# How can taxis provide subsidized transport in small towns and rural areas?

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## Foreword

In March 2011, the Institute for the City on the Move (IVM)[1] and the Taxi Research Network organized a workshop on Taxis and Hire Cars with Driver in small towns & rural areas. This workshop brought together fifteen experts from Ireland, the UK, the Netherlands, Sweden, Norway, Denmark, and France. The workshop brought about three main findings: (i) the issues generally discussed about taxicab regulations are irrelevant in rural contexts, (ii) subsidized transport services constitute the major part of rural taxis' turnover and (iii) insuring competition in the tendering process for these services is a very complex task that needs to be researched.

Following this seminar research missions were conducted in France, the Netherlands, Denmark and Sweden with funding from the IVM and Veolia. The purpose of this research was to understand how the different agencies that finance demand responsive transportation services put them to tender, and how taxis can compete to enter these markets. This report is a summary of the findings of this research effort.

## Abstract

In most countries of Europe, to minimize social exclusion, different levels of government, from municipal to national, subsidize demand responsive transportation (DRT) for different target groups, e.g.: the handicapped, the elderly, and even for the residents of low density areas, where scheduled bus transportation would be too expensive to provide because of low demand.

Urban sprawl combined with the greying of the suburbs and of the countryside, together with a growing awareness for the needs for social inclusion of the handicapped put the budgets for these subsidized transportation services on the fast-growing trend when public finances are squeezed by the economic downturn.

The strategies put forward by the public authorities to contain these growing costs vary from country to country but basically, they rely on two ingredients: (i) combine as much as possible the services for different target groups, and (ii) try to introduce competition when tendering these services to the transport operators.

These two strategies are intimately interwoven since the number of competitors and hence competition for the markets depends on the size of the market, and the size of

[1] Institut pour la Ville en Mouvement http://www.ville-en-mouvement.com/taxi/uk/index.html

market depends on the ability of the various public authorities to work together and allow regrouping these different services into the same vehicles.

Everywhere, taxicabs play a substantial role in these markets. In most countries of Northern Europe, from France to Norway, outside of the big cities, these subsidized transportation markets represent from 70 to 95% of the turnover of the taxicab operators.

DRT markets, especially in rural areas, exhibit several features of natural monopoly, from economies of scale (e.g.: DRT corridors) and economies of scope (e.g.: diversity in the vehicle fleet) to economies of reputation (e.g.: call centre and radio dispatch centres). These monopoly features tend to favour larger firms. It is thus difficult to design a tendering process that would not crowd out (and thus kill) small taxi operators.

Several regions in Denmark, Sweden, and the Netherlands seem to have come up with different and innovative solutions to this problem. We evaluate these solutions and check to which extent they depend on the local institutional framework and on the national taxicab regulation. We, then, draw conclusions on the transferability of these solutions to other institutional contexts.

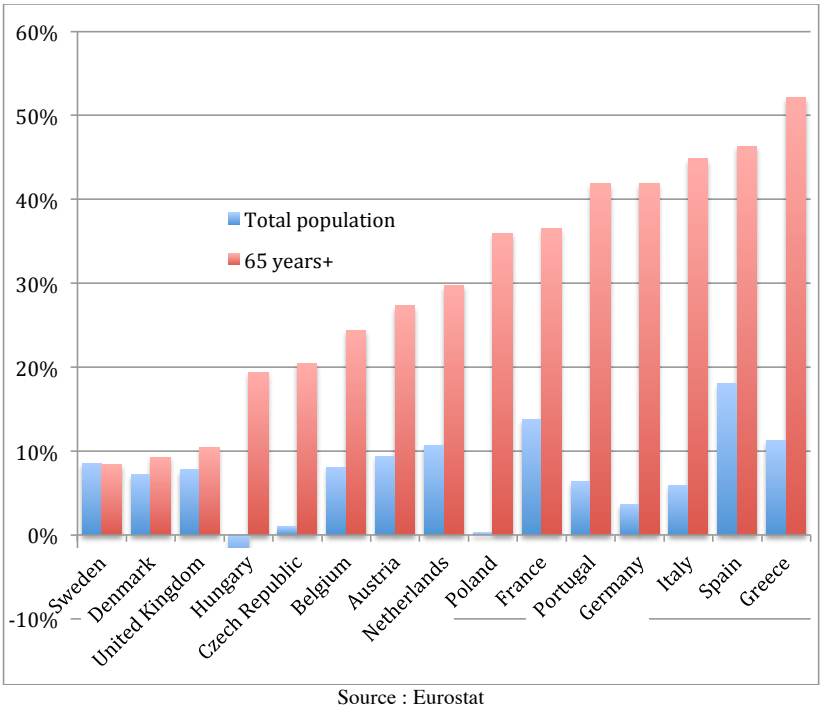
## Growing needs… and costs

Under the combined effect of urban sprawl, an aging population and a concentration of medical facilities, across Europe the demand for subsidized transport services on behalf of local authorities and of health agencies has grown significantly, and even more so in small towns and rural areas, when and where scheduled bus transportation would be too expensive to provide because of low demand.

The first factor is the aging of the population. This already started in the last two decades but will gather momentum in the coming decades with the retirement of the baby-boomers.

Eurostat data show that in the past two decades, whereas the total population in the EU27 experienced a 6% increase between 1990 and 2009, the population over 65 years old grew by 33%. This average covers some differences between countries as can be seen in the figure below, but everywhere the population of elder citizen grew faster, and some times much faster (as in Germany, Greece and Italy) than the general population.

**Figure 1 – Population change from 1990 to 2009 in various European countries**




Source : Eurostat

In Italy, Sweden, France and Germany more than 5% of the population is now over 80 years old. This aging generation is the one that took advantage of the democratization of car ownership to go and live in distant suburban areas. Because of their low densities, these areas cannot be efficiently serviced by public transport. The problem is getting acute when their residents get too old to be fit to drive.

Several research papers[2] have addressed the issues of urban sprawl and the "greying of the suburbs"[3]. Most point out the safety problems with older drivers and the need to provide mobility to the many baby boomers who have opted for what sociologists call "aging-in-place" although they cannot drive anymore. One solution, generally put forward as cost effective, is to provide some form of "Demand Responsive Transport" or DRT.

DRT schemes are also an option for providing mobility to the handicapped. In the mid-80s several European governments became aware of the transportation needs of the handicapped. Laws were passed as the 1982 *Loi d'Orientation sur les Transports Intérieurs* in France, the 1982 *socialtjänstlagens* in Sweden or as the UK Transport Act 1985 that established the Disabled Persons Transport Advisory Committee. These laws were later reinforced[4] to make it an obligation for local governments to supply all their citizens with "affordable access to transportation at a reasonable cost to the public purse"[5]. This may entails costly solutions like low floor buses, special access equipment to subway stations, etc. However, even in large cities, local governments often found it more cost effective to set up and subsidize dedicated DRT schemes that provide multi-occupancy door to door transport services for people with a permanent or long term disability or health problem who are unable, or virtually unable to use conventional public transport. Some local authorities also fund Taxicard schemes for disabled people who have difficulty using public transport. Taxicard holders are able to travel in licensed taxis at reduced fares.

A third factor contributing for the growing demand for subsidized personal transportation is the rationalization of public services like healthcare and schools. Rationalizing healthcare service delivery entails centralization of services to achieve economies of scale. This is becoming particularly important due to the growing specialization and costs of medical equipment like MRI scanners. Hospitals are frequently the chosen site of cost containment and rationalization especially in rural areas. To mitigate the impact of rural hospital closures, national or regional health agencies need to provide subsidized transport for patients living far away, once the physician has ordered the treatment.

The same happens with the closure of small schools in rural areas because of falling birth rates. When density is too low, school buses pickup routes would be much too circuitous and take too long, so local government usually contract smaller vehicle operators.

