Hindawi
Journal of Advanced Transportation
Volume 2020, Article ID 4242964, 11 pages
https://doi.org/10.1155/2020/4242964

WILEY | Hindawi

Review Article

Influencing Factors in Congestion Pricing Acceptability: A Literature Review

Aya Selmoune, Qixiu Cheng, Lumeng Wang, and Zhiyuan Liu

Jiangsu Key Laboratory of Urban ITS, Jiangsu Province Collaborative Innovation, Center of Modern Urban Traffic Technologies, School of Transportation, Southeast University, Nanjing, China

Correspondence should be addressed to Qixiu Cheng; qixiu.cheng@seu.edu.cn

Received 29 September 2019; Accepted 26 December 2019; Published 13 January 2020

Academic Editor: Yuchuan Du

Roads congestion pricing has been considered as an effective solution following the successful implementation of such programs by many cities such as Singapore, Stockholm, and London. In multiple cases, congestion pricing projects have not been implemented, and multitudinous industrialized countries' governments are struggling to find an effective and satisfactory way of introducing congestion pricing schemes that will not be affected by the public's negative opinion and resistance. The lack of political and public acceptability can, therefore, be blamed for the nonimplementation of many congestion pricing projects in many cities around the world. This paper reviews eight cases where congestion pricing schemes were implemented or rejected, as well as the major influencing factors that enable congestion pricing introduction and acceptability by road users, discusses public and political acceptance of urban road pricing, and provides a valuable guideline for policy and decision-makers.

1. Introduction

Across the world, traffic congestion had been a significant issue in most urban areas. These congestions lead to delays in the movement of both goods and passengers. The effects of such traffic delays are not limited to increased vehicles pollutions due to emissions, gas waste, and increased road usage costs among other challenges. Instead of these drawbacks, economic productivity, as well as the land use, is in limbo. In some of the largest cities across the world, a rush hour may last more than an hour, and thus commuters have to be stuck in traffic that is hardly flowing. The current demand for roads is more than the available capacity, and the future might be even worse if the prevailing conditions persist. For instance, in the United States, wasted fuel costs during traffic snarl up in 2018 were estimated to $87 billion [1]. To deal with this menace, agencies in the transport sector have been devising new alternatives on handling congestion. The old traditional measures, that is, building new roads and infrastructures, over the years have continuously been ineffective because they do not relate the associated full fuel cost on a clogged road with that travel. Other than that, road pricing is advantageous, since it acts as revenues generator and at the same time leads to an efficient road capacity usage. The collected charges in most international road pricing projects have been channelled in enforcement and operating costs, improve alternative transit routes, and finance road infrastructures. Also, the revenues have enhanced transportation for road users that may otherwise be seriously compromised due to traffic congestion [2].

To address roads congestion problem, two main options are considered to either construct more roads or maximize utilization of the existing ones. In the recent past, several analysts and policymakers have been focusing their attention on addressing the challenge of congestion in urban roads. Congestion pricing has been viewed as the most appropriate solution to ensure maximum utilization of existing roads. However, there are very few cases where such project has been fully implemented past planning stage, despite the several types of research acknowledging that congestion pricing is an economically sound tool that can be used to manage road traffic congestion effectively [3].

Introduction of congestion pricing has been discussed and debated frequently, but public acceptability has been the

main obstacle to its implementation [4]. Ideally, there are two main challenges of introducing congestion pricing scheme; these are the political and public acceptability, other than the administrative and technical issues as many may perceive. With minimal or lack of a strong political and public support, such projects have proven to be very difficult to implement in many democratic countries [5]. For the case of Edinburgh, where the project was approved, a public referendum was conducted in February 2005, after which the public accepted the introduction of congestion pricing in the city [6]. In recent years, many countries and regions studied the political and public acceptability of introducing the congestion pricing policy locally [7–16].

In many fast-developing countries, the urban areas' transport system is faced with traffic congestion. Due to such problems, some options need to be put in place to curb these menaces of congestion. In most cases, the solution considered entails some initiatives, with upcoming small cities utilizing the congestion pricing methods as explained in this study. The public transportation system, walking, cycling (bicycles), and congestion pricing as well as other additional incentives can encourage residents instead of using private vehicles [17].

In this paper, we review eight cases where congestion pricing schemes were implemented or rejected, as well as the arguments for congestion pricing in those various cities, the importance of taking into account parking pricing alongside road pricing, and the effect of trying to implement or implementing congestion pricing in multiple cities as well as outcomes of implementation.

Further, this research material is aimed at examining various factors that influence congestion pricing accessibility in various urban centers. Indeed, most studies in the field of congestion pricing only focused on four major influencing factors of congestion pricing [18, 19]. Therefore, there is still a need for a discussion on other factors that may help increase public acceptance of road pricing. This paper reviews four most cited influencing factors in the literature, namely, equity, complexity, privacy, and uncertainty, as well as other poorly known but not less influential factors of public acceptance, that is, variable pricing system, impacts on traffic, administrative issues, high installation costs, public attitudes, use of project champion, use of mass transit, the impacts on the multimodal flow, and political acceptance.

This paper also proposes practical frameworks that can be used in modeling road pricing impacts in attempts to reduce congestion on roads. In this study, several studies were reviewed in studies that have been undertaken describing several factors that influence congestion pricing, while at the same time figuring out the influence and relationship that exists in various forms of congestion pricing.

2. Review of Congestion Pricing Practices

In this section, we review eight cases, London, Stockholm, Singapore, Edinburgh, New York, Norway, Hong Kong, and Milan, where congestion pricing schemes were proposed and successfully implemented or rejected; hence both types of cases will give a clearer image of the factors influencing congestion pricing acceptability.

2.1. London. After three decades of preliminary feasibility studies, London congestion charging scheme was finally implemented in 2003. Indeed, since 1965, numerous studies have reported that a congestion pricing scheme in central London could ameliorate the traffic and the environment and raise revenues. After the implementation, the results showed a diminution of potentially chargeable vehicles and considerable expansion in exempt vehicles and 40% to 70% fewer accidents within the charging zone, and even though implementing the scheme is costly, the economic benefits are positive [20]. In 2005/2006, the scheme generated net revenues of approximately £122 million, from which £100 million have been spent on improving bus services [20]. Santos [21] added that the bus reliability has raised not just as a result of reduced congestion in the charging area but also as a result of increased investment on public transport. Along these lines, the London case confirms that the improvement of public transport is a crucial factor in improving public acceptance, as highlighted by Small [22], mentioning that congestion pricing yields to an effective cycle in shifting car user to public transport, creating a remarkable decrease in cars numbers and allowing buses to travel faster. In a different study, Santos reported that, by the time the system was introduced, public support attained 49%, which increased to 70% after the scheme was introduced [23]. The finding is consistent with those findings of recent studies, which reported that, in Stockholm, people have become more positive as they have experienced congestion pricing effects (e.g., Börjesson et al. [24]).

