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Effects of Parking Measures in the Center of Leeuwarden

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ABSTRACT

In the center of Leeuwarden, a town with approximately 85,000 inhabitants in the northern part of The Netherlands, new parking regulations were introduced that caused radical changes in parking policies. A before-and-after study has been carried out to get information about the effects of the new parking policy. The effects can be divided into the effects on the parking system (primary level), the effects in relation to the transport system (secondary level), and the effects on the spatial and economic system (tertiary level). The situation before the introduction of the parking measures is compared with the situation a year after their introduction. The results of the before-and-after study are discussed in detail.

Parking in the town centers in The Netherlands is a matter of constant concern. Various categories of motorists require parking space in the town center, but people who work there often occupy much of the parking space. Consequently, the number of parking places remaining for residents, tradespeople, and shoppers and visitors to businesses are believed to be insufficient. Ease of parking for people visiting town centers thus leaves much to be desired.

A large number of municipalities have therefore started regulating the use of parking space by residents, persons working in the city centers, and visitors. The principal measures used are those that restrict parking duration or that owe their effect to the operation of a price mechanism.

It is important to understand the effects of these measures in the urban centers. Do they serve their purpose? Are there any unexpected side effects? What effect do they have on the parking behavior of people working in and visiting the center?

The Project Bureau for Integrated Transport Studies had the opportunity to answer some questions of this nature, in consultation with the Leeuwarden municipal authorities. In November 1979 parking measures were introduced in the Leeuwarden city center that altered the parking situation drastically. Sev-

eral surveys were carried out to determine the effects of these measures.

The results of the parking surveys are reported. The parking situation before the introduction of the measures is reviewed. This is followed by a description of the measures and the parking surveys, and also a discussion of the new situation. Finally, a number of conclusions are drawn.

PARKING SITUATION BEFORE INTRODUCTION OF MEASURES

Leeuwarden has about 85,000 inhabitants. The town center comprises the inner core, surrounded by canals and linked by eight bridges to the rest of the town and the station area. The center has about 2,800 inhabitants and a working population of more than 11,500 (1980 figures). It covers an area of about 900 x 1000 m. Figure 1 shows the exact boundaries.

The parking situation in the second half of the 1970s was considered unacceptable in several respects. In absolute terms, there was a shortage of parking space. Moreover, people working in the center were taking up parking areas intended for visitors and shoppers. The latter group tend to pay their calls in the second part of the morning, or in the afternoon, from 2:00 p.m. onwards. The working population, however, arrives earlier, both in the morning and in the afternoon, than the majority of visitors. The consequence is that visitors have to walk considerable distances or else park in places not intended for that purpose. The residents and tradespeople in the town center were also having problems. It was often difficult for them to find a parking place when they returned to their homes or business premises because any places reasonably close to their destination were taken by people working in or visiting the center.

PARKING MEASURES

The main objective of the parking plan (1) drawn up by the local authorities is to reallocate the number of parking places in a way that is attuned to the various categories, each with their own requirements



FIGURE 1 Leeuwarden town center.

as to the length of their stay. The reallocation is based on the following principles.

1. The residents of the town center and other interested parties should have parking facilities at their disposal close by.
2. Visitors to the town center should be able to park fairly close to their destination, especially if they only wish to park for a short time. The longer the parking lasts, the further the walking distance may be.
3. Long-term parking, particularly for those working in the center, should be provided on the periphery of the town center, in appropriate car parks.

The new system is intended to put a stop to the situation whereby the working population was able to take over the attractive free parking places at a short or medium distance from the shopping center. The old situation forced visitors to the town center to use the legal parking places at greater walking distance (just within the center or outside of it) or to park illegally. This in turn could have important consequences for visits to the town center, and consequently its long-term functioning.

The effect produced by the application of basic principles of the parking plan was to allow longer maximum parking time for parkers who have to walk the farthest to the core of the shopping center. Parking rates are also lower at parking places farther from the center. At the periphery of the center there are car parks where parking is allowed for a maximum of 1 day.