## Mounting costs

Meeting this growing demand for subsidized transport services is significantly draining local authorities and health agencies budgets. In France, since 1998, transport for sitting patients has grown each year by 6% to 10%. If no effort is done to rationalize the provision of these transport services, the cost for public finance will become unbearable. In Sweden, where mobility services to the elderly have been generously provided since the 1980´s, these transports already make up for 20-25 % of the total tax subsidy for all public transport service. In general in the Netherlands all subsidies for transportation of special target groups (elderly, sick, disabled, school children etc.) sum up to the same amount as that is spend on all public transport except the national railways. This is about 1 billion €/year.

The strategies put forward by the public authorities to contain these growing costs vary from country to country but basically, they rely on two ingredients: (i) combine as much as possible the services for different target groups, and (ii) try to introduce competition when tendering these services to the transport operators.

These two strategies are intimately interwoven since the number of competitors and hence competition for the markets depends on the size of the market, and the size of market depends on the ability of the various public authorities to work together and allow regrouping these different services into the same vehicles.

Everywhere, taxicabs play a substantial role in these markets. In most countries of Northern Europe, from France to Norway, outside of the big cities, these subsidized

[2] See, for instance, *Transportation in an aging society: A decade of experience*, Technical Papers and Reports from a Conference, November 7–9, 1999 Bethesda, Maryland, published in 2004 by the Transportation Research Board, Washington, DC, 325 p.

[3] Expression "graying of the suburbs" was probably coined by Sandra Rosenbloom (2003) in her essay for the Brookings Institution Series on Transportation Reform

[4] As with the Disability Discrimination Act 1995 in the United Kingdom that made it unlawful to discriminate against people in respect of their disabilities in relation to transport.

[5] In the French law: un droit au transport devant permettre de se déplacer "dans des conditions raisonnables d'accès, de qualité et de prix ainsi que de coûts pour la collectivité"

transportation markets represent from 70 to 95% of the turnover of the taxicab operators. Keeping the taxis in these markets is important because, properly managed, they can contribute to policies designed at containing costs.

Indeed, taxis have a comparative advantage when markets are narrow, as it is often the case for DRT markets in rural areas. This comparative advantage comes from their exclusive right to ply for hire and to stand at taxi ranks, thus benefitting from economies of scope. When they can take part in the competition, these advantages allow them to push prices down. (to exert a downward pressure on prices).

Unfortunately, when procuring subsidized transportation contracts, authorities often neglect to adapt their calls for bids to the idiosyncrasies of taxi operations, and thus prevent them from taking part in the competition.

Since they often are the *condicio sine qua non* for their survival, stymieing taxis from these markets has a collateral damage. This is because taxis also provide (non-subsidized) mobility to people who temporarily or permanently have no access to private cars. When they are driven out of business, the supply for non-subsidized trips disappears.

Keeping small taxi firms in the competition for subsidized transport is no easy task. DRT markets, especially in rural areas, exhibit several features of natural monopoly, from economies of scale (e.g.: DRT corridors) and economies of scope (e.g.: diversity in the vehicle fleet) to economies of reputation (e.g.: call centre and radio dispatch centres). It is thus difficult to design a tendering process that would not crowd out (and thus kill) small taxi operators, in favour of larger firms that will become future monopolists as a result.

## Analytical framework

To carry out a comparative analysis of how the needs for subsidized transport in rural areas are catered for in different countries, it is convenient to look successively (i) at the various needs for transport services, (ii) at the public clients who contract the operators to provide subsidized mobility to their citizens and eventually foot the bill and (iii) at the transport, logistics and call centre operators who supply these services.

### A variety of transport needs

Depending on the country, various segments of the population can be entitled to benefit from subsidized transport. The demand in rural areas and small towns can be segmented into different markets. Of course, depending on local conditions two or more of these markets can be aggregated. For the sake of the analysis, we can distinguish:

— School transport in very low density areas;
— School transport for handicapped children or special education transport;
— Seated patients transport as opposed to patients who need ambulances (e.g. “Medicaid non-emergency transportation” in the USA);
— Handicapped or impaired people transport (“disabled paratransit programs” in the USA);
— Transport for the elderly (“senior paratransit programs”);
— Public transport complement when or where demand is too low to justify running a full size bus, i.e. general public demand-responsive transit service, complementary to scheduled bus services;
— Transport to promote job access for the unemployed.

### Many different clients

The client agencies subsidizing these services could be: National health services, or local health services (e.g. hospitals); County governments; Municipal governments; Public transport operators (public or private firms) when acting upon request from local governments.

### Competing suppliers

Providing demand responsive transport entails chaining various services from receiving the telephone calls and Internet orders down to actually carrying the passengers, going through assigning the passengers to vehicles and selecting the best route for the vehicles. These various services can be carried out internally by the carrier himself or by various specialized operators successively.

Subsidized transport services can be supplied by a variety of transport operators. Depending on the country, these are regrouped in different categories as defined by the national regulatory framework. These are: (i) metered taxis, (ii) hire cars with drivers,

also called private hire vehicles or PHVs (cars and vans), (iii) ambulances, and (iv) bus or coach operators.

In this research, we are mostly interested in the two first modes of transport: metered taxis and private hire vehicles. Ambulances are too specialized and costly to enter DRT schemes, and busses and coaches are too big to operate in sparsely populated areas.

In most countries, there is a clear distinction between taxis on the one hand and hire cars with driver services (PHVs) on the other hand. PHVs are not allowed to pick up street hails and to stand at ranks or stations. They can only service pre-booked trips by phone call or by contracts. Metered taxis are required by law to be equipped with a taximeter and to use it when carrying passengers picked up on street hail or at taxi ranks. When operating under contract (when permitted) they are generally allowed either not to use the meter or to offer a discount on the meter rate. These rates are either set by governments or submitted to declaration and control as in Sweden. Private hire vehicles are totally free to set their price in a competitive market.

In some countries (e.g. France, Denmark) taxi numbers are more or less limited by quotas whereas in other countries (e.g. Sweden, the Netherlands), there are no quantitative barriers to entry in the industry. Everywhere, taxi drivers licences are submitted to stricter requirements than PHV drivers'.

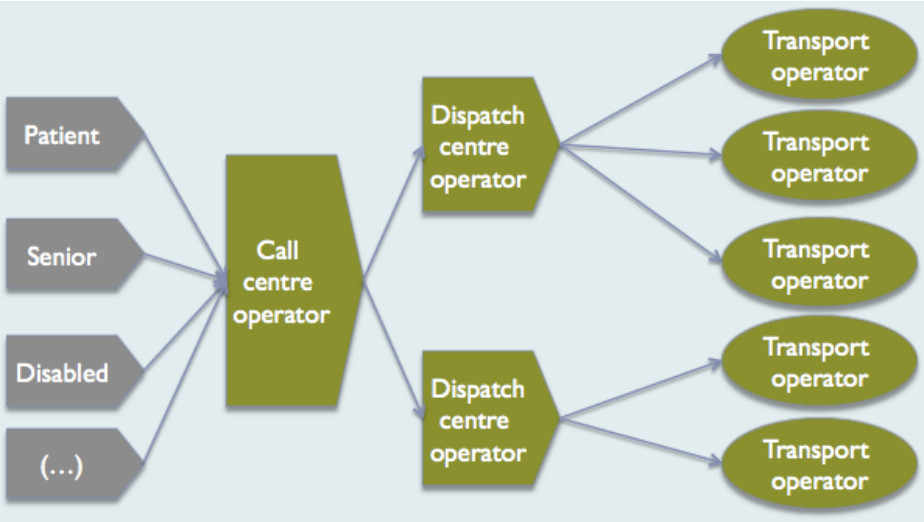
These transport operators may have, in house, their own call and dispatch centre. However, separated call centres and logistic centres can also carry out these functions and be procured separately.

**Who procures what?**

Each agency subsidizing the mobility of its own specific target group can procure the transport services directly from the transport operators. But several agencies might prefer to join up as a single client and set up a transport authority that would, on their behalf, procure transport services for their pooled target groups.

