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Federale Overheidsdienst Mobiliteit en Vervoer
Service public fédéral Mobilité et Transports

Summary

What effects would staggered working hours have on congestion and road safety at peak times?

An exploratory approach to commuting in Belgium

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An exploratory approach to commuting in Belgium

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Publisher: Vias institute
Date: 26/09/2018

This research has been made possible by the financial support of the Federal Public Service Mobility and Transport.

1. Introduction

As you're doubtless already aware, travelling on Belgian roads during peak hours can be a real ordeal, especially on a school day. Across all forms of transport combined, the most journeys are made between 07:00 and 09:00 and from 15:00 to 18:00 on weekdays[1].

When we look at the reasons for these journeys, trips to and from work and school account for the majority of the miles travelled at these peak times, although they only represent a small part of the journey's made over the day as a whole.

When it comes to road safety, rush hour travel also proves to be the most dangerous, with the number of accidents involving physical injury higher than at other times of the day, with a spike between 07:00 and 08:00 and from 15:00 to 18:00. The greater number of accidents is of course a direct correlation of the higher volume of traffic on the roads at these times[2].

In order to reduce the intensity of peak-time congestion, it's necessary to reduce the number of journeys made during these hours. However, it's very difficult to estimate how much of a reduction would be required in order to produce a significant gain in terms of mobility. Moreover, we don't have enough information regarding the requirements, expectations and efforts which we can realistically expect from those generating a large part of this rush hour traffic, i.e. employees, their employers and schools.

It's against this background that the Vias Institute has been examining the concept of "de-synchronisation", which basically means moving some of these journeys from peak to off-peak times.

2. Aims of the study

This study focuses firstly on the potential impact of a decrease in the proportion of home-work trips on the reduction of congestion levels and the improvement of road safety at peak times. Secondly, it examines the constraint levels of the main rush hour user groups (i.e. those making journeys to/from work and school), conducts a preliminary exploration of their initial willingness to stagger their travel times and explores some strategies for actually encouraging them to do it.

In this exploratory study, the Vias institute has adopted an approach involving the simulation of traffic on the primary road network (motorways and main roads), combined with opinion polls among employees, employers and schools.

[1] Cornelis *et al.*, 2012

[2] Cornelis *et al.*, 2012

3. Summary of the simulations

Nearly 7 out of 10 cars on our roads between 07:00 and 09:00 are travelling for reasons connected with work, whereas this category of journey accounts for just 3 in 10 cars over the day as a whole.

A journey time saving of 6% over the day as a whole if the traffic is spread proportionally over each time slot

In our simulations, we can see that if some of the rush hour "work" traffic is shifted to off-peak hours, the average journey time can be improved by up to 6% over the day as a whole. Unsurprisingly, the gains are highest at peak times, with an average journey time improvement of 25%, which is 15 minutes slashed off a one-hour journey. There's always a knock-on effect, however, and these peak-time gains have an adverse effect on journeys made during all other time slots, particularly at 06:00, 10:00, 11:00 and 20:00 (when journey times are almost doubled).

The rush-hour gains are also variable according to the location (Figure 1): sections of road currently suffering from a high degree of congestion would not necessarily see an improvement after a shift. For instance, access to the capital via Grand-Bigard would remain congested (<35km/h) while average speeds would rise to 70km/h at the Léonard and Sterrebeek intersection, equivalent to slow-moving traffic rather than the (near) standstill experienced at the moment.