2.2. Stockholm. A long and acute debate preceded the Stockholm trial starting in the 1970s [25]. A few years later, three major political parties made an agreement, the so-called "Dennis package," a political agreement to build new roads and improve public transport; it aimed to mitigate congestion and control roads traffic in Stockholm [26]. However, the package collapsed in 1997 due to political disagreement and an absence of public support [27]. In 2006, a trial finally took place in Stockholm, aiming to reduce traffic, increase accessibility, and improve environment quality. The trial was succeeded by a referendum among the citizens in September of the same year [28], where 51.3% of Stockholm inhabitants voted in favor of the congestion charge scheme; the parliament then decided for the permanent implementation of the congestion charge system [25]. In a study that evaluated the effects of Stockholm congestion charging system six months after, Hugosson and Jonas [29] reported that not only did the accessibility has improved and travel times fell as a consequence of traffic declining but the Stockholm trial led to decreased emissions of particles and carbon dioxide by 14% in the inner city, and even if it is delicate to convince the vehicle users about the environmental benefits, both of the public and political acceptance increased after the trial [30]. In a similar study, 5 years later, Börjesson et al. [24] indicated that the most critical factors affecting public acceptability are benefits that may turn out to be more considerable than anticipated; they concluded: "accept the unavoidable, when the charges are

fixed, resistance may decrease due to psychological effect known as cognitive dissonance." Another study of Schade [31] showed that once users are convinced that the scheme is already decided, they tend to cope with the unavoidable event.

2.3. Singapore. Due to its very small and limited territory, in addition to the excessive demands on land resources and the fast-growing number of vehicles, Singapore, an island city-state by definition, had no other potential solutions but to introduce the Area Licensing Scheme in the early 1970s, delineating a restricted zone in the central business district. Phang [32], then, described it as the "world's first comprehensive road pricing scheme." With the exemption for the vehicles with 4 passengers and more, besides a rise in parking fees by 100% and the implementation of a park-and-ride scheme (15,000 parking spaces), the scheme's success was almost instantaneous as the traffic fell by 43% during peak hours [32]. For more efficiency, the Area Licensing Scheme was replaced by the Electronic Road Pricing (ERP) in 1998, more sophisticated and adaptive system; the charges were automatically attributed based on the vehicle type, the location of the gantry, and the time of the day. Santos [33] qualified it as the most efficient system by that time. In August 2013, the government increased the tolls for 7 gantries, which led to an increase in bus ridership by 12% to 20% during peak hours [34]. Santos [35] also reported that improving public transport is the key to a successful urban congestion pricing scheme and the imperative strategy to gain public support.

2.4. Edinburgh. The scheme was introduced in a referendum in 2005; the proposed charge was £2 during the weekdays for crossing one of both cordons, and the outer cordon would be payable from 7 am to 10 am, while the inner cordon would charge from 7 am to 6.30 pm. The pricing scheme did not propose any discounts for residents and was rejected in the referendum, due to the lack of information, as the plans were not well developed and thus very difficult to "sell" to the public, and consequently the lack of public trust and support [4]. Gaunt et al. [6] reported that the main determinant of voting was car use; indeed, car owners opposed the scheme, while non-car owners approved it. In another study, Rye et al. [36] analyzed the reasons for nonimplementation and concluded that one of the main reasons was the press coverage, which decreased attention about the benefits and merits of the pricing scheme, besides the institutional context of the scheme, the lack of a strong political champion, and insufficient development resources [6].

2.5. New York. In 2007, Mayor Bloomberg announced PlaNYC, which contains more than 120 policies to make the city more sustainable, including a pilot congestion charging program [37]; the proposed plan consisted of the following: a zone charge from Monday to Friday, from 6 am until 6 pm, and $8 a day charge for cars, $4 for driving within the charging zine, $21 for trucks going into the zone, and $5.5 for trucks driving within the charging zone [38]. Based on the public's opinions, several adjustments were made on the plan's fairness and complexity, and the commission passed the plan with a vote of thirteen to two [39]. However, two rounds later, the State Assembly decided not to vote the scheme because of the opposition of the public and the elected officials. Numerous studies investigated the non-implementation of the congestion pricing program in New York; Odioso and Smith [40] compared between surveys carried out in London, Stockholm, and several US cities including New York City, in order to analyze the factors influencing public acceptance of congestion pricing and concluded that respondents who trusted the reported benefits of the scheme and were more informed and familiar with it or used different transportation modes were more likely to show support. US cities should better "sell" the environmental and traffic benefits of the schemes, improve public transport, and have a clear plan of revenue used to increase public acceptance. On the other hand, Gu et al. [18] found that the main reasons for this rejection were a clumsy political handing, a lack of a congestion pricing trial, and an inadequate solution for the equity issue; therefore, the rejection came mainly from the public and the elected officials.

2.6. Norway. Norway has started using tolls as a financial instrument for infrastructures construction for over 80 years [41]. Bergen, Oslo, and Trondheim have many similarities when it comes to road pricing, policy, and decision-making [42]. Toll financing projects were based on political agreement, following a two-step political process: toll financing acceptance and the approval of financing scheme. Table 1 shows the main characteristics of Bergen, Oslo, and Trondheim toll cordons. Few surveys were conducted in those cities 1 year before and 1 year after the opening of the cordons to assess the public attitude; Odeck and Bråthen [42] discussed the results and concluded that, in fact, users become less negative to tolls after the implementation.

Even though the first goal of Norway toll cordons was not congestion pricing, it has taken an active interest in the transport professionals' field such as Odeck and Bråthen [42] and Ieromonachou et al. [43]; on the other hand, the use of automatic vehicle detection and debiting was another influential factor for an efficient congestion pricing scheme [43, 44].

2.7. Hong Kong. In 1983, the government of Hong Kong announced the introduction of the world's first ERPS, that is, Electronic Road Pricing System in order to manage and solve the traffic problems. Hong Kong had unique geographical, political, and economic features to make an excellent place to introduce ERPS [45]. The implementation of a pilot stage of Electronic Road Pricing System then began in July 1983 with 18 toll sites in the central business district using automatic vehicle identification [46] and was completed in March 1985 and reduced traffic by 11%. However, despite all the positive results and the arguments in favor of the ERP, the scheme was shelved. Since then, numerous studies have been carried out to discuss the reasons for such a failure, in particular the lack of political courage as no responsible dared to propose such a scheme [45] and the

Table 1: Main characteristics of Bergen, Oslo, and Trondheim toll cordons.

Characteristics	Bergen	Oslo	Trondheim
Date	January 1986	February 1990	October 1991
Mode of operation	Manual	Semiautomatic	Automatic
Charging period	Monday–Friday 6 am–10 pm	Permanent	Monday–Friday 6 am–5 pm

unsolved equity, exemption, openness, and trust issues [47], the excuses of "traffic condition were not seen to be sufficiently bad" [48] besides the rapid and vigorous expansion of the MRT (Mass Transit Railway) that significantly helped to ease congestion in the area [49], and even the argument about privacy, which was a highly controversial factor in the Hong Kong case [29]: "the fear of a 'big brother' government were foremost in people's minds" [49].