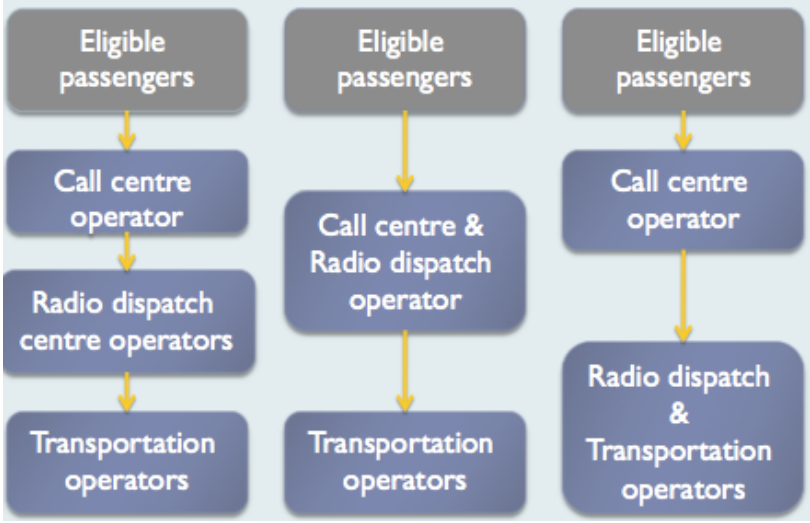
Once different institutions in charge of providing subsidized transport services for specific target groups have joined up as a single client, they can procure some or all the services along the chain that goes from the operation of the call centre down to the actual transportation.

**Figure 2 — Chained operations to be procured**




Theoretically all these services from call centre, dispatch and logistics centre, down to actual transport can be procured separately, and in fact they are sometimes regrouped and tendered to the same operator. This bundling is often dictated by the structure of transport industry.

**Figure 3 — Operations bundling**




Sometimes, some of these services are not tendered and are provided (in house) by the public authority in charge of coordinating the system.

Conversely, some big transport operators, once they have won the bid, can subcontract smaller transporters to supply the service in specific regions and focus their activities in organizing the logistics of the whole system.

The differences in efficiency, cost and transparency of the whole system from one country to the other probably lie in the details of these different possible arrangements.

## Our sample of country case studies

At the March 2011 workshop organized in Paris by the IVM-Cities on the Move, it appeared that the most interesting experiments in how local authorities organize demand responsive transport services could be found in some regions of the Netherlands, Denmark and Sweden. This sample of countries has the added advantage of diversity. In Denmark the taxi industry is tightly regulated as in France, while it is completely deregulated in the Netherlands and Sweden. Population densities in the Netherlands and Denmark are higher than in France, they are lower in Sweden.

Organizing subsidized demand responsive transport, whether it be services open to any public or specialized services for certain categories of the population, is mainly a local matter. Country size is not critical. In contrast, population density, and fineness of municipal geographic boundaries may play a role. The lower the density, the less justified will be the use of high-capacity vehicles. The administrative fragmentation, meanwhile, does not promote the coordination necessary to achieve economies of scale.

In terms of administrative boundaries, France breaks all records with the tiniest communes (See Table 1).

**Table 1 – Size effects of municipal boundaries**

| Country | Number of communes | Average population | Mean area km² | Average population density |
|---|---|---|---|---|
| Denmark | 98 | 55.200 | 440 | 126 |
| Netherlands | 467 | 34.900 | 89 | 392 |
| Sweden | 290 | 31.100 | 1.522 | 20 |
| Sweden * | 186 | 32.700 | 438 | 75 |
| France | 36.565 | 1.600 | 15 | 108 |

Note : * Sweden, excluding the 104 communes with more than1000 km² area

In the case of Sweden, if we exclude the hundred municipalities with an area exceeding 1000 km² that are mainly located in the north, the municipalities' average density rises to 75 inhabitants per km² for an average area of 440 km², comparable to the other countries in our sample.

The grouping of tenders for all subsidized transport services is possible only if these services are all under the responsibility of local authorities. This is shown in Table 2 below: in France, only a few services are subject to real tender, and some, like seated patients transportation are negotiated nationally. Inversely, in the Scandinavian

countries, all services are under the responsibility of local or regional authorities and funded by them, so they can, and frequently do, join to launch invitations to tender.

**Table 2 – Capacity to regroup services in the same call for bids**

| | France | Netherlands | Sweden | Denmark |
|---|---|---|---|---|
| All services are competitively tendered | | X | X | X |
| All services are under local responsibility | | | X | X |
| In some regions some services are regrouped | | X | X | X |
| In some regions all services are regrouped | | | X | X |

## France

France stands out as the country where the system is the most fragmented. It is true for the clients that very seldom join to merge their procurements. It is even truer of the transport operators, who, by law, belong to a patchwork of distinct regulations that strictly fence their capability to serve specific markets. Thus, one finds in France, besides the metered taxis, no less than four types of hire cars with driver services: the "voitures de petite remise", the "véhicules sanitaires légers", the "transports occasionnels", and the "voitures de tourisme avec chauffeur".

### Transport operators

The taxis and the *voitures de remise*, are regulated by the ministry of the Interior (the police). In the early 80's, yielding to the pressure of the taxi lobby, the ministry put an end to the development of the *voitures de remise* to prevent them from competing with the taxis on the telephone market. Unlike taxi licenses, the licenses to operate a *voiture de remise* are not transferable. Since the ministry stopped issuing licenses, this policy has been very successful in making the *voitures de remise* virtually disappear from the scene.

However, with the taxi lobby also resisting the issuance of new taxi licences, as a way to boost the market value of their own licences, the capped taxis could not meet the growing demand for transport. The first reaction came from the ministry of Health whose demand for non-emergency transport was partly unmet. As a result, to complement the taxi supply, ambulance operators were allowed, for each ambulance vehicle licence they owned, to put on the road two *véhicules sanitaires légers* i.e. "light sanitary vehicles", a type of hire cars with driver restricted to only carrying seated patients.

Another reaction came later from some entrepreneurs when they discovered a loophole in the law by which the ministry of Transport could grant licences for bus operators. This law was designed for scheduled and occasional "collective" transport. These entrepreneurs realised that as long as they would carry more than one passenger, they could register as "occasional collective transport" operators. Of course, working under the status of public transport operator, involves greater constraints than under a PHV type status and taxi unions are very quick to bring to court the operators they can catch with only one passenger on board. However, dodging these constraints, this quasi-PHV supply has been growing fast and now constitutes a transport sector on its own.

More recently, in 2009, the ministry of Finance and Industry created a new licence for *voiture de tourisme avec chauffeur* as a way to bypass the ministry of Interior's clamp on the *voitures de remise* and resurrect a real PHV sector. After a quick start, this new sector is now in limbo because the taxi lobby managed to get the ministry to gradually put more stumbling blocks on the entry to the business.

The table 3 below summarizes the various types of personal transport available in France and their legal constraints.

**Table 3 – Transport operators in France**

| Legal name | Legal constraint | Comment |
|---|---|---|
| Metered taxis | up to 9 passengers | Licenses capped but transferable |
| Voitures de remise | up to 9 passengers | PHV, extinct |
| Voitures de tourisme avec chauffeur (VTC) | up to 9 passengers, but increasing requirements to confine them to the luxury limousine market segment | PHV, in limbo or on borrowed time |
| Occasional collective transport (LOTI) | Mandatorily more then one passenger. | Busses, minibuses and a growing number of barely legal PHVs |
| Light Sanitary Vehicles (VSL) | for seated patients only | Reserved to ambulance operators |

Note: PHV stands for "Private Hire Vehicle", i.e. "hire cars with driver"

The taxi industry is very fragmented. Outside the Paris region, there are around some 30.000 taxi companies with 40.000 vehicles. Most of them are not connected to cooperative radio dispatch centres.

**Subsidized transport markets**

On the client side, things are barely simpler. In the case of France, taxi trips in and out of hospitals are subsidized by the national "Social Security" (the equivalent of the NHS in the UK), school trips by handicapped children are subsidized by *Départements* (Counties), on-demand trips by the elderly and the handicapped, are subsidized either by municipal governments or by counties. All these agencies and authorities have specific ways for contracting the taxis and the other transport operators for these services, and the amount of subsidy depends on both the traveller and the authority involved.