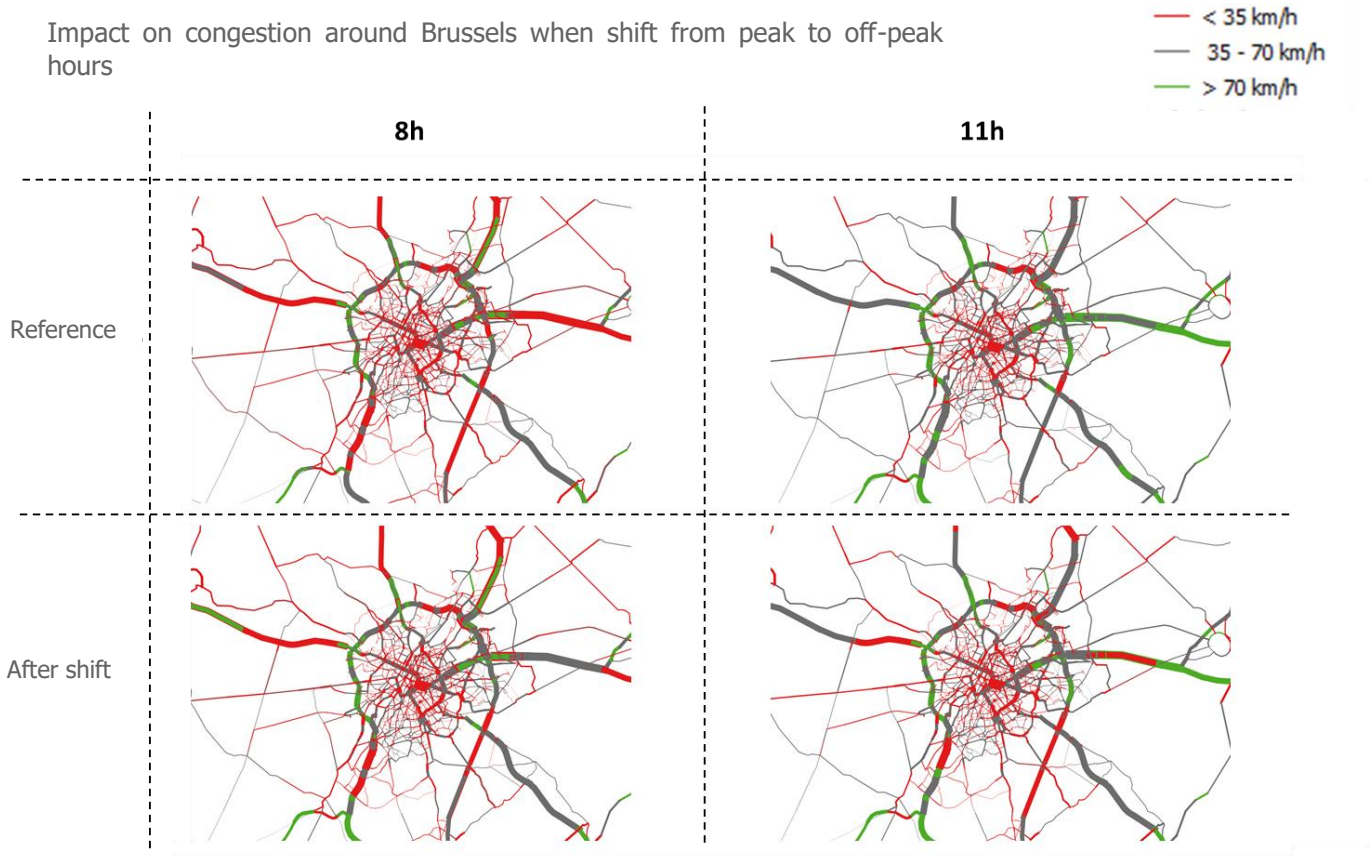

Figure 1: Maps illustrating the shift in road network congestion levels at peak times in terms of average speed

At this stage, we can clearly assert that a situation where all of the traffic is spread proportionally over the whole day does not necessarily translate into uncongested flow. However, improved traffic staggering could

help optimise use of the infrastructure and relieve hyper-congested segments between 07:00 and 09:00 and 15:00 and 18:00. Clearly, other parameters must be factored in here, such as modal shift and goods traffic, as the even spread of solely "work-related" traffic would involve the shifting of nearly all such journeys made in the evening rush hour, which seems somewhat unrealistic.

If this is taken further and a certain volume of non-essential journeys by employees is eliminated – and not shifted – from the roads, traffic levels are reduced and the journey time savings are made even greater. For instance, a 30% reduction in journeys is accompanied by a 6% traffic reduction and a time saving of just over 15%, which equates to 10 minutes shaved off a one-hour journey.

Clearly, the variations differ from one geographical section to another, since the saturation rates are currently very different at the bottlenecks of Brussels, Antwerp and Liège. For instance, this would equate to 5,000 PVEs (Private Vehicle Equivalents) less between La Hulpe and the Léonard intersection and 6 minutes saved on the current journey time. For Grand Bigard, it's the equivalent of 2,000 fewer private vehicles, which equates to 11 minutes saved on the current journey time. So a few less vehicles using already (hyper-) congested roads can actually improve journey times, sometimes considerably.

Where road safety is concerned, with an equivalent volume of traffic, few changes can be expected in terms of improving safety for road users. But if traffic levels are reduced without just being shifted, this would reduce the risk and thus enhance user safety.

4. Summary of opinion polls

A spike at 08:00 and 17:00 for employees and at 08:30 and 15:00-15:30 for schools.

There's no denying it: the start and end times of work and lessons have a direct impact on home-work and home-school journeys. Consequently, employees, employers and schools all generate journeys made almost exclusively at peak times, particularly from 07:00 to 09:00 and, in the afternoon/evening, over a slightly wider time frame stretching from 15:00 to 18:30. The absolute peak is at 08:00 for employees (21%) and at 08:30 for schools (50%), while in the afternoon/evening, the most common travel time is at 17:00 for employees (17%) and 15:15-15:30 for schools (24%).

These 3 different groups are well aware that the journeys they generate are made at peak times, but not all necessarily feel any pressure to introduce more staggered timetables. For schools, this might be because mobility around these establishments is not a systematic problem, but can arise in half of all cases. This confirms therefore that school mobility is highly specific to each establishment and thus requires a local approach in liaison with other nearby schools.
As regards employees, 1 in 2 expressed a desire for more staggered hours in their current work and home

Nearly 70% of those polled feel more at risk of being in an accident in the morning and evening.

situations. Since situations evolve, 6 out of 10 employees would be inclined to stagger their hours in future if their situation allowed it. The nature of their work activity is identified as the main obstacle, particularly the limits defined by their working hours (1 in 2 employees have fixed working hours). Safety is also a significant factor, with nearly 70% of participants feeling at greater risk of accidents during rush hour, whether morning or evening.
Nearly 9 in 10 employees combine their journeys with other activities on route. The most common among these is shopping and, contrary to expectations, just 3 out of 10 employees pick up or drop off their children at least once a week. According to the employees polled, this need to drop off children does not necessarily

constitute an obstacle to staggering their journeys (12%), in contrast to employers (22%). Moreover, employees who never have to drop off their children appear to be no more inclined to travel outside peak times than those who have to drop off the kids at least once a week.

Employees don't seem to be making the most of the flexibility offered by variable working hours, with no difference being observed here between fixed and variable hours, whereas more flexibility might have been expected among employees with variable hours.

Size of company, region and sector have no direct influence on departure times. It's more the nature of the activity and the working hours system used which play a role. For instance, in hotel & catering, industry, transport and the cultural sector, employees travel a little less at peak hours than in public administration, banking & insurance and consultancy activities.

Method of transport and journey duration have an indirect influence on departure time, with cyclists and pedestrians tending to set out at more off-peak times than drivers and public transport users, since the distances to be covered are shorter.

2 out of 3 employers would be prepared to widen variable time frames from 06:00 to 10:00 and from 15:00 to 19:00, while 7 out of 10 companies would be willing to introduce variable hours for certain posts currently subject to fixed hours.

On the subject of possible new time frames, 2 in 3 employers say they'd be prepared to widen their variable time frames from 06:00 to 10:00 and 15:00 to 19:00 (Figure 2), while 7 out of 10 businesses would be prepared to introduce variable hours for certain positions currently subject to fixed hours. A slight difference can be noted with small businesses (<50 staff): the smaller they are, the more they tend to feel that fewer of their roles are compatible with staggered hours. Most commonly cited are office roles (manager, employee, clerk, researcher), along with those positions that are already mobile (consultant, sales rep.). There are exceptions, however, as some employers believe that certain technical roles could benefit from slightly wider time frames, but not necessarily outside peak hours. This suggests that it's more the type of tasks that matters rather than the role in itself. So for instance, a shift employee needing to follow an e-learning course could also benefit from flexibility.

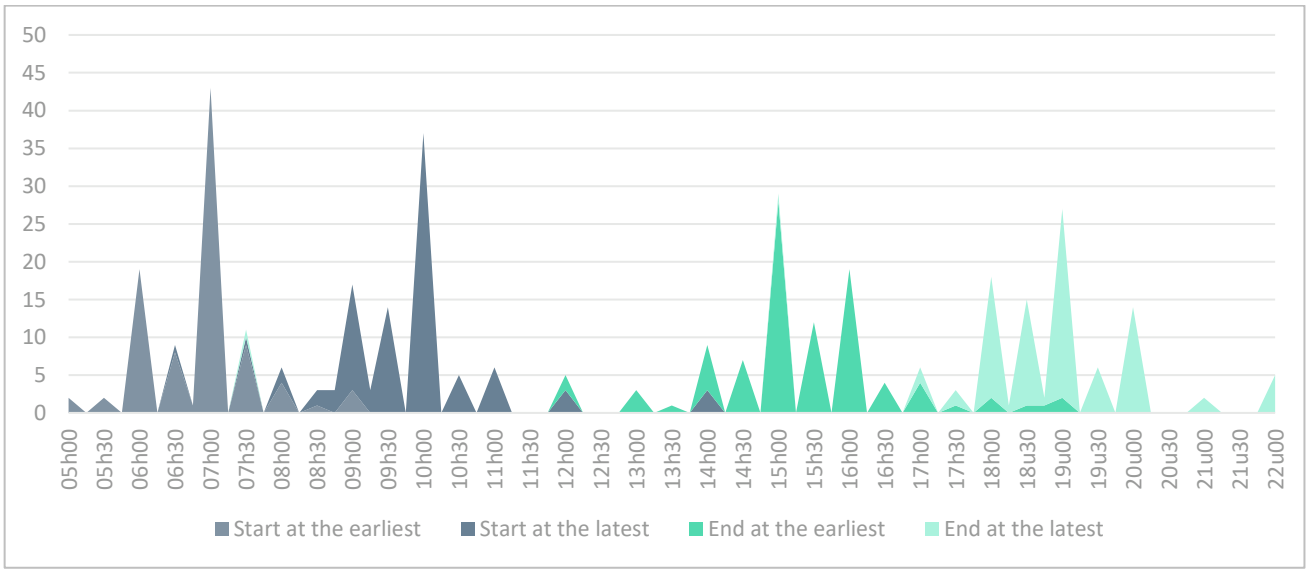

Figure 2: possible wider time frames that employers would consider for variable hours

In terms of incentives, staff would be more inclined to stagger their hours if it brought financial reward – lower taxation for off-peak travel and perks such as discounted or free mobility products (fuel, parking, taxis, etc.). For public transport users, a more frequent service at certain times of day (86%) and being able to count travel time as working time (68%) would make flexible travel a more attractive proposition. Free transport does not appear to be a key factor (50%), probably due to the current obligation for Belgian employers to contribute to employees' public transport costs. Most take the view – entirely logically – that new ways of working such as homeworking one or more days a week, decentralised work from a satellite office and co-working also have a role to play in helping to limit peak-time travel.
Among employers, the appeal of the company, the quest for a better work-life balance and the retention of new generations of employees are priorities towards which de-synchronised hours could make a positive

Corporate image, work-life balance and attracting new generations of employees are seen by employers as good reasons for adopting more staggered working hours.

contribution. Not all of them look favourably on the idea of financial or legal incentives, with less than 1 in 2 employers liking the idea of variable taxation (or deductibility) according to travel times. Like employees, employers see the new ways of working as important, particularly homeworking (even for a few hours) and a "free" choice of workplace.

Overall, among both employees and employers, one preferred target seems to emerge: office activities governed by fixed and variable timetables. This is the case for all sectors, although in information & communication, public administration and scientific research, there appears to be a stronger inclination to adopt measures of this type.

For schools, the issues are somewhat different: since their mobility issues are much more localised, not all of them share the same opinion. For instance, the staggering of class times in relation to those at other nearby establishments would seem to appeal to just 3 schools in 10. With such a system, the morning classes could begin 15 minutes earlier and in the afternoon, 15 to 30 minutes later. However, tiredness and shorter concentration periods are referred to as obstacles in this regard. It should also be noted that certain schools are already taking action on mobility by encouraging the use of public transport and, in some cases (3/10), by arranging the start, break and end times of different classes in a way that optimises the space available.

5. General conclusions and recommendations

44% of accidents involving physical injury occur between 07:00 and 09:00 and 15:00 and 18:00

Traffic intensity is highest at peak hours, which account for 44% of accidents involving injury. Home-work and home-school journeys are highly concentrated in time and constitute roughly 85% of all trips made between 07:00 and 09:00.

This study has shown that a reduction in traffic volume is accompanied by a slightly stronger improvement in journey times. In other words, a few less vehicles on the roads can directly influence average speed and therefore journey time, but clearly, the gains vary according to geographical sector and its existing state of congestion.

When we focus on spreading the traffic evenly over the day as a whole – i.e. smoothing out the peak-time overload across all other time slots – we see an average gain on journey times of 25% between 07:00 and

09:00. Clearly though, this has a detrimental knock-on effect for the other time slots, which see their average journey times rise. Some variability is also apparent according to location: already congested sections don't always flow any better, such as certain sections of the Brussels ring road. Over the day as a whole, a (fairly small) gain of 6% in terms of journey times is identified for an equivalent volume of traffic. Apart from this average gain, this even spread would facilitate more sustainable use of the existing infrastructure.

Employers and employees are aware of their impact on rush-hour traffic.

The opinion polls conducted among employees, employers and schools have served to identify real benefits and willingness vis-a-vis staggering their hours and travelling outside peak times. Most of the employees surveyed showed an interest in travelling outside peak times, while the employers seemed inclined to offer greater flexibility, whether in the form of wider time frames, homeworking, or more independent choice of workplace. Schools, however, appear to be less concerned about this subject, as although lesson start and end times are highly concentrated in time, only half of schools are currently experiencing accessibility issues.

For both employees and employers, work factors are the main blocks/levers when it comes to staggering their hours – the nature of the role or the type of schedule. The safety argument is also important, since the majority of those polled feel at greater risk of accident at peak times. Surprisingly, only a small minority of employees have to drop off a child on route to work, so the "child" factor would appear to be overestimated in the perception of journey flexibility, including by employers.

Steps are already being taken by those concerned to further stagger journey times, such as staggered break times for certain schools which are encountering accessibility issues, and variable working hours for certain employers. However, these measures are still very much underused, particularly among employers and employees. The study highlights the fact that the vast majority of employees travel at the same time – at rush hour – regardless of whether their working hours regime is fixed or variable. Moreover, 8 in 10 employees still travel to work every day, from Monday through to Friday.

Extended time frames, more efficient off-peak public transport, incentives to travel at other times and the counting of travel time as working time are all suggestions put forward by employees and employers for reducing peak-time congestion.

The opinions of the different target groups on certain measures for encouraging de-synchronisation were also sought, particularly those of employees and employers. Wider time frames – moving from the "traditional" 07:00-09:00 and 16:00-18:30 to the more "ambitious" 06:00-10:00 and 15:00-19:00 -, better off-peak public transport, a smart taxation system, a mobility bonus system and also the counting of travel time on public transport as working time are all measures which seem particularly promising. Conversely, free public transport at or before certain times appeals to scarcely half of the respondents, probably due to the current obligation for Belgian employers to contribute to employees' public transport costs.

In order to make progress on this subject, it could be advantageous to raise awareness among employers and employees (via the joint committees, for instance) regarding the concepts of de-synchronisation and flexible hours. It might also be appropriate to inform employers regarding the legal framework for the introduction of variable hours and NWOW[3]. At this stage, and in view of the interest expressed by employees in particular, it could also be beneficial to more thoroughly investigate general measures such as smart taxation and incentive schemes to encourage more off-peak travel.

[3] New Ways Of Working.

School mobility is more localised, with a less clear impact on overall congestion.

Among schools, there is a noticeable lack of interest in the subject, especially where accessibility issues have not yet been experienced. It might therefore be a good idea to communicate with them on this subject and integrate these discussions into existing educational reform projects. In contrast to employees/employers, school mobility needs to be part of a local initiative.

The role of goods traffic in congestion in both the morning and afternoon/evening is cited by employees, employers and schools.

Finally, the role of employees and employers in overall congestion is a reality for the vast majority of those sampled. The share generated by schools, however, is more nuanced, due to their much more localised mobility. It has not been studied here, but the transportation of goods is also cited by employees, employers and schools as playing a major role in peak-time congestion.

The introduction of desynchronization measures always needs to be accompanied by other actions permitting the reduction of traffic volumes, in order to maximise the impact on journey times and road safety.

In conclusion, the introduction of desynchronization measures always needs to be accompanied by other actions that enable traffic volumes to be reduced, so as to maximise the impact on journey times and road safety (e.g.: homeworking, satellite offices, co-working, encouraging the use of alternative forms of transport, etc.). If this is not the case, the gains from desynchronization are even smaller for mobility and road safety, although the more even spread of traffic throughout the day would permit optimisation of the infrastructure. Moreover, the other reasons for journeys need to be considered, as an even spread would require the shifting of almost all work-related traffic to certain time slots, which seems somewhat unrealistic.


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