2.8. Milan. In 2008, a cordon pricing scheme named "EcoPass" was introduced in Milan, by which all the vehicles entering the city center from Monday to Friday, 7.30 am to 7.30 pm, have to pay a pollution charge corresponding and proportional to their vehicle's emissions [50, 51]. The scheme aimed to reduce both pollution and congestion; indeed, after 11 months, the traffic decreased by 12.3% and NO_x and CO_2 were reduced by 17% and 14%, respectively, within the area, while public transport users increased by 9.2% [52]. The scheme was then replaced by "Area C" with a flat daily charge of 5 euro, 7.30 am to 7.30 pm and until 6 pm on Thursdays. Utility vehicles have been exempted, and commercial vehicles had a discount of 2 euros [53]. The impacts on traffic were even greater with Area C scheme: 30.1% of traffic reduction, 23.8% less road accidents, 12.5% more public transport users with 11.8% increasing in public transport average speed, and finally a reduction of 18% of PM10 emissions after the first year [54]. To conclude, there was a major change in Milan scheme that aimed to reduce pollution at first and then shifted successfully into a congestion charge scheme, and the trial was a key factor at that purpose.

3. Influencing Factors on the Acceptability of Congestion Pricing

Several studies have addressed the issue of the congestion pricing and the public acceptance of the congestion pricing from many aspects; even though a lot of studies provide theoretical aspects, very few provide the practical implementation of congestion pricing and its major driving forces and factors that can influence its willingness attitude. Few studies presented and reviewed only four major influencing factors of congestion pricing, such as [18, 19]. Thus, factors that strongly influence public acceptance are not well understood. Therefore, there is still a need for a discussion on other factors that may help increase public acceptance of road pricing. In order to arrest the above problem, this section presents a review of the four most cited influencing factors in the literature, namely, equity, complexity, privacy, and uncertainty; and the remaining nine poorly known but not less influential factors of public acceptance will be introduced in the next section.

3.1. Major Influencing Factors in Congestion Pricing Acceptability

3.1.1. Personal Privacy. In Hong Kong, for instance, the privacy issue was first noted during the scheme trial that resulted in the proposal rejection in the future referendum [49]. Various groups of executives were concerned about the invasion of users' privacy [47, 55]. During the implementation of congestion pricing in London and ERP introduction in Singapore, the privacy issue was fully addressed [19]. Singapore's ERP smart card does not store private details for both drivers and vehicles. Hence, private information of commuters will not be recorded at various transacting points. To create trust and encourage public acceptance, the transport stakeholders are mandated to secure the privacy of smart card holders. For industrial or research applications usage of smart card data, it is required that personal information be securely kept.

3.1.2. Factor of Fairness. Equity issue manifests when there is a distribution of tolls as well as various sociodemographic groups. Numerous times, people with mobility impairment and low-income drivers were the most affected with severe traveling burden when congestion pricing is introduced, as they have fewer travel choices [56]. This is the case as "the poor" are hampered with extra expanses, hence limiting them from using road infrastructure as compared to their rich counterparts. Also, when a pricing scheme is installed, many concerns about its fairness are raised by citizens living both inside and outside the charging zone. This, therefore, implies that the public has to be aware of the fact that the congestion pricing scheme introduction is a step forward in creating an equitable use of the transport system [57]. Congestion pricing schemes implementation in Stockholm, Milan, and London was sensitive enough to address equity issues. For the case of London, it involved granting full exemption of vehicles used by people living with disabilities and of a £10 fee for vehicle registration on an annual basis for vehicles that are registered to individuals from the congestion charging zone [58]. This is similar to the Milan case as there are exemptions for vehicles that are used by the handicapped and frequent road users discounted [52]. Börjesson et al. [24] argue that the case is slightly different in Stockholm as the scheme is generally progressive, where there are differences in overall monthly earnings between groups; gender dictates the amount one earns as men were

charged more than women, and numbers of the employed are more than those of the unemployed.

On the other hand, there is evidence that the issue of equity was not well addressed in Edinburgh, Hong Kong, and New York City, where the rejection of proposed congestion pricing schemes was experienced. In New York City, based on public opinion, there were multiple adjustments to the original plan's fairness and complexity. Despite all these attempts, the final document was not voted in by the State Assembly due to much opposition. The strongest oppression was from areas that depend more on vehicles and experience the least cases of public transit like Southern Brooklyn and Eastern Queens. Ryley and Gjersoe [59] noted that, for the case of Edinburgh, politicians considered exemption of people with mobility impairments from the charge unfairness, and this contributed largely to the abandonment of the entire project. This was the similar case experienced in Hong Kong; due to political pressures, commercial vehicle owners and taxi drivers were exempted from the charge. This move was likely to increase the burden on other road users who would not have been exempted from the scheme, and thus private car owners felt discriminated against and singled out [47].

Santos [60] argues that the tolling mechanism also has the potential of creating the problem of equity. In Singapore, the ALS allowed an infinite number of passages that raised equity issues from the public. To address this issue, the ERP was introduced as an enhancement. In Edinburgh, New York City, and later on in Milan, a flat toll mechanism was used, while in Stockholm, Hong Kong, and Singapore, a time-of-day toll mechanism was used. The advantage of time-dependent charge helps in identifying equity concerns that were raised by the use of the tolling mechanism. France and Kaniok [61] conducted a study whose findings were that the distance-based congestion pricing with a fixed kilometer charge was averagely the most approved mechanism compared to the other possible alternatives. However, in the United Kingdom, the preferred mechanism was the fixed cordon over the variable one [62].

3.1.3. Increasing of Risk. Uncertainty is among the major reasons that affect the introduction of new policies, and congestion pricing is not an exception. Ingberman [63] argues that the main reason for uncertainty leads to lack of support when introducing congestion pricing schemes as many voters are likely to continue maintaining their status quo when new schemes are being introduced without proper trials. De Borger and Proost [64] identified two types of uncertainties: uncertainty due to revenue allocation and uncertainty due to the efficiency of the proposed scheme.

Jones [5] concurred with this by stating that the uncertainties of proposed congestion pricing schemes are the main reason for their resistance. In Hong Kong, Noordegraaf et al. [19] reported that the government made very little efforts in selling the proposed scheme and this was the main reason why it was rejected. Lack of positive publicity denied the general public a chance to know the associated benefits and impacts after its introduction. The less the information the voters have, the more they are likely to vote against plans of introducing new policies; on the contrary, the more information they have, the higher the probability of voting in new plans is [65].

This implies that uncertainty over a proposed scheme like congestion pricing is likely to have a negative effect on its future development. It is therefore important to provide the general public with enough education and information through trials to ensure the successful implementation of new policies. Revenue allocation is also another issue that has to be spelled out clearly to ensure acceptance of any congestion pricing scheme [66]. Programs like using collected revenues from congestion pricing to improve roads facilities and provide support for other transport modes can increase chances of accepting the introduction of congestion pricing projects.

3.1.4. Difficulty of Implementation. The complexity of proposed schemes can be blamed for a failed implementation of congestion pricing schemes in Great Manchester and Edinburgh, as they were cordon-based and more complicated when compared to other available schemes [67]. Both of these schemes were designed with two cordons, unlike the one in Stockholm that had a design of only one scheme, which was easily understood [68]. A similar situation experienced in Milan was Area C, which is easier to understand than EcoPass (the predecessor of Area C) due to the application of charging rates. In the scheme of Area C, the pricing is fixed, while in EcoPass, it was calculated based on vehicle types, fuel types, and its Euro emissions classes. The process of switching from a complex scheme to a simpler scheme for the ease of calculating returns turned out to be accepted by the public and encouraged further development [67].

The failures experienced in Great Manchester and Edinburgh and the success in Milan and Stockholm imply that it is important to begin with a simple proposal that is well understood to ensure that residents and the public understand it. Singapore's case shows that it is possible to consider changes in the initial congestion pricing scheme and make changes at a later stage. The scheme initially adopted a flat toll of about $1.3 before it was modified and expanded to a more complex scheme ERP, where charging rates vary by the time of the day, vehicle type, and its location. Upgrading the system was not considered as a complex issue, since motorists were already familiar with the basics of the scheme, and the efficiency and equity aspects were improved [32].

To sum up main congestion pricing acceptability factors, as tabulated in Table 2, related literature sources have pointed out that public acceptance towards the vice, congestion pricing, is mainly dictated by four factors: equity, privacy, uncertainty, and complexity.

3.2. Other Factors Influencing Congestion Pricing Acceptability

3.2.1. Variable Pricing System. The idea of congestion charging was introduced in central London with hopes that

Table 2: Explanations and key references of the four main influencing factors of congestion pricing.

Factor	Definition	Literature cited (related)
Factor of fairness	Two elements make up the issue of equity in congestion pricing: the tolling strategies and the distribution of tolls among various sociodemographic groups.	[56, 57, 67, 69–73]
Personal privacy	The core opposition cause of congestion pricing is privacy, since the client's private information recorded may be deemed an invasion of travellers' privacy.	[5, 19, 49, 66, 71, 72, 74, 75]
Increasing of risk	Though the electorates are well versed on matters status quo, they are not certain or well versed with the proposed congestion pricing regarding revenue allocation and effectiveness.	[4–6, 22, 57, 63, 64, 73, 76, 77]
Difficulty of implementation	To settle an efficient and clear hypothetical charging scheme that is conveniently understandable and useful for road's users and the public in general.	[61, 65–68, 75, 77–79]

it would act as a turning point in addressing various challenges encountered when applying the congestion charging policy. Olszewski and Xie [80] note that accurately predicting the behavior of motorists in response to direct charging schemes imposed on them is the main hindrance when evaluating benefits derived from a road pricing scheme. Also, when a pricing scheme involves the use of a flat toll, demand elasticity can be employed in making estimates of traffic impacts. However, this technique becomes ineffective in cases when addressing time-variable pricing for motorists with several options to reschedule trips easily and make them when there is no charge or a lower charge.

3.2.2. Impacts on Traffic. Introduction of congestion pricing exerts several impacts to traffic. In a study conducted by Transport for London, it was established that there were some reductions in vehicles numbers as a response to the establishment of a charging scheme and the average in driven distance had a likelihood of increasing or reducing as per the relative magnitude of the specific change. It was also observed that the average kilometers covered by vehicles being charged decreased. This signified that reduced number of vehicles in the town was not fully compensated for by longer driving distances.

In addition, Litman [71] argued that the quality of public transport is a major factor that can influence how the public react to plans of introducing congestion pricing schemes. For the case of the failed attempt of implementing the scheme in New York City, there were concerns about the quality of the public transport system. In some cases, public transport can easily be related to factors like fairness, problem awareness, and freedom [76].

3.2.3. Administrative Issues. The project of London Congestion Charging was well managed and operated as intended; however, problems were still encountered in the administration of the project, specifically its enforcement process. An unacceptable number of penalty charge numbers (PCNs) were erroneously issued, leading to incorrect processing of appeals and representations.

Another challenge of properly implementing the program of congestion pricing is license plate theft. The PCNs that are given to theft victims were affected in the United Kingdom due to this problem [80]. In addition to this, there are gadgets that are capable of fooling number plate reading cameras, being circulated on the black market; the best example is the liquid crystal display license plate; this gadget is operated by a switch inside the car, sending a signal to the false plate, and can attach a fake number to an existing vehicle's plate, thereby concealing the real license number of the car [81]. However, these challenges have not spread out to rampant levels to affect the functionality and level of enforcement of the London Congestion Program [80].

3.2.4. High Installation Costs. High initial investment capital is required in laying the system for congestion pricing, despite its low operating costs. In most cases, this high cost may deter cities in the Third World from investing in such projects, unless privatization is involved or they are donor funded. There are rapid changes in technology, and this may translate to frequent upgrading or replace the existing structures within a short period, and that may require high costs [82].

The congestion pricing system is expensive and not fully foolproof. The mechanical error can occur on the system, and vehicles erroneously changed, and this requires that emergency teams must be on standby to ensure a quick recovery. For this system to be accepted, the public must therefore know and understand available avenues to be followed when they feel to have erroneously been charged by this system [82].

3.2.5. Public Attitudes. Public attitudes and perceptions have a great influence on the respondent's answer when congestion pricing system has to be introduced. Generally, many of the respondents tend to believe that the introduction of the system has a positive effect on the

environment when vehicle emissions are reduced, hence becoming more supportive of the introduction of these changes. On the other hand, another section of respondents does feel that the introduction of a congestion pricing scheme in their city would negatively affect their mobility by decreasing their trips to the city to undertake their daily chores like shopping and entertainment. Such respondents become less supportive of the project, hence hindering the overall decision of introducing the project [76].

Apart from reducing traffic congestion—the main purpose of introducing congestion pricing—some of the other main benefits realized from such schemes that will increase public acceptance include increased revenue and transit ridership and improved public health and environmental benefits and travel times and transit services due to improved traffic conditions. Our quantitative empirical analysis showed that people are more susceptible to accepting congestion pricing schemes if they feel more concerned about environmental and economic benefits.

3.2.6. Use of Project Champion. These are charismatic individuals whose main activity is spearheading planned projects to ensure their acceptability. They ensure project acceptability by stimulating the process and ultimate acceptance of projects by ensuring the process of introducing the charging system put in place. Existing research findings show that the motivation of all projects that had some kind of a champion figure, whether an individual or a coalition, can be linked to motivating that spread beyond implementation stage of the transport policy. In addition, politicians' support is critical when introducing a tolling system, whether a charismatic champion of the project is in existence or not [82].

Zheng et al. [76] note that even though it is appealing, conducting a successful survey on policymakers on the issue of congestion pricing becomes very sensitive, except for the case of Australia, which was also affected by lack of enough evidence on the issue. It should, however, be noted that policymakers' support is always linked directly to general publics' support, mainly for two reasons. The first reason is that, in democratic countries, voting is done by the general public, and, secondly, acquiring strong public support is the initial step for one to secure support from politicians. This makes politicians sensitive when discussing any transport policy for implementation when they know they lack public backing. Thus, it becomes a challenge when one has to measure and accurately understand the public acceptance of a congestion pricing scheme before its implementation.

Therefore, in many cases, the resistance of the public has always been considered as an inhibitor to the process of introducing congestion pricing schemes, save for the case of Edinburgh, where the project was accepted after an exclusive referendum in February 2005 [4].

3.2.7. Use of Mass Transit. A key element that enables the success of congestion pricing is the use of mass transit, like buses, as in the case of London Congestion Control. In this case, many commuters switched to mass transit after being priced out of driving their cars. This greatly increased the number of passengers and any changes like increment in charges will have very minimal impacts on the number of cars being driven on a particular road and no overall effects on those riding bus.

In the United Kingdom, the London Congestion Control is not the only contributing factor to an increase in mass transit. Restructuring of bus fares in recent years contributed to a real reduction in the average fare that one is charged on a trip. This leads to improved bus service reliability as there is now reduced waiting time: a reduction of 30% on routes in and around the charging zone.

3.2.8. Impacts of Congestion Pricing on the Multimodal Flow. Experiences have shown that the improvement of public transport was a factor of vital importance to any successful congestion pricing scheme. Indeed, congestion pricing plans have raised cars' travel costs, reduced both traffic and travel time, and increased public transport speed and frequency. Hence, road pricing incited a large number of car users to switch to different public transport modes. In London, the major response of car users was to change destinations, reduce trip frequency, change their departure time, park and ride outside the area, or shift to another mode, that is, public transport or bicycle trips that increased by more than 80% across the charging zone. The case was similar to those of Milan and Stockholm, where the majority of users switched to public transit: around 74% switched to public transport in Stockholm or switched route to avoid the cordon, decreased their trip frequencies, and even canceled their travel in some reported cases [28], leading, in all the cases, to a very significant increase of public transport use, bicycles, and carpooling.

3.2.9. Public and Political Acceptance. Political and social acceptance when planning a tolling system is a key function in the practicability of building a road-pricing program [82]. In a study in 2005 about the referendum conducted in Edinburgh, where the road pricing scheme was rejected, Ison and Rye [47] found that 80% of participants felt that urban road pricing is publicly unacceptable. Also, several studies have been undertaken to create the link between social aspects and acceptability of road pricing policies in both the UK and Norway [83]. From these studies, it is evident that the success of a pricing system relies on perceived benefits and the justification that is granted to the overall program in a particular area. It is important to consider the views of the general public and incorporate them as much as possible in the scheme designing phase to ensure the success during future operations of the plan. Therefore, government officials and operators have to value the public acceptability as a must for the success of the project.

Goodwin et al. [84] emphasize the importance of including views of various groups in a congestion pricing scheme early in project designing stage. Furthermore, they elaborated on the significance of considering the interests of different groups rather than basing a decision on the overall state of public opinion. This is because

some empirical literature indicates that the public still lacks the best knowledge of using pricing policies in finding lasting solutions to traffic congestion over other policies.

3.3. Discussion. In many cases, the single most barrier to the implementation of congestion pricing schemes is the lack of public acceptability during implementation [62]. This paper therefore has summarized several factors contributing to the lack of public acceptability when governments want to introduce congestion pricing on particular roads. Reducing traffic congestions and improving available alternatives have abstract possibilities; chances of charging are more tangible of solving this problem.

Before the introduction of any management policy, its masterminds must have a clear set of goals to be achieved, and this also applies to congestion pricing. Whatever the goals that are set, they should be explicit, whether it aims at reducing traffic congestion, generating revenues, improving the air quality, or a combination of these goals. To increase goals acceptability by the public, it is important that they are quantified to some extent, and this can be done in cooperation between traffic experts and policymakers who are conversant with fixing consistent goals to ensure their targets, which is more difficult than most policymakers realize. These objectives should all be pertinent and consistent with the overall objective. It should be noted that choosing ill-formulated goals and targets when planning for a congestion pricing program is likely to cause problems when designing it, at the very least causing confused discussions. This is therefore likely to affect overall project acceptability [30].

It should be noted that, despite these financial and technical challenges, low public acceptance of proposed congestion pricing schemes is the most significant of all. According to Schaller [39], it is quite essential to involve the public in the final shape of a proposed scheme. In New York City, congestion pricing gained support from the general public and some elected officials because of top-level leadership coupled with an education campaign and strong assistance from the civic community.

Congestion pricing trial projects are important to ensure that the general public has access to all important information concerning the project to be implemented to ensure that it gains the needed support. This shows that lack of publicized information concerning congestion pricing effectiveness is the major contributor to their rejection, and relevant stakeholders should be included in trials in their planning stage.

Other experiences, like Stockholm [24] and Norway [42, 85], also showed that the public opinion has significantly changed, despite the primary negative public attitude, seemingly because users realized that the revenues are being spent on transport projects from which they would benefit, such as improving public transport services and building park-and-ride facilities, as well as other new infrastructure. Therefore, people became more positive as they have experienced the real effects of congestion pricing schemes on the traffic; however, it is slightly more difficult to convince the public of the environmental effects [29].

In addition, the complexity of the congestion pricing scheme has a huge impact on the success of a pricing program. In fact, the failure experiences in Great Manchester and Edinburgh and the success in Stockholm and Milan highlighted the importance of beginning with a simple proposed scheme that is well understood for the residents and the public. Indeed, the more the complex a project seems, the lower the chances of public acceptance are, and people are more likely to support a project that clearly addresses the issues of uncertainty. Some of the main factors to be considered include ensuring that the design of the scheme chosen should be simple and avoid any unnecessary complexity that can be involved. Complex schemes tend to be misunderstood by motorists and residents who might tend to believe that these changes are likely to be larger and be applied on a frequent basis. Moreover, there are chances of a strong wave of opposition from narrow economic self-interest motorists who work against the scheme to weaken it. Lastly, there should be a balance in consultation against awareness raising as these two factors act antagonistically. That is, a simple scheme with a specific program that is easily understood by everyone easily leads to its acceptance when proposed.

4. Limitations of Congestion Pricing

Just like any other innovation, the system is free from various inherent limitations that, when considered, the idea of the installation may be halted. Among them is when a business that attracted its customers to cross the cordon boundaries starts incurring losses due to the implementation of this project, they may decide to relocate their business to areas outside the cordon. The new business may also be located outside the cordon boundaries in a better and alternative environment that is easily accessible by public transport so as not to pay extra road charges.

In many cases, congestion pricing charges tend to work against car owners with low income as these charges are regressive. This tends to discourage many individuals from supporting the implementation of projects aimed at introducing congestion pricing system. To address these issues, plans should be in a place that ensures compensation of vehicle owners with low income directly, mostly by channeling some funds to public transport systems in place.

In order to control the traffic and ensure strict enforcement of road laws and regulations, a system of regular and strict law enforcement by traffic police officers is required. This resulted from long queues and waiting experienced on expressway shoulders before motorists can enter a gantry. In these situations, by-pass roads will experience heavy congestions translating into long operational hours on the road and thus discouraging plans of installing the system. To address this, heavily used roads should be covered comprehensively by the congestion pricing system [86].

Besides lost business of firms in the charging area, where people would decrease their trips for shopping or other

advertisement activities, other limitations were cited, such as equity problems, where road pricing is regressive and may take a higher percentage of the income in tax from the poor. As for the London case, other illegal activities appeared after the scheme introduction, such as using false plate numbers or trying to avoid taxes by creating false minicab companies.

5. Recommendations

Hensher and Li [67] proposed a three-step approach for promoting acceptance of congestion pricing. These include considering aspects of privacy, complexity, and equity through vigorous public education in the attempt of raising the confidence of the public. In doing this, the government should ensure the personal information security of all involved stakeholders. To achieve these, a forecasting model can be developed in predicting changes likely to occur due to project implementation and results shared with the public. Trials are the best tools in knowledge provision when addressing the uncertainty issue of when to implement congestion pricing as opinions and attitudes of the public can be considered when making the final plan.

Secondly, before any referendum is conducted, a trial for congestion pricing should be conducted. Its results are important in guiding the public in making a better understanding of the project to be implemented. Trials are important in addressing issues like uncertainty concerning the effectiveness of congestion pricing.

Thirdly, the government has the mandate of maintaining the practice that was showcased at the designing and trial phases to build the social trust of the public. To eliminate public apprehension over revenue allocation, it is important that the policymakers keep their promise, for example, the use of collected revenues in improving the public transport system.

It is therefore important to note that a well-designed congestion pricing plan has the capability of demonstrating its effectiveness by achieving public support and any government should be guided by these two provincials; some of the generated revenues from the congestion pricing scheme are used to improve the public transport system, and any information about the actual benefits of congestion pricing is made public.

6. Conclusions

This paper reviews eight cases where congestion pricing schemes were implemented or rejected, as well as the major and minor influencing factors that affect the overall acceptability of congestion pricing by road users. The public and political acceptance of urban road pricing is discussed and a valuable guideline for policymakers and decision-makers to increase the acceptability of congestion pricing is provided. A hint of challenges to be expected and considered when planning to introduce a congestion pricing program as a means to address traffic congestion are also provided. This paper attempts to bridge the existing gap between congestion pricing theory and application by increasing the public and political acceptability.

Conflicts of Interest

The authors declare no conflicts of interest in the research.

Acknowledgments

This study is supported by the National Key Research and Development Program of China (no. 2018YFB1600900) and the Scientific Research Foundation of Graduate School of Southeast University (no. YBPY1885).

References

[1] CATO Institute, *New Billboards Blame the Onerous Jones Act for Snarling Traffic along Eastern Seaboard*, Cato Institute, Washington, DC, USA, 2019, https://www.cato.org/news-releases/2019/4/2/new-billboards-blame-onerous-jones-act-snarling-traffic-along-eastern.

[2] A. Barry, *Reducing Congestion and Funding Transportation Using Road Pricing in Europe and Singapore*, The National Academies of Sciences, Engineering, and Medicine, Washington, DC, USA, 2010.

[3] N. Paulley, "Recent studies on key issues in road pricing," *Transport Policy*, vol. 9, no. 3, pp. 175–177, 2002.

[4] S. Allen, M. Gaunt, and T. Rye, "An investigation into the reasons for the rejection of congestion charging by the citizens of Edinburgh," *European Transport*, vol. 32, pp. 95–113, 2006.

[5] P. Jones, *Acceptability of Road User Charging: Meeting the Challenge*, Emerald Group Publishing Limited, Bingley, UK, 2003.

[6] M. Gaunt, T. Rye, and S. Allen, "Public acceptability of road user charging: the case of Edinburgh and the 2005 referendum," *Transport Reviews*, vol. 27, no. 1, pp. 85–102, 2007.

[7] D. Glavic, M. Mladenovic, T. Luttinen, S. Cicevic, and A. Trifunovic, "Road to price: user perspectives on road pricing in transition country," *Transportation Research Part A: Policy and Practice*, vol. 105, pp. 79–94, 2017.

[8] S. C. Jagers, S. Matti, and A. Nilsson, "How exposure to policy tools transforms the mechanisms behind public acceptability and acceptance-the case of the Gothenburg congestion tax," *International Journal of Sustainable Transportation*, vol. 11, no. 2, pp. 109–119, 2017.

[9] M. Percoco, "Cost distribution and the acceptability of road pricing: evidence from Milan's referendum," *Journal of Transport, Economics and Policy*, vol. 51, no. 1, pp. 34–46, 2017.

[10] Z. Liu, N. Shiwakoti, and Y. Bie, "Measuring the public acceptance of urban congestion-pricing: a survey in Melbourne (Australia)," *Transport*, vol. 33, no. 4, pp. 902–912, 2018.

[11] A. Nikitas, E. Avineri, and G. Parkhurst, "Understanding the public acceptability of road pricing and the roles of older age, social norms, pro-social values and trust for urban policy-making: the case of Bristol," *Cities*, vol. 79, pp. 78–91, 2018.

[12] S. Sugiarto, T. Miwa, and T. Morikawa, "Recursive bivariate response models of the ex-ante intentions to link perceived acceptability among charge and refund options for alternative road pricing schemes," *Transportation Letters*, vol. 10, no. 1, pp. 52–63, 2018.

[13] E. Cipriani, L. Mannini, B. Montemarani, M. Nigro, and M. Petrelli, "Congestion pricing policies: design and

assessment for the city of Rome, Italy," *Transport Policy*, vol. 80, pp. 127–135, 2019.

[14] S. Hess and M. Börjesson, "Understanding attitudes towards congestion pricing: a latent variable investigation with data from four cities," *Transportation Letters*, vol. 11, no. 2, pp. 63–77, 2019.

[15] X. Li, J. W. Shaw, D. Liu, and Y. Yuan, "Acceptability of Beijing congestion charging from a business perspective," *Transportation*, vol. 46, no. 3, pp. 753–776, 2019.

[16] Y. Wang, Y. Wang, L. Xie, and H. Zhou, "Impact of perceived uncertainty on public acceptability of congestion charging: an empirical study in China," *Sustainability*, vol. 11, no. 1, p. 129, 2019.

[17] A. Downs, *Still Stuck in Traffic: Coping with Peak-Hour Traffic Congestion*, Brookings Institution Press, Washington, DC, USA, 2004.

[18] Z. Gu, Z. Liu, Q. Cheng, and M. Saberi, "Congestion pricing practices and public acceptance: a review of evidence," *Case Studies on Transport Policy*, vol. 6, no. 1, pp. 94–101, 2018.

[19] D. V. Noordegraaf, J. A. Annema, and B. van Wee, "Policy implementation lessons from six road pricing cases," *Transportation Research Part A: Policy and Practice*, vol. 59, pp. 172–191, 2014.

[20] G. Santos, "Pricing in road transport: a multi-disciplinary perspective," in *Chapter 14: The London Experience*, E. Verhoef, M. Bliemer, L. Steg, and Bert van Wee, Eds., Edward Elgar Publishing, pp. 273–292, Cheltenham, UK, 2009.

[21] G. Santos and G. Fraser, "Road pricing: lessons from London," *Economic Policy*, vol. 21, no. 46, pp. 264–310, 2006.

[22] K. A. Small, "Using the revenues from congestion pricing," *Transportation*, vol. 19, no. 4, pp. 359–381, 1992.

[23] G. Santos, "Urban road pricing in the U.K.," *Research in Transportation Economics*, vol. 9, no. 4, pp. 251–282, 2004.

[24] M. Börjesson, J. Eliasson, M. B. Hugosson, and K. Brundell-Freij, "The Stockholm congestion charges-5 years on: effects, acceptability and lessons learnt," *Transport Policy*, vol. 20, pp. 1–12, 2012.

[25] G. Schuitema, L. Steg, and S. Forward, "Explaining differences in acceptability before and acceptance after the implementation of a congestion charge in Stockholm," *Transportation Research Part A: Policy and Practice*, vol. 44, no. 2, pp. 99–109, 2010.

[26] P. Pedersen, "Moral hazard in traffic games," *Journal of Transport Economics and Policy (JTEP)*, vol. 37, no. 1, pp. 47–68, 2003.

[27] I. Ahlstrand, "The rise and fall of the heroic transport plan for Stockholm," *Transport Policy*, vol. 5, no. 4, pp. 205–211, 1998.

[28] J. Eliasson and L.-G. Mattsson, "Equity effects of congestion pricing," *Transportation Research Part A: Policy and Practice*, vol. 40, no. 7, pp. 602–620, 2006.

[29] M. B. Hugosson and E. Jonas, "The Stockholm congestion charging–system–an overview of the effects after six months," Association for European Transport, 2006, http://web.mit.edu/11.951/oldstuff/albacete/Other_Documents/Europe%20Transport%20Conference/traffic_engineering_an/the_stockholm_cong1720.pdf.

[30] J. Eliasson and L. Jonsson, "The unexpected "yes": explanatory factors behind the positive attitudes to congestion charges in Stockholm," *Transport Policy*, vol. 18, no. 4, pp. 636–647, 2011.

[31] J. Schade and M. Baum, "Reactance or acceptance? reactions towards the introduction of road pricing," *Transportation Research Part A: Policy and Practice*, vol. 41, no. 1, pp. 41–48, 2007.

[32] S.-Y. Phang and R. Toh, "Road congestion pricing in Singapore: 1975 to 2003," *Journal of Transportation*, vol. 43, no. 2, pp. 16–25, 2004.

[33] G. Santos, "Urban congestion charging," *Transportation Economics*, vol. 38, pp. 345–369, 2004.

[34] S. Agarwal and K. M. Koo, "Impact of electronic road pricing (ERP) changes on transport modal choice," *Regional Science and Urban Economics*, vol. 60, pp. 1–11, 2016.

[35] G. Santos, "Urban congestion charging: a comparison between London and Singapore," *Transport Reviews*, vol. 25, no. 5, pp. 511–534, 2005.

[36] T. Rye, M. Gaunt, and S. Ison, "Edinburgh's congestion charging plans: an analysis of reasons for non-implementation," *Transportation Planning and Technology*, vol. 31, no. 6, pp. 641–661, 2008.

[37] R. C. Larson and K. Sasanuma, "Urban vehicle congestion pricing: a review," *Journal of Industrial and Systems Engineering*, vol. 3, no. 4, pp. 227–242, 2010.

[38] J. Peters and C. Gordon, "Results not guaranteed: a tale of road pricing in New York and London," *SSRN Electronic Journal*, pp. 1–16, 2009.

[39] B. Schaller, "New York City's congestion pricing experience and implications for road pricing acceptance in the United States," *Transport Policy*, vol. 17, no. 4, pp. 266–273, 2010.

[40] M. S. Odioso and M. C. Smith, "Perceptions of congestion charging: lessons for U.S. Cities from London and Stockholm," in *Proceedings of the 2008 IEEE Systems and Information Engineering Design Symposium (SIEDS)*, pp. 221–226, Washington, DC, USA, 2008.

[41] K. Waersted, "Urban tolling in Norway–practical experiences, social and environmental impacts and plans for future systems," in *Proceedings of the PIARC Seminar on Road Pricing with Emphasis on Financing, Regulation and Equity*, Cancun, Mexico, 2005, https://www.piarc.org/ressources/documents/281,2.1-Waersted-0405C11.pdf.

[42] J. Odeck and S. Bråthen, "Toll financing in Norway: the success, the failures and perspectives for the future," *Transport Policy*, vol. 9, no. 3, pp. 253–260, 2002.

[43] P. Ieromonachou, S. Potter, and J. P. Warren, "Norway's urban toll rings: evolving towards congestion charging?," *Transport Policy*, vol. 13, no. 5, pp. 367–378, 2006.

[44] P. Ieromonachou, S. Potter, and J. P. Warren, "A strategic Niche analysis of urban road pricing in the UK and Norway," *European Journal of Transport and Infrastructure Research*, vol. 7, no. 1, pp. 15–38, 2007.

[45] J. A. L. Dawson and I. Catling, "Electronic road pricing in Hong Kong," *Transportation Research Part A: General*, vol. 20, no. 2, pp. 129–134, 1986.

[46] P. K. W. Fong, "Issues of the electronic road pricing system in Hong Kong," *Transportation Planning and Technology*, vol. 10, no. 1, pp. 29–41, 1985.

[47] S. Ison and T. Rye, "Implementing road user charging: the lessons learnt from Hong Kong, Cambridge and central London," *Transport Reviews*, vol. 25, no. 4, pp. 451–465, 2005.

[48] R. L. Pretty, "Road pricing: a solution for Hong Kong?," *Transportation Research Part A: General*, vol. 22, no. 5, pp. 319–327, 1988.

[49] T. D. Hau, "Electronic road pricing: developments in Hong Kong 1983–1989," *American Association for the Advancement of Science*, vol. 17, no. 4, pp. 145–148, 1990.

[50] M. Percoco, "Is road pricing effective in abating pollution? evidence from Milan," *Transportation Research Part D: Transport and Environment*, vol. 25, pp. 112–118, 2013.

[51] M. Percoco, "The effect of road pricing on traffic composition: evidence from a natural experiment in Milan, Italy," *Transport Policy*, vol. 31, pp. 55–60, 2014.
[52] L. Rotaris, R. Danielis, E. Marcucci, and J. Massiani, "The urban road pricing scheme to curb pollution in Milan, Italy: description, impacts and preliminary cost-benefit analysis assessment," *Transportation Research Part A: Policy and Practice*, vol. 44, no. 5, pp. 359–375, 2010.
[53] M. Gibson and M. Carnovale, "The effects of road pricing on driver behavior and air pollution," *Journal of Urban Economics*, vol. 89, pp. 62–73, 2015.
[54] E. Croci, "Urban road pricing: a comparative study on the experiences of London, Stockholm and Milan," *Transportation Research Procedia*, vol. 14, pp. 253–262, 2016.
[55] S. F. Borins, "Electronic road pricing: an idea whose time may never come," *Transportation Research Part A: General*, vol. 22, no. 1, pp. 37–44, 1988.
[56] A. Weinstein and G.-C. Sciara, "Unraveling equity in HOT lane planning," *Journal of Planning Education and Research*, vol. 26, no. 2, pp. 174–184, 2006.
[57] W. Robert and J. Poole, "Introducing congestion pricing on a new toll road," *Transportation*, pp. 383–396, 1992.
[58] G. Santos and G. Fraser, "Road pricing: lessons from London," *Economic Policy*, vol. 22, no. 46, pp. 263–310, 2006.
[59] T. Ryley and N. Gjersoe, "Newspaper response to the Edinburgh congestion charging proposals," *Transport Policy*, vol. 13, no. 1, pp. 66–73, 2006.
[60] G. Santos and B. Shaffer, "Preliminary results of the London congestion charging scheme," *Public Works Management & Policy*, vol. 9, no. 2, pp. 164–181, 2004.
[61] A. Francke and D. Kaniok, "Responses to differentiated road pricing schemes," *Transportation Research Part A: Policy and Practice*, vol. 48, pp. 25–30, 2013.
[62] A. S. Jaensirisak, M. Wardman, A. D. May, S. Journal, N. May, and S. Jaensirisak, "Explaining variations in public acceptability of road pricing schemes explaining variations in public acceptability of road pricing schemes," *Journal of Transport Economics and Policy*, vol. 39, no. 2, pp. 127–153, 2005.
[63] D. E. Ingberman, "Running against the status quo: institutions for direct democracy referenda and allocations over time," *Public Choice*, vol. 46, no. 1, pp. 19–43, 1985.
[64] B. De Borger and S. Proost, "A political economy model of road pricing," *Journal of Urban Economics*, vol. 71, no. 1, pp. 79–92, 2012.
[65] T. Christin, S. Hug, and P. Sciarini, "Interests and information in referendum voting: an analysis of Swiss voters," *European Journal of Political Research*, vol. 41, no. 6, pp. 759–776, 2002.
[66] A. D. May, "Road pricing: an international perspective," *Transportation*, vol. 19, no. 4, pp. 313–333, 1992.
[67] D. A. Hensher and Z. Li, "Referendum voting in road pricing reform: a review of the evidence," *Transport Policy*, vol. 25, pp. 186–197, 2013.
[68] J. Eliasson, "Lessons from the Stockholm congestion charging trial," *Transport Policy*, vol. 15, no. 6, pp. 395–404, 2008.
[69] Z. Liu, S. Wang, and Q. Meng, "Optimal joint distance and time toll for cordon-based congestion pricing," *Transportation Research Part B: Methodological*, vol. 69, pp. 81–97, 2014.
[70] Z. Y. Liu, T. S. Wang, X. B. Qu, and Y. D. Yan, "Urban congestion pricing: practices and future development," *Applied Mechanics and Materials*, vol. 505-506, pp. 787–793, 2014.
[71] T. A. Litman, *Comprehensive Transport Planning Framework-Best Practices for Evaluating All Options and Impacts*, Victoria Transport Policy Institute, Victoria, BC, Canada, 2012.
[72] D. Banister, "Critical pragmatism and congestion charging in London," *International Social Science Journal*, vol. 55, no. 176, pp. 249–264, 2003.
[73] G. Giuliano, "An assessment of the political acceptability of congestion pricing," *Transportation*, vol. 19, no. 4, pp. 335–358, 1992.
[74] J. Odeck and A. Kjerkreit, "Evidence on users' attitudes towards road user charges-a cross-sectional survey of six Norwegian toll schemes," *Transport Policy*, vol. 17, no. 6, pp. 349–358, 2010.
[75] P. Decorla-souza and A. R. Kane, "Peak period tolls: precepts and prospects," *Transportation*, vol. 19, no. 4, pp. 293–311, 1992.
[76] Z. Zheng, Z. Liu, C. Liu, and N. Shiwakoti, "Understanding public response to a congestion charge: a random-effects ordered logit approach," *Transportation Research Part A: Policy and Practice*, vol. 70, pp. 117–134, 2014.
[77] M. Berrini, "AREA C in Milan: From Pollution Charge to Congestion Charge (Italy)," The Urban Mobility Observatory, Eltis, Pune, Maharashtra, 2015, https://www.eltis.org/discover/case-studies/area-c-milan-pollution-charge-congestion-charge-italy.
[78] P. Bonsall, J. Beale, N. Paulley, and A. Pedler, "The differing perspectives of road users and service providers," *Transport Policy*, vol. 12, no. 4, pp. 334–344, 2005.
[79] P. Olszewski and L. Xie, "Modelling the effects of road pricing on traffic in Singapore," *Transportation Research Part A: Policy and Practice*, vol. 39, no. 7–9, pp. 755–772, 2005.
[80] G. Santos, H. Behrendt, L. Maconi, T. Shirvani, and A. Teytelboym, "Part I: externalities and economic policies in road transport," *Research in Transportation Economics*, vol. 28, no. 1, pp. 2–45, 2010.
[81] D. M. Newbery and G. Santos, "Road taxes, road user charges and earmarking," *Fiscal Studies*, vol. 20, no. 2, pp. 103–132, 1999.
[82] P. Ieromonachou, S. Potter, and M. Enoch, "Adapting strategic Niche management for evaluating radical transport policies-the case of the durham road access charging scheme," *International Journal of Transport Management*, vol. 2, no. 2, pp. 75–87, 2004.
[83] F. Rajé, "The impact of transport on social exclusion processes with specific emphasis on road user charging," *Transport Policy*, vol. 10, no. 4, pp. 321–338, 2003.
[84] P. B. Goodwin, S. Hallett, F. Kenny, and G. Stokes, "Transport: the New Realism. Report to Rees Jeffreys Road Fund," *TSU Working Paper*, no. REf 624, 1991, https://www.tsu.ox.ac.uk/pubs/1062-goodwin-hallett-kenny-stokes.pdf.
[85] T. Pettinger, "Pros and cons of a congestion charge," 2016, https://www.economicshelp.org/blog/143/transport/how-effective-is-a-congestion-charge/.
[86] F. Tuan Seik, "An advanced demand management instrument in urban transport," *Cities*, vol. 17, no. 1, pp. 33–45, 2002.