Trips to and from hospitals are free when doctors prescribe them. Patients can choose between taxis and VSL, i.e. the "light sanitary vehicles", as they will. Both are paid directly by the National Health Service. Every year the National Health Service negotiates with the national ambulance operators' union to set the fares charged by the VSL. Taxi trips are paid by the meter, but a countywide discount on the meter fare is negotiated with the taxi unions at the local level by the decentralized agencies of the National Health Service.

The National Health Service sets the rules by which their local agencies can contract taxis to carry seated patients. Ambulance companies use their VSL to compete with taxis for the seated patient market, but some of these ambulance companies also bought taxi licences to be able to dispatch the vehicle that would bring the most revenue for a given journey since taxis and VSL are not priced according to the same fare schedule.

School transport is under the responsibility of (and paid for by) the county governments (*départements*). It is generally carried out by bus, except in very low density areas where taxis and minibus operated under *transport occasionnel* licences can be called in. County governments are also in charge of school transport for handicapped children or special education transport. These are generally taken care by the same taxis and minibus operators under annual contracts. Until recently, these contracts were granted, on an *ad hoc* basis and with no real competition by the prefect of the *département*, the central government representative at the local level. Two years ago, this system has been reformed to comply with EU regulation on public tendering. Real invitations to tender are now published by the county governments. However, in most cases the allotment plans for these markets were designed in such a way that small taxi operators could not compete for lack of a sufficient vehicles fleet size.

Providing mobility to the elderly and the handicapped rests on the initiative of local governments at the municipal or at the county level. As a result, access conditions and operations can vary greatly from one place to the other, unlike medical and school transport, which are provided uniformly all over France. In some places, eligible customers pay a nominal fare (often the same as they would pay for regular public transport). In other places they are entitled to a limited number of trips (or distance) per month. In all cases, these services are heavily subsidized.

Outside the Paris Region, public transport networks in France are almost exclusively operated by private firms. Their contracts grant them a monopoly over the whole municipal or metropolitan network. Most of the time, these firms also operate the special demand responsive services for the elderly or for the handicapped through a subsidiary or by subcontracting taxis or smaller "occasional collective transport" operators. They may also operate general public demand responsive transport to substitute regular scheduled bus services where demand is too sparsely scattered. Through mergers and acquisitions, the public transport industry in France became a duopoly with two firms Veolia-Transdev and Keolis controlling almost all the networks except for Paris. These firms have developed sophisticated technologies for call and dispatch centres. However, since they have no access to the seated patient market and only marginally to the special school transport, the only demand responsive transport systems where they can implement this knowhow are rather limited and local.

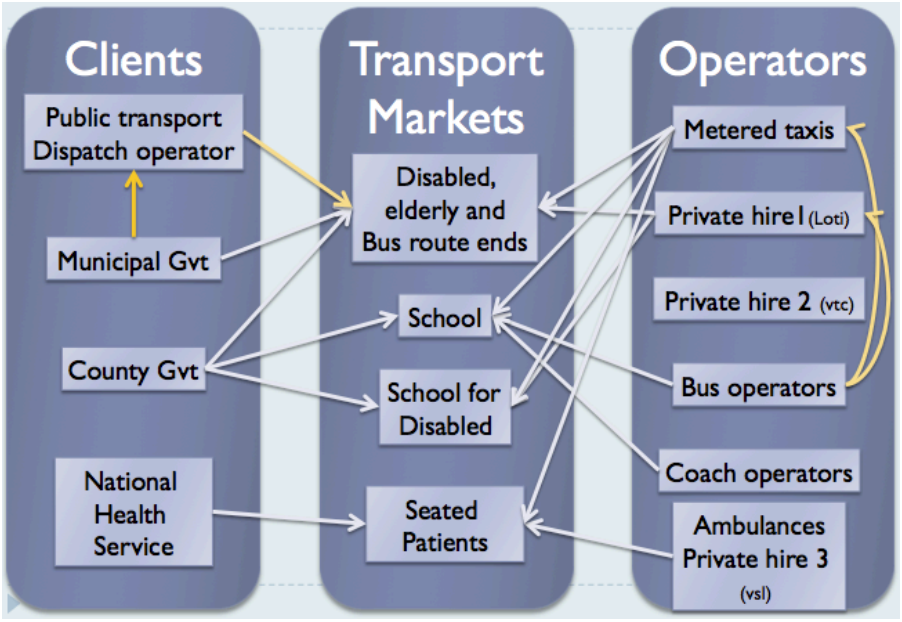
Table 4 below summarizes the market segmentation of subsidized transport in France.

**Table 4 – Market segmentation for subsidized transport in France**

| Market segment | Who contracts | Who pays |
|---|---|---|
| Transportation linked to health care entitlements | Regional Health Agencies | Ministry of Health |
| Transport for the elderly or/and for the disabled | Municipalities or counties | Municipalities or counties |
| DRT public transport service | Public transport operators or municipal or regional transport authorities | Municipalities or counties |
| Transportation of (disabled) schoolchildren | Counties | Counties and Ministry of education |

Interactions between clients, operators and subsidized transport markets in France

**Figure 4 — Interactions between clients, operators and subsidized transport markets in France**




### Taxis and subsidized markets

As we have seen, taxis have access to all of these subsidized markets. However in most of them, one or two other modes are competing with the taxis, and these modes are regulated by different authorities. In France, different ministries grant licences to specific types of transport operators:

— Taxi licenses are granted, for free, by municipal governments, under the close supervision of the Ministry of Interior. These licences are transferable and since their numbers are de facto capped, they acquire a market value that can reach several hundred thousands Euro.

— Licenses for public transport operators (including some types of private hire called "transport occasionnel") are granted by the Ministry of Transport. Public transport services are contracted by municipalities (urban) or by counties (interurban).

— Licenses for a new type of private hire vehicles called "voitures de tourisme avec chauffeur" are now granted by the Ministry of Finance.

— Licenses for "sanitary transport operators", i.e. ambulances (lying patient) and VSL (a special type of private hire for seated patient), are granted by the Ministry of Health. The number of vehicle licences is capped.

On the market for the disabled, the elderly and bus route ends, taxis face competition from *transport occasionnel*. On the regular school transport market, they only run the low demand routes for which bus or coach operators are not suited. On the market for the disabled school children, they face competition from *transport occasionnel*. On the market for seated patients they face competition from the VSL run by ambulance companies. The *voitures de tourisme avec chauffeur* operators demands to the legislator to get access to this market did not get any answer yet. It seems unlikely that they would be allowed to compete with the taxis in this market before long.

Most of these contracts are granted on an *ad hoc* basis. It is only recently that a regular procurement process was introduced in the market for the disabled school children in compliance with European directives. In the case of the market for seated patients, local health agencies negotiate with the taxis at the county level to obtain a discount on the

taximeter fares. But patients pay nothing, and are free to choose their transporter, whether taxi or VSL.

Public transport operators may contract taxis to operate as a substitute to scheduled services on low demand routes and for some demand-responsive transit service. They sometimes do this under request from municipal governments, but municipal governments may also contract taxis directly for the same services.

Table 5 below gives an estimate of the share of the various markets in the total sales of taxi operators.

**Table 5 – Share of the various markets in the total sales of taxi operators**

| | Rural Communes | Small Towns* | Large urban areas and Paris |
|---|---|---|---|
| Number of licences | 22 000 | 5 600 | 20 000 |
| Non-emergency medical transport | 70-90% | 10-40% | 5% |
| School transport | 0-10% | 0% | |
| Special school transport | 20-30% | 10% | |
| Disabled, elderly and other | Variable | Variable | |
| Complements to scheduled bus transport | Variable | Variable | |
| Taxi (téléphone & station) | 5% | 50-80% | 95% |

Sources : Darbéra 2012, p.18.
Note : * our "Small Towns" range from 20.000 to 190.000 inhabitants

Outside Paris, taxis are thus heavily dependent on subsidized demand responsive transport.

## The Netherlands

The Netherlands present a very different picture because of the 2000 deregulation of the taxi sector and because of the partial aggregation of the DRT market under "Regiotaxi".

### Transport operators

The Dutch taxi industry was totally deregulated in 2000. Prior to this deregulation, the 12 provinces of the Netherlands were the authorities that delivered taxi licences and established the fares. In some cases they had delegated this power to co-operations of municipalities. There were 27 taxi zones, corresponding to the perimeter of the authorities, and licences were delivered for one zone only, according to a quota based on the demand and on the possibility for a profitable operation (Baanders and Canoy, 2010). The links between the local authorities and the taxi industry were considered to be too close, the captured authorities becoming more concern about preserving the market value of the taxis licences rather than delivering mobility to their citizens. The 2000 centralisation of taxi policy did end this.

However, outside of the major towns, there was already a *de facto* deregulation in the mid-90s, when the taxi vehicles used for contract work were no longer included in the quotas.

As a result of deregulation, the distinction usually found in other countries between taxis and hire cars with driver services is blurred. All are called taxis. Baanders and Canoy (2010) distinguish several segments in the Dutch taxi market: (i) the contract market: taxis are hired (mostly by institutions) to perform regular trips according to a pre-arranged contract; the non-contract market, in which they distinguish: (ii) the call or telephone taxi, booked by calling a dispatching centre, and (iii) the street taxi, which is taken at a taxi rank or hailed in the street. This is a functional differentiation, not a legal one. It is mainly in the contract market that we find very large taxi companies.

In the Netherlands public transport is operated by private contractors, under the responsibility of, and with subsidies from the provincial government or from the 'urban regions' where the regional municipalities cooperate. Connexxion is by far the largest of these private contractors, however, it is not in a quasi-monopoly position. There is a well functioning competition in the regional public transport between Connexxion and five other large operators. The merger between Connexxion/Transdev and Veolia was admitted because their market share did not become too large. Besides operating scheduled bus routes, these large companies also operate de major part of the contract taxi fleet. The special transportation they deliver for specific target groups falls under the responsibility of different ministries.

**Subsidized transport markets**

The national service for disabled people (Valys), is a demand responsive transportation only for disabled, catering for trips over 20 km. It is organised and contracted by the national government through the Ministry of Health, Welfare and Sport (VWS). These contracts are awarded through a tendering process at the national level were taxi companies can compete as long as they operate vehicles that are specially adapted. At the moment, there is only one contract, with Connexxion. Under Valys, beneficiaries could travel 750 km/year at € 0.18 per kilometre. This has been reduced to 450 km in 2012. The high personal kilometre budget (PKB) remained constant: 2250 km for € 1.19 per kilometre.

For shorter distances, by law, under the Social Support Act (WMO), municipalities must provide transport to maintain social contacts for the elderly and the disabled. These are asked to contribute to roughly 10% of the cost.

The Netherlands have a dual-level system for health care insurance. All primary and curative care is financed from private obligatory insurance. Long term care for the elderly, the dying, the long term mentally ill etc. is covered by social insurance funded from earmarked taxation. In 2009 this social insurance covered 27% of all health care expenses.

Private insurance companies must offer a core universal insurance package for the universal primary curative care, which includes the cost of all prescription medicines. They must do this at a fixed price for all. This basic coverage pays by far the most important health care costs. An estimated 94% of healthcare costs are covered in the basic coverage. The basic coverage insures eight functions; of which #8 is transportation linked to health care entitlements. Most insurance packages allow patients to choose where they want to be treated. Under the Insurance Act, medically necessary transportation by taxi or private car is covered.

Insurance companies have management teams. Each one has its own tendering system to get a rebate on the taxis' metered fares. These tendering procedures do not have to comply with EEC rules since insurance companies are not protected from competition. Each health care insurance company has its own way of contracting with the taxi operators to provide this service, and to get reimbursed of their travel expenditure, patients must use the taxi company specified on their health care contract. However, there are also situations in which the client can choose his own taxi company without restrictions.

The long-term care for the elderly, the long-term mentally ill, day-care, and housing, including transportation to and from hospitals, are provided by competing institutions under the general law on special illnesses (AWBZ: algemene wet bijzonder ziekten). These institutions do the procurement for their transportation. They contract transport operators in different ways. Since they are not obliged to do a tendering there is no overview of how they do the procurement. From 2013 municipalities will become responsible for assignment of care, treatment and the connected transportation. This new task for municipalities will be part of the WMO from 2013. For the 8th function, the patient is allowed to choose his taxi company. The trip is paid by the AWBZ institution.

The Ministry of education, culture and science (OC&W) sets rules for the transportation of (disabled) schoolchildren. Municipalities procure this service from transport and taxi operators. This service is different from the services provided under the Social Support Act (WMO). Connexxion is the major operator for these contracts, but school children's transportation is often carried out by smaller local taxi companies. For them it's easy to execute (much easier to handle than DRT) and sometimes they make use of parents as drivers. Municipalities divide their school transportation in different lots to make an easy market entrance possible. The tendering process of transportation for schoolchildren differs between municipalities, but is always based on EU-rules on public tendering so that all operators can make a bid. Some municipalities provide in their tender the addresses of the children and schools and let the operator do the planning of routes. The contract will be awarded to one operator in this case. Other municipalities make routes themselves where operators can make bids on one or more or bundles of routes. In this case more than one operator can be awarded for the contracts. There is also differentiation between the ways prices are calculated. In one case is calculated with time (hours of operations, or driving time) in another case with distance (total driving kilometres or kilometres between served addresses). In many cases municipalities co-operate in the tendering procedure, which makes it possible to make more efficient

routes and lead to lower costs (also because the costs of the tendering procedure can be shared.

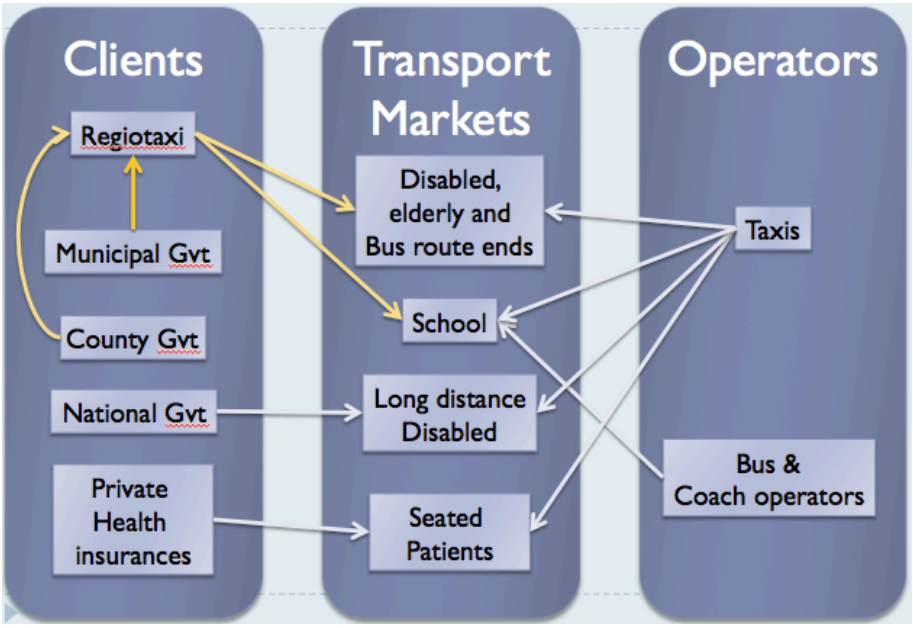
The Ministry of Infrastructure and Environment (Ministerie van Infrastructuur en Milieu, formally V&W) finances provincial public transport authorities (OV- autoriteit) to contract transport operators (including taxis) to provide Demand Responsive Transportation open to all (as part of the public transport system). This is often provided under the brand name "Regiotaxi" (see below).

The Ministry of social affairs and employment (SZW), through the Institution for employment of the disabled (WSW- instelling) and through the Benefits agency for the unemployed (UWV) provides transportation to work for the re-integration of handicapped people. This is not part of the Social Support Act (WMO). The UWV indeed does not contract operators for transportation. Clients will receive money for a taxi or the UWV will lend the client a car. The money is only available if ones annual income does not exceed a certain amount.

**Table 6 – Market segmentation for subsidized transport in the Netherlands**

<table>
<tr><th>Market segment</th><th colspan="2">Who contracts</th><th colspan="2">Who pays</th></tr>
<tr><td>Transportation linked to health care entitlements</td><td colspan="2">Private insurance companies</td><td colspan="2">Private insurance companies</td></tr>
<tr><td>Transportation linked to long term care entitlements</td><td colspan="2">Long term care institutions</td><td colspan="2">Ministry of health through earmarked taxation</td></tr>
<tr><td>Transport over 20 km for disabled (Valys)</td><td colspan="2">Ministry of health</td><td colspan="2">Ministry of health</td></tr>
<tr><td>Transport for the elderly and under 20 km for the disabled</td><td>Municipalities</td><td rowspan="2">Regiotaxi</td><td>Municipalities</td><td rowspan="2">Municipalities through Regiotaxi</td></tr>
<tr><td>DRT public transport service</td><td>Municipalities or regional transport authorities</td><td>Municipalities</td></tr>
<tr><td>Transportation of (disabled) schoolchildren</td><td colspan="2">Municipalities</td><td colspan="2">Ministry of education</td></tr>
</table>

**Figure 5 — Interactions between clients, operators and subsidized transport markets in the Netherlands**




In some areas, Regiotaxi is a brand name for a DRT public transport service, combining transport for elderly and disabled people with public transport travellers, especially in low-density areas. Regiotaxi offers a door-to-door service. Since its slow start in 1995 the number of Regiotaxi services in the Netherlands has increased and nowadays covers 85% of the Dutch territory (KNV, 2009). Elderly or disabled people that are under WMO (law for disabled people) pay the regular public transport fare for a ride in Regiotaxi. People using Regiotaxi instead of regular transport (for example in rural areas without buses) pay a higher fare. Because Regiotaxi falls under a joint responsibility of the province and of the municipalities of a given area, the procurement process is special. It is mostly carried out by the provincial public transport authority.

In most regions, the services are tendered as a package including the call centre, the dispatch centre and the transport operations. Most of the time, the winner mostly manages the call centre and subcontracts the transport operators together with their own dispatch centres.

### Taxis and subsidized markets

There are 5000 taxi companies in the Netherlands with 25,500 vehicles, of which 25.5% (approximately 6,500 vehicles) are based in the four major cities. Approximately 40,000 drivers are employed in the industry. More than half the 5,200 companies have only one car. The others have a dozen vehicles on the average, except for Connexxion with its 4000 vehicles and and PZN-Véolia with its 500 vehicles.

Based on a survey among taxi operators[6], the share of pre-contracted work in the total turnover is estimated at an average of 68% for the whole country in 2003, varying from 30% in the four large cities to 77% in the countryside. More recent data from KNV (Royal Dutch Transport) show that, in 2006, subsidized transport accounted for 60% of the total turnover of the industry at the national level. Table 7 below gives the breakdown by type of transport.

**Table 7 – Breakdown by activity of total turnover in the taxi industry (2005)**

| | |
|---|---|
| CVV / Regiotaxi * | 23% |
| Student transport | 15% |
| Other collective transport (overig groepsvervoer) | 15% |
| Seated patient transport | 7% |
| Non-subsidized transport (street and private contracts) | 40% |
| Total turnover VAT excluded 1.095 M€ | 100% |

Source: KNV, 2007, p.9
Note: * RegioTaxi falls mostly under collective demand responsive transport (CVV) contracts.

All types of taxi-companies can bid for contracts. However, the bigger contracts are only within reach of larger companies. These companies then usually subcontract substantial part (60% in the case of Connexxion) of their contracts to small operators. In the case of Regiotaxi, there are approximately 40-50 contracts. Besides Connexxion, the market leader, larger companies (50-150 cars) or taxi cooperatives have most of the Regiotaxi contracts. Smaller taxi companies lack size and expertise.

As a result, according to Westerlund & Cazemier (2007), metered taxis don't play a substantial role in contracted transportation for public transport or special transportation services, although 51% of the metered taxi vehicles are mini-buses and wheelchair vans. Most of the contracts are won by "contract taxi" companies, i.e. larger PHV companies.

## Sweden

### Transport operators

In Sweden the taxi industry was fully deregulated in 1990. There are about 9000 taxi companies with a total of some 15.000 vehicles. Although the requirement that a taxicab must belong to a central booking service was abolished in 1990 (Pelli and Puu, 2001, p. 8), almost all the taxis are connected to radio dispatch centres, most of them are cooperatives.

One of the reasons mentioned behind the deregulation of the taxi market was to give a breathing space to free competition in order to reduce government spending on subsidized medical travel. (Pelli and Puu, 2001, p. 8)

### Subsidized transport markets

Until 1992 health insurance funds were responsible for patient transports. A patient could phone the taxi company he wished, or if necessary an ambulance, and then receive travel reimbursement from the insurance. For the state, this was considered an expensive option and in 1992 the national government transferred the responsibility for health trips from the insurance funds to the county councils. The underlying idea of this reform was that the county councils would be able to procure medical transportation in a competitive market. This was considered to be advantageous since seated patient transport and ambulance services could be better coordinated and ultimately lead to a reduction of government expenditure for medical transport.

According to Swedish law, the counties or regions (in three instances) are responsible for the health care (and related medical transportation) and for the general public transportation in their service area. The new public transport law that takes effect in

[6] TNS Nipo Consult – KPMG BEA, bijlagerapporten Monitoring deregulering taxivervoer: 1999-2003.

2012 requires the establishment of new regional Public Transport Authorities (PTA) and also opens up for private operators to set up non-subsidized public transport services as they see fit. The counties/regions collect taxes for health care (and medical transportation) and for all or part (normally around 50 %) of the public transport, where the rest is financed by municipal taxes. There is basically no state support for these two domains – only for special projects and for large infrastructure investments (rails, trains, trams and possibly bus rapid transit).

Special public transport[7] (SPT) for disabled and elderly persons (everywhere) and complementary public transport in rural areas is a municipal responsibility (as is school transport for all school children in need of mobility services). By law the municipalities will grant the individual permits to use SPT and to decide the service level and the user fees for these services. About 4 % of the Swedish population are eligible for SPT.

However, just as in Denmark, the law allows for the municipalities to delegate this responsibility to the regional Public Transport Authorities that can manage the SPT service in a coordinated manner with other subsidized transport services, i.e. to determine eligibility, to receive bookings, to plan and coordinate these trips with other subsidized mobility services. Thus SPT is often coordinated with medical transport for sitting patients, that is managed by the county council and often the doctors will decide the need for special transport on an *ad hoc* basis.

### Taxis and subsidized markets

The regional Public Transport Authorities may contract taxis to operate low demand routes, feeder services to rural bus routes and other complementary public transport. Municipal governments may contract taxis to provide transport services for the disabled, the elderly (SPT) and school transport for children under 16 years old. County/regional governments may contract taxis to carry seated patients.

Metered taxis are thus present on all of these markets but they also face competition from larger bus operators on occasional transport. However, in the vast, very sparsely rural areas such competition is rare.

According to the Swedish Taxi Association's estimate (See Table 8), such contracts accounted for an estimated 56 % of all taxi revenues in Sweden, but with wide variations from 15-20 % in Stockholm and 90% in the countryside (SOU 1999:60).

**Table 8 – Taxi markets in Sweden in 1999.**

| Segments | tax. (Mkr) | Percentage |
|---|---|---|
| Municipalities / county | 4500 | 56 |
| - Of which transportation service | 2 250 | 28 |
| - patient transport | 1 370 | 17 |
| - school bus | 880 | 11 |
| Individuals | 1 800 | 23 |
| Corporations | 1 700 | 21 |
| Total | 8 000 | 100 |

Source: SOU 1999:60 “Customer-friendly taxis” page 31

## Denmark

Just as in Sweden, the Danish authorities are relying heavily on the taxi industry to carry out subsidized demand responsive transport services in a coordinated manner and under contracts in a public tendering process. Taxi and bus companies are invited to bid for various “packages” of transport services according to somewhat varying procurement models.

### The transport operators

In Denmark, as in France, taxi licenses are granted for free by the municipalities (*kommuner*). But, unlike France, they are not transferable. They therefore have no market value. As in France, the opposition of the taxis already established to the creation of new licenses results in a de facto quota. But, because the municipalities in Denmark are on average 30 times larger and 30 times more populous than the French *communes*, areas where taxis can operate are significantly larger.

[7] (Särskild kollektivtrafik)

As in France, the government is trying to hinder the development of hire cars with driver to protect the taxis from their competition. They progress, however in some market segments especially with vehicles specially adapted for disabled people.

There are about 3000 taxi companies in Denmark that operate a total of approximately 5000 vehicles. The sector is mainly a sector of single licence owners. 2300 of these vehicles are located in Copenhagen with 8000 drivers. The supply of taxis, reported to the Danish population is two to three times higher than it is in France.

Licenses for buses, vans and coach are granted by the Ministry of transport. There are no licenses for 'sanitary transport operators', i.e. ambulances (lying patient) - instead the regional governments make separate procurements.

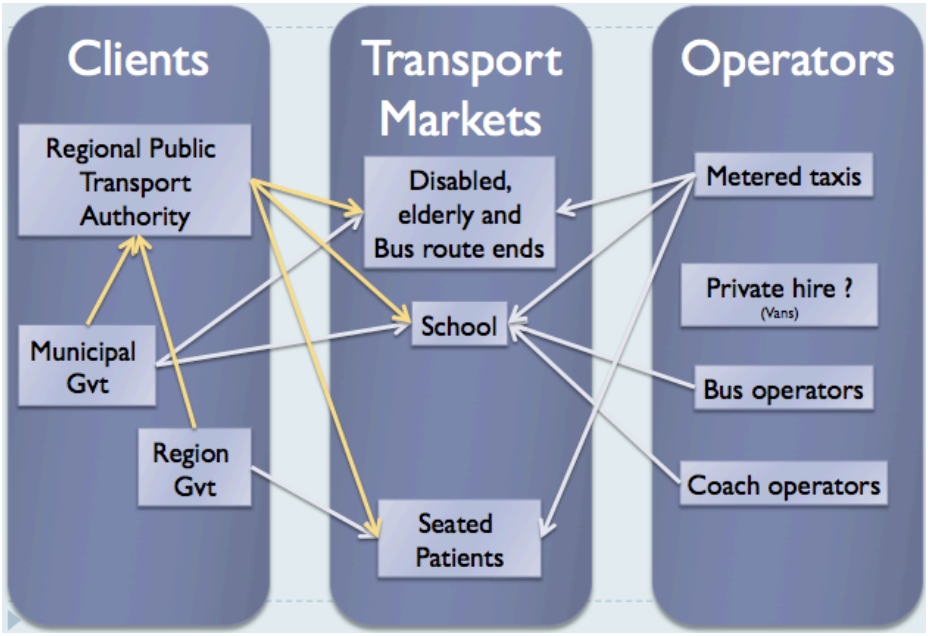
**The subsidized transport markets in Denmark**

In each one of the six regions, there is an "incorporated" Public Transportation Agency (PTA). These agencies are owned by the regions and municipalities and regulated in the Law for Public Transportation Agencies. They are responsible for local railways and for bus services, but do not operate any vehicles of their own. Transport services are procured from private operators in a manner that is compatible with the European Directive for Public Procurement.

A nationally mandated "Handicap service" provides each disabled person with 104 one-way trips per year, almost fully subsidized by municipal governments. Transports to regional health services are a regional responsibility but there are also local medical and rehab trips that are a municipal matter. Complementary (mostly rural) public transport is managed by the regional public transport agencies (PTAs), but is subsidized by the municipalities that also decide on service level and price. In addition there are various municipal mobility trips, special school, day-care, etc.

All these governments and services can have specific ways of contracting the taxis for these services, or can give the task to the regional PTA that manages a procurement process for the integrated transport services.

**Figure 6 — Interactions between clients, operators and subsidized transport markets in Denmark**




## Aggregating DRT markets without excluding smaller taxi companies

For reasons we have mentioned in the introduction, the needs for subsidized demand responsive transports are growing rapidly in most countries of old Europe. Faced with the explosion of the budgets they devote to them, governments try to implement policies to contain these costs. These policies vary from country to country, but rely on the same two ingredients: (i) combining them as much as possible services for different target groups and (ii) introduce more competition between carriers during the procurement.

Both strategies are intimately linked. Indeed, the degree of competition depends on the number of competitors, the number of competitors depends on market size and market size depends on the ability of the different administrations to cooperate to combine their

transport needs to cater for their respective beneficiaries in the same vehicles and to carry out joint tendering.

But markets of DRT, particularly in low-density areas, exhibit several characteristics of what economists call "natural monopolies". These characteristics are: (i) economies of scale (e.g. in the corridors of demand), (ii) economies of scope (e.g. having a diversified fleet of vehicles to suit specific requests) and (iii) economies of reputation (for example those related to telephone call centres that favour the first installed). All these characteristics of natural monopolies tend to favour larger companies. This is why it is difficult to conceive and organize tenders that would not de facto exclude small taxi companies and single taxi licence owners.

In all European countries, and even the Netherlands, the taxi industry is primarily a "cottage industry". The majority of taxi companies operate only one vehicle. In rural areas, these companies are highly integrated in their social environment. Excluding them from the subsidized transport markets equates sentencing them to disappear because these markets provide 80 to 90% of their turnover. Their disappearance in turn removes the services, which admittedly, were only 10 to 20% of their turnover, but were nonetheless essential to the welfare of the populations serviced.

Preparing tenders so that small taxi businesses can respond also has the advantage of potentially lowering prices. Indeed, it is precisely because they have the exclusive right to pick up customers at taxi ranks and stations or in the street that taxis can achieve economies of scope by playing in both their exclusive market and the subsidized DRT markets.

Several regions of Denmark, Sweden and the Netherlands have come up with creative solutions to this dilemma. In all three countries, the different subsidized transport services are subject to tender by the various institutions that eventually pay for them.

In most regions of Sweden and Denmark several or all of these different organizations have been able to agree at the regional level to carry out joint tenders through a single authority. This regional authority is responsible not only for the selection of carriers, their remuneration and allocation of costs among payers, but also for all the logistics that allocate passengers to vehicles and determine vehicle routes. In the Netherlands, however, when they exist, these groupings affect only two markets: the short-distance transport of disabled persons, and that of complementary services of public transport networks.

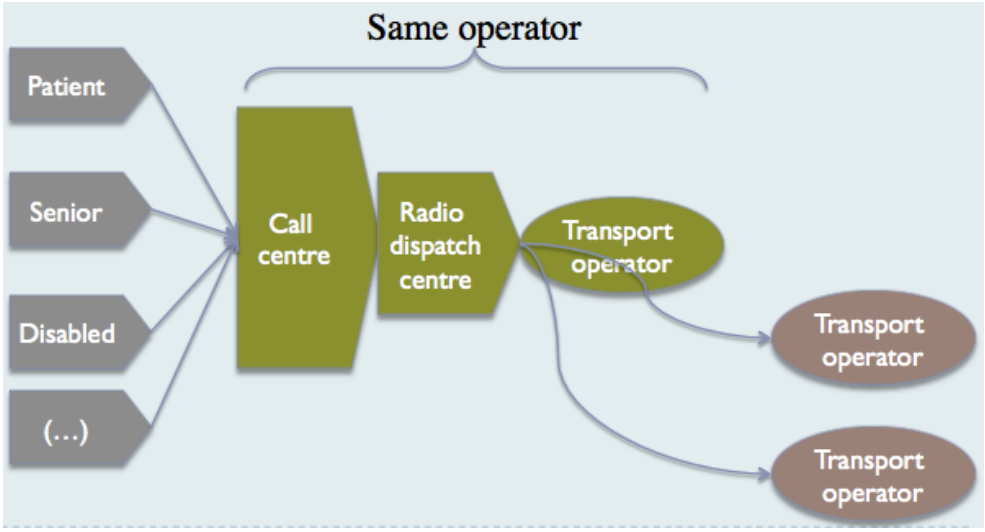
## The Regiotaxi system in the Netherlands

In most regions of the Netherlands, the regional government and municipalities pool their needs for the transport market of people with disabilities and the market for complementary public transport service in sparsely populated areas or in off hours. This is the Regiotaxi system. The transport market of seated patients, that of school transport, transport to nursing homes or long-distance transport of persons with disabilities are not integrated into Regiotaxi.

In most cases, once the market for Regiotaxi has been assigned, usually for four or five years, the regional government has little information about how the system works. It simply pays the trips at the agreed price, and conduct satisfaction surveys of those who were transported. It is up to the provider whenever possible to combine the various trips to fill its vehicles and thus increase its margin.

To reduce costs, the Dutch system relies on private providers because they are subject to competition during periodic tenders. Indeed, since they are paid according to the number of trips provided, these providers have an incentive to optimize their collection system to ensure maximum number of trips with a minimum number of vehicles and empty miles.

**Figure 7 — Procurement model of the Regiotaxi system**




The Dutch procurement model for Regiotaxi and similar DRT services has some drawbacks due to its lack of transparency. As we have seen, DRT systems are tendered by municipalities or provincial public transport authorities. The public bodies usually keep some distance to the development of the transport system. Operators are considered to be transport specialists that can best develop (the details of) the transport system and that also have the greatest expertise in aspects like planning, radio dispatch centre, vehicles and so on. The result of this is that the municipality or public transport authority formulates a set of demands and then procures the complete transport system in one procedure. After signing the contract, all activities to implement the system have to be done by the selected operator.

The contracting authority has no information on the unit costs of the different types of services, or even on the conditions under which they are provided. It can, of course, and it does, conduct satisfaction surveys of its beneficiaries. But it is often difficult when failures happen, e.g. for missed appointments, to attribute responsibility to the carrier or to the person who requested the trip. When problems occur during the implementation of the system or during the operation, the public bodies have no or limited knowledge of what can be done to reduce the problems, since most of the knowledge is retained in the transport company.

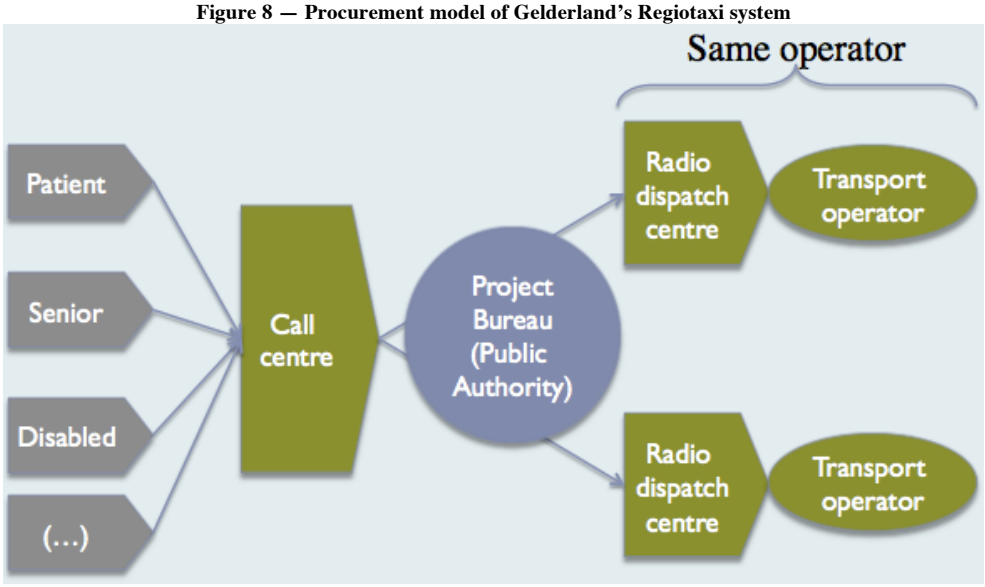
Most contracts have a term of 3-5 years, and after this period the contract is tendered again. The other drawback is that at the periodic tenders, the incumbent has an advantage because it is he alone who has the knowledge of the actual market conditions. He can therefore charge prices significantly higher than his costs because he knows that his competitors should integrate the cost of risk into their prices. If by chance he would lose the market, the competitor who would replace him would be forced to go through a learning phase during which not only his costs would be higher but also the provision of the service would be of lower quality due to inevitable failures resulting from lack of experience.

Finally, the system favours big businesses: about half of the Regiotaxi contracts were won by Connexxion, which sub-contracted about 60% of it to smaller taxi companies.

How to entrust private providers with the organization and operation of DRT systems while maintaining transparency? The province of Gelderland provided original solutions to this dilemma. Unlike other regions of the Netherlands who entrust the whole Regiotaxi service to one company selected by tender, this province has segmented its tender for Regiotaxi into six distinct elements: one tender for the call centre and five tenders for dispatch and transport services in five predefined areas within its jurisdiction. These areas, which include an average of half a dozen municipalities, have been designed so that companies or taxi cooperatives can be put in competition to place bids within each. Without this segmentation of the tender, these companies would be too small to bid and would be forced to be only sub-contracted by the regional taxi company or, more likely by the nationwide company that would have won the contract. Of course, the five selected companies can in turn make use of subcontractors, that is to say, to smaller taxi companies, or even individuals, for whom they handle the logistics. At the last tender, twenty subcontractors were involved this way.

When it receives a request for a trip, the call centre of Gelderland transmits it directly to the one of the five operators that is concerned. This operator reviews the request, plans his route, and returns its proposal to the call centre that takes care of communicating it to the person who ordered the trip. Besides this market segmentation, the other original feature of the province of Gelderland model, is that between the call centre on the one hand and dispatch and transport operators on the other hand stands a "Projectbureau" to monitor the whole system in real time. All information exchanged between the operator of the call centre and transport operators passes through the computer system of this control office managed by the region which also receives real-time GPS coordinates of each vehicle. All these data are recorded and a statistical analysis is done regularly. Total transparency resulting from this organization can provide all the necessary information to competitors during the bidding at contract renewals, but it also allows the regional government to assess the quality of the service, and even track failures in real-time.

**Figure 8 — Procurement model of Gelderland's Regiotaxi system**




When it comes to the tendering in Gelderland operators place their bid with a price per passenger-zone. The zone has an average size of 4,5 km cross-section, and the operator will be paid the number of zones a passenger travels plus one. For a local trip (one zone) an operator gets paid two zones, for a two zone trip three zones, etc. The cost price of one zone is approximately € 3,75.

The division of costs between municipalities and province is as follows:

- For all Wmo-trips the province pays € 0,84 per zone, the rest of the costs are for the municipalities;
- For all other trips the costs are for the province;
- All overhead costs are divided 50-50 between province and municipalities.

The main characteristics of the Regiotaxi operations are given in appendix 2.

## The "Planet" system in Scandinavia

In Sweden and Denmark, all the responsibilities for providing subsidized transport are obligations of local bodies only, at the county and municipal levels. In several counties, the jurisdictions and agencies have been able to agree to pool their needs and create a single authority or organisation in charge of making calls for tender, selecting the carriers, ensuring the logistics system, paying the carriers, and charging the different agencies of the consortium transportation costs of the people to whom they must ensure mobility.

Consolidating markets as diverse as transