo, we believe is an unusual – and necessary case. It is our hypothesis that a road pricing system can be one of the options implemented in Sapporo, for winter road maintenance.

2. Finding a system for Sapporo

Road user charging developments can be categorized in several distinct stages according to a number of different principles (Fig 1)

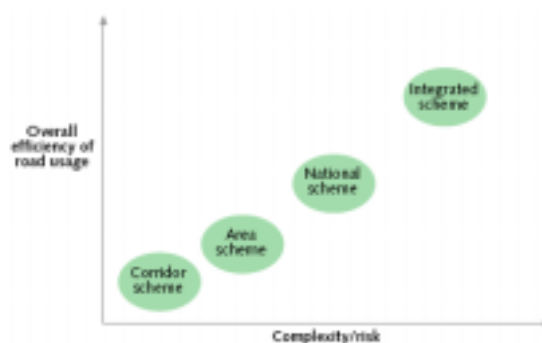


Figure 1 – Road user charging complexities

- *The corridor approach.* A charged stretch of road that provides a means of transport from one location to another, such as a traditional toll road. The main objective: revenue generation to pay for the road. The highways connecting Sapporo to the rest of Japan are partially financed in this manner.

- *The area scheme.* Charging for driving in an area with a closely integrated road system. The objectives are to improve traffic conditions and to generate revenues. The main focus of the analysis is here.

The question then is how is an area specified and chosen for charging? There are many reasons, but for the purposes of the study, research is focused on the existing mass transit systems in situ and how they can be harmonized with a new area charging project.

The Underground system in London runs on a zonal charging system, as displayed in Figure 2. It is clear that the current congestion charging area and its western extension were designed to correspond with the area designated as Zone 1 within London Underground. The idea is of course to create a pricing synergy between the underground and surface systems.



Figure 2 - London Underground Zones

Following this line of reasoning, a similar application can be made for a hypothetical winter road charging system for Sapporo, referring to Odori Station as the central point, from where zones can be demarcated as per the current subway fees.

地下鉄のみ利用の場合 (円)

区分\区画	1区	2区	3区	4区	5区	6区
大人	200	240	280	310	340	360
こども	100	120	140	160	170	180

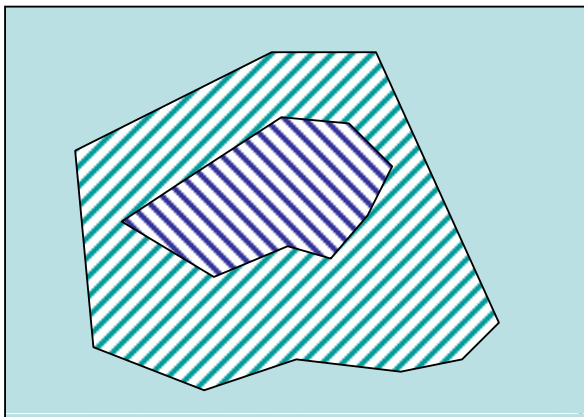


Figure 3- Subway Zone Delineations

Thus, a zonal map akin to that of London can be constructed, with each area within a 'zone' a possible cordon. This will encompass the city of Sapporo, providing a basis for the proposed city's winter road pricing system.

The major stumbling block is of course acceptability to citizens as well as cost analysis. Will it be voted down, and will it make money? The former will be analyzed by survey, and a random representative population of certain parts of the city will be queried as to the desirability of the proposed system in its various possible scenarios. Management costs of the revenue collection system is important to take into account as well.



Figure 4 - City Inbound Cordon area

3. Pre-survey Testing

Participants - 43 students, researchers, teachers and salaried workers living mainly in the Kita-ku area. There are a significant number however that commute from other parts of the city as well as from the suburbs

Table 1 – Pretest survey variables

Type	Variables	Valuation
Personal and Demographics	Age	Classify
	Sex	1,0
	Income	Classify
	Location	1,0
Attitudinal Data (Public Policy)	Environmental Awareness	AHP
	Economic Awareness	AHP
	Equity	AHP
	Lifestyle	AHP
	Electoral Attitude	1,0
Behavioural Data (Travel Patterns)	Car Usage	Classify
	Public Transport Usage	Classify
	Travel Pattern	Classify
	Seasonal Behavioural Changes	1,0
Valuation Data	Willingness to Pay	Classify

The results of the pre-survey are being analyzed for application into the main survey and will be reported at a future date.

4. Survey and Analysis

From here, the variables for the survey proper can be redefined and an idea of the requirements of the surveyed residents can be ascertained. It has been suggested that a concrete benefit such as a 'residential driveway snow clearance' be offered. With the data and models derived from the survey the positioning and feasibility of the snow charging system can then be clarified.