The series of parking measures introduced in Leeuwarden center in November 1979 include

1. An interested-parties arrangement;
2. A drastic increase in parking rates for places that were paid for in the old situation;
3. A drastic increase of paid parking; in the

new situation, legal free parking in the center no longer exists;

4. Reduction of permitted parking time; and
5. A new underground car park with 625 places.

The interested-parties arrangement is an important element in the range of parking measures introduced. According to the by-law on parking and parking moneys, in which this arrangement is included, the burgomaster and alderman may issue a parking permit or season ticket to

1. The owner or licensee of a motor vehicle who lives in an area where interested-party parking places are located, and
2. The owner or licensee of a motor vehicle who has a business or exercises a profession in an area where interested-party parking places are located, and can prove that it is necessary, in the interests of this business or profession, to park the motor vehicle in such a parking place.

The permit or season ticket authorizes its holder to park in only one particular part of a street or one car park. Permits are only issued for streets reserved for residents and service traffic. In the past season tickets were supplied for car parks only. Since November 1980 a season ticket can also be obtained for a place at a parking meter. In 1980 the monthly rate for a parking permit or season ticket was Fl. 15.

Formerly, payment was required for about 1,200 of the 3,250 public parking places in the town center. Rates were doubled for 0.5- and 4-hr meters, and tripled for the 1-hr meters.

The data in Table 1 give the number of public parking places available in the old situation and now that the measures have been introduced. The number of parking places with payment increased from 1,200 to nearly 3,500. The 2,050 free places in the old situation have been converted into paid places.

TABLE 1 Public Parking Places in Town Center

Type of Parking Place	Hourly Rate (Fl.)		No. of Places ^a	
	1978	1980	1978	1980
Limited parking				
0.5-hr meter	1	2	90	80
1 hr	0.50	1.50	150	310
0.5-1.5 hr (parking-disc zone)	-	-	330	-
2 hr	-	1	-	800
4 hr	0.50	1	970	290
Total			1,540	1,480
Public parking				
Ticket machine	-	1 ^b	-	1,380
Underground car park	-	1.25	-	630
Free parking	-	-	1,720	-
Total			3,260	3,490

^a Rounded figures.

^b Per day.

The number of 4-hr meters has been cut considerably; some of the original places with unlimited parking have been changed to parking for a limited time. Parking in the underground car park, which is near the shopping center, is unlimited, although the car park is closed at night.

In addition to the measures regulating parking, a great many measures have also been taken relating to traffic circulation. One-way traffic has been introduced for most of the main streets in the center. Moreover, some streets are accessible to residents and service traffic only.

PARKING SURVEY

At the beginning of 1978 a plan was completed for Leeuwarden that contained measures regulating short-term parking (1). The compilers reached the conclusion that not enough was known about parking actions, in regard to the reason for and the duration of parking. Subsequently, the municipal authorities commissioned DHV Raadgevend Ingenieursbureau B.V. to carry out a parking study and shopper survey in the autumn of 1978 (2).

The new parking measures were introduced in November 1979. The desirability of examining their effects had already been noted. This became all the more pressing when the consequences of the measures became apparent: there was a substantial drop in parking in the center and the underground car park was almost empty. In 1980 the municipal authorities held a similar parking study of their own that, on the whole, ties up with the 1978 study (3).

In the autumn of 1981, a year after the second study, another limited follow-up study took place. At the request of the Project Bureau for Integrated Transport Studies, DHV analyzed the data obtained, adding to the information and analyzing it in more depth (4).

In June 1982 the evaluation of the parking measures was discussed in the appropriate committee of the town council. A few minor adjustments were decided on.

The studies at the end of 1978 and 1980 consisted of several parts. Parking occupancy was recorded, parking duration was observed, and a survey was held among people parking in the inner core and among people visiting the shopping centers on the outskirts of the town. A survey of pedestrians was also held at all points of entry into the center.

The results of an opinion poll by Lagendijk's research agency among the inhabitants of Leeuwarden were also used. This opinion poll included questions on traffic and parking in the town center. Van Heesewijk's Town and Country Planning Agency also collected data for a study of distribution and planning (5,6). Other data were also used, such as those relating to the development in the number of inhabitants and jobs, traffic censuses, and the costs and proceeds of parking.

POLICY QUESTIONS

The study carried out for the Project Bureau for Integrated Transport Studies, using all the available information, is intended to answer several questions relating to policy. These concern the effects of the parking measures, which can be subdivided into three groups:

1. Effects on parking behavior (primary effects),
2. Effects on mode of transport chosen (secondary effects), and
3. Effects on the functioning of the center's activities (tertiary effects).

The analysis relates almost exclusively to primary effects. There is insufficient information to permit conclusions on secondary and tertiary effects; moreover, the 10-month period between the initiation of the parking measures and the second study is too short to establish any tertiary effects. The policy questions are as follows:

1. Is there an improvement in ease of parking for residents and tradespeople?
2. Is there an improvement in ease of parking for shoppers?

3. Is there a change in the number of visits to the town center?

4. Is there a reduction in ease of parking for people working in the center?

5. Is there a change in the distribution pattern of parking congestion?

6. What function is the underground car park fulfilling with respect to parking in the center?

7. Has illegal parking increased?

8. Is there a change in the net proceeds of the parking system?

PARKING SITUATION AFTER INTRODUCTION OF NEW MEASURES

General

Parking density in the center has dropped: on Tuesday mornings by 35 percent, on Thursday evenings by 17 percent, and on Saturdays by 16 percent (see Table 2 and Figure 2). This drop is the result of fewer parking actions and shorter average parking times. On Tuesdays the number of parking actions dropped from around 9,500 to around 7,500; figures

TABLE 2 Parking Density

	Density
Tuesday afternoon, 12:30-5:30 p.m.	
1978 ^a	3,550
1980 ^a	2,300
Percent	-35
Thursday evening, 6:30-10:00 p.m.	
1978 ^a	2,650
1980 ^a	2,200
Percent	-17
Saturday, 10:30 a.m.-5:00 p.m.	
1978 ^a	2,500
1980 ^a	2,100
Percent	-16

Note: Density is the average numbers of parked cars, rounded off to the nearest 50.

^aNo. of parked cars.

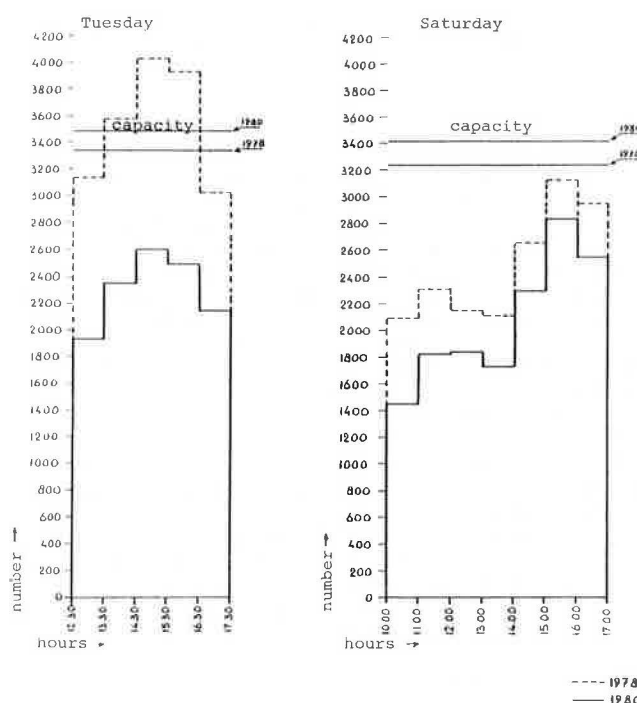


FIGURE 2 Parking density in Leeuwarden town center, 1978 and 1980.

for Saturdays are unchanged (around 10,000). Average parking time dropped on Tuesdays from 124 to 111 min, and on Saturdays from 88 to 79 min.

The data in Table 3 give parking density for different sections of the town center.

The data in Table 4 give the changes in the number of parking actions and the parking duration, according to the various parking motives. Apart from the motives of residence and business visit, parking has decreased substantially in the center for all motives. The greatest drop is among people working in the town center.

TABLE 3 Parking Density for Subareas (peak periods)

Area ^a	Tuesday, 2:30-4:30 p.m.	
	1978	1980
I	1.30	1.01
II	1.04	0.70
III	1.47	1.01
IV	1.39	0.95
V	1.22	0.43
VI	1.12	0.76
Entire center	1.22	0.73

Note: Density is the number of parked cars divided by the number of available public parking places.

^aSee Figure 1.

TABLE 4 Number of Parking Actions and Average Parking Time (Tuesday)

Motive	No. of Parking Actions ^a		Avg Parking Time (min)	
	1978	1980	1978	1980
Residence	1	1	179	113
Work	20	8	369	331
Shopping	47	36	85	56
Private visit	6	5	80	59
Business visit	10	11	116	68
Other	16	9	95	64
Total	100	70		

^aIndex 1978 = 100.

On Saturdays little has changed. The number of parking actions is almost the same, and there is only a slight shift in the share of the various motives in the total number of parking actions.

The data in Table 5 give an indication of the walking distances in the situation before and after the new policies were enacted. The average walking distance is considerably lower for all motives, except work. On Tuesdays this has even increased. The average walking distance, taking all the motives together, is 23 percent lower for Tuesdays and 9 percent lower for Saturdays.

In order to check how parking density had developed, another survey was held on a Tuesday afternoon in the autumn of 1981 (many shops are closed on Monday mornings or Wednesday afternoons). It proved to be 11 percent lower than at the end of 1980. This decrease is mainly due to a considerable reduction in illegal parking (about 90 percent). Occupancy of paid places was only down by 2 percent.

Residents and Tradespeople

Approximately 400 people make use of the interested-parties arrangement (29 percent residents, 37 per-

TABLE 5 Average Walking Distance (m) According to Motive

Motive	Tuesday		Saturday	
	1978	1980	1978	1980
Residence	— ^a	— ^a	— ^a	— ^a
Work (fixed address)	199	242	180	105
Shopping	279	214	273	245
Private visit	209	183	246	222
Business visit	235	154	232	68
Other	234	92	200	196
Avg	244	188	258	236

^aAverage walking distance is not known.

cent resident tradespeople, and 34 percent tradespeople). Some 260 permits and more than 130 season tickets were involved. At the end of 1980 there were 519 interested-party places available. The local authorities only issue season tickets for car parks where occupancy does not exceed 0.85.

In view of the increased rates and restricted parking time for other parking places, interested parties are largely dependent on the interested-parties arrangement. This is the least-expensive alternative for people who wish to park near their home or business.

An opinion poll among the inhabitants of Leeuwarden by Lagendijk's agency in February 1981 (5) produced several interesting opinions on the measures regulating parking and traffic circulation that were introduced at the end of 1979. Altogether, 690 people were interviewed. Two-thirds of these people considered the drastic measures to be an improvement; there was little difference between car users and noncar users. Two-thirds also considered it right that parking in the center was no longer free. Sixteen percent of households with cars believed that the town center had become more accessible, as opposed to 36 percent who said it was less accessible. Thirty-four percent of the households that did not own a car (31 percent) found the center more accessible, whereas 14 percent found it less accessible. On the whole, parking rates were thought by car-owning households (53 percent) to be too high. About two-thirds of the respondents agreed that the new situation made the center more pleasant to walk in and to be in. They indicated that the use of cars for trips to the center had decreased.

It must be noted, with respect to these figures, that the opinion poll only involved inhabitants of Leeuwarden. The opinion of visitors to the town center from around Leeuwarden is not known. It is doubtful whether they share the inhabitants' opinions because they are far more dependent on transport by car.

Shoppers and Other Visitors

The number of shoppers parking in the center in the new situation has dropped 25 percent compared with the old situation. Use of parking places for visitors (to shops) has decreased substantially on Tuesdays, from 0.98 to 0.39. The walking distance for that group has also dropped considerably, from 279 to 214 m (on Tuesdays).

The available data do not indicate whether parking places are now being selected in the fringe around the center or whether visits (to shops) are being stopped, and to what extent the choice of mode of transport has changed. However, the Lagendijk opinion poll has revealed some shift in favor of cycling, but the extent is not known.

Number of Visits to Center

The research material does not provide a decisive answer to the question of whether there has been a change in the number of visits to Leeuwarden center. It is known that visitors to the shopping centers on the outskirts maintain that they visit the main shopping center less frequently (more frequently 3 percent, less frequently 24 percent).

People Working in the Center

In the old situation the motorists among the people working in the center, on arrival at work in the mornings, found enough parking space. In view of the limited duration of parking elsewhere, free places were preferred.

The parking situation in the town center has changed radically for this group with the advent of the new parking measures. The new situation requires payment for all parking places, and parking time is restricted as well.

The average walking distance for people working and parking their cars in the center has increased from 199 to 242 m (on Tuesdays). The number of people parking in the center, with the motive work, and their share in the use of places has dropped substantially. Their numbers have dropped 60 percent.

This decrease ties in with the objective of the measures. A quarter of this 60 percent (about 240) now park on the fringe of the center, although in the past they had parked in the town center. A quarter of the group now leave their cars on their own (business) parking lot in the inner city. It appears as though some people employed in the center have switched from private cars to public transport or bicycles. This cannot, however, be verified from the survey results.

Distribution Pattern of Parking Congestion

In 1978, in almost all parts of the center during the peak period, the degree of occupancy could be described as extremely high. In 1980 this no longer applied to about half of the inner core. In part of the town there is still overcrowding on Thursday evenings (late night shopping) and on Saturdays.

The total overspill to the fringe is not known. As was mentioned in the previous subsection, some of the people who work in the center no longer parked there after the measures were introduced, but instead left their cars on the periphery of the town center.

Illegal Parking

There are various forms of illegal parking:

1. Parking where there is a general prohibition (at bus stops, pedestrian crossings, entrances to premises, on street corners, and so forth),
2. Illegal use of interested-party places,
3. Insufficient or no payment, and
4. Exceeding the time limit.

The data in Table 6 give the parking volumes during peak periods in areas where a general prohibition applies. The drop in illegal parking, both in terms of absolute volume and as a percentage of total occupancy, is partly caused by increased checks. To ensure that the parking measures are properly observed, the number of parking wardens was gradually increased from 5 in October 1978 to 15 in September 1980. All wardens have the authority to fine parking

TABLE 6 Legal and Illegal Occupancy During Peak Periods

	Tuesday, 2:30-4:30 p.m.		Thursday, 7:00-9:00 p.m.		Saturday, 3:00-5:00 p.m.	
	1978	1980	1978	1980	1978	1980
Legal occupancy	2,850	1,900	2,200	2,000	2,300	2,200
Use of illegal places	1,150	600	800	450	700	350
Total	4,000	2,500	3,000	2,450	2,000	2,550

Note: Numbers are rounded off to the nearest 50.

offenders. Nevertheless, in 1980 illegal parking still comprised 20 percent of the total occupancy. Although a great many legal places are available, large numbers of cars are still parked illegally.

Illegal use of places reserved for interested parties is as follows: more than 35 percent of the cars do not have an appropriate permit, and the total occupancy of those places is in fact only 60 percent; therefore, illegal parking there does not cause a shortage of space.

In 1980, 46 percent of the people using parking meters were in default of payment (Tuesday afternoons). The number of people exceeding the time limit has dropped a little.

Net Proceeds of Parking System

The annual proceeds from parking are 5 times higher since the new system has been operating (0.35 million guilders in 1979 and 1.8 million guilders in 1980). Costs are 5 times higher too (1.50 million guilders now as opposed to 0.3 million guilders previously). These sums do not include the proceeds and costs of the underground car park, nor have the costs of the land and of constructing the parking places been included.

In 1980 Fl. 75,000 of the proceeds were derived from charges to interested parties. The increase in costs is mainly generated by the extra parking wardens (5 in October 1978, 18 in January 1980, and 15 in September 1980).

Underground Car Park at Wilhelminaplein

When the 1978 study was being conducted, construction of the underground car park was already under way. Consequently, Wilhelminaplein was barred for parking at that time.

Before the car park was built the 400 parking places in the square were in great demand. Now it is no longer available for parking, but is reserved for activities like the weekly market, fairs, and so forth.

After the underground car park (close to the core of the shopping center) was opened in November 1979, it could be used free of charge for more than a month. During that period it was almost always fully occupied. Since parking charges have been introduced, at the rate of Fl. 1.25 an hour (up to a maximum of Fl. 10 a day), occupancy initially dropped considerably to 17 percent on Tuesdays, 40 percent on Thursday evenings, and 32 percent on Saturdays (1980 figures). The underground car park was mainly used for short- and medium-term parking. On Tuesday afternoons 70 percent of the people parked there for less than 2 hr, and on Saturdays 80 percent. On Thursday evenings, Fridays, and Saturdays 80 percent of the parkers give shopping as their motives for parking. On other days season ticket holders account for much of the occupancy (mostly people working in

the center). A monthly ticket costs Fl. 65. In 1980 about 60 of these tickets were issued; most were purchased by businesses for their employees.

In 1980 the neighboring 1- and 2-hr parking places were better occupied than the underground car park, although rates for the former are more expensive (about Fl. 1.75 an hour). Evidently people prefer to park on the streets or in parking lots to the underground car park.

The maximum rate was later reduced from Fl. 10 to Fl. 2.50 a day. This was done because visitors to the (shopping) center often do not park for more than 2 hr, and a low maximum rate might make the car park more attractive. This is to the advantage of people parking their cars for longer than 2 hr.

In 1981 occupancy on Tuesday afternoons was more than 30 percent; in 1981 on Saturdays and once or twice a week the underground park was completely full. This does confirm its importance for shoppers. In 1981, over the entire year, 30 percent more cars parked in the underground garage than in 1980. The proceeds from parking fees were practically 30 percent higher in 1981 than in 1980.

CONCLUSIONS

Since a series of parking measures were introduced, the number of cars parked in the town center has dropped substantially. This applies more on Tuesdays (the first full shopping day in the week), when people working in the center and those visiting the shops monopolize most parking spaces, than on Thursday evenings (late-night shopping) and Saturdays.

The average walking distance is considerably lower: on Tuesdays 188 m instead of 244 m and on Saturdays 236 m instead of 258 m. Average parking time has dropped too.

In Leeuwarden 260 permits and 132 season tickets have been issued under the interested-parties arrangement (1980 situation).

It would appear that it was easier for residents and tradespeople in the center to find a satisfactory parking place in 1980 than in 1978. If a motorist has a parking permit, competition with other groups of parkers (visitors, shoppers, and people employed in the center) for a space is a thing of the past.

Since the parking measures have been operating, visitors (shoppers) can park closer to their destination. Degree of occupancy of appropriate spaces for visitors has dropped considerably on Tuesdays and to a slightly lesser extent on Thursday evenings. However, in part of the center there is still high occupancy.

The number of shoppers parking in the center is down by 25 percent. Parking rates are considered in the main to be too high. It is not certain from the available data whether people have changed to parking on the fringe of the center or have changed

their mode of transport or have stopped their visits (to shops).

Average walking distance for people working in the center has risen from 199 to 242 m (measured for people parking in the center). Some are now parking on the fringe. More people park in their own (business) parking lots. The research data suggest that some people who work in the center have switched from car travel to public transport or bicycles. However, there is no firm evidence for this.

The use of illegal places has almost halved but is still considerable, nonetheless.

Occupancy of the underground car park has increased by more than 30 percent in 1980 (on Tuesdays). On Saturdays and once or twice a week it is completely full (1981). On Thursday evenings, Fridays, and Saturdays 80 percent of the people who use the underground car park give shopping as their motive.

Parking proceeds have gone up from 0.35 million guilders in 1979 to 1.8 million guilders in 1980. Costs have risen from 0.3 to 1.5 million guilders.

The effects of the parking measures correspond largely with the municipal authorities' objectives in implementing this parking policy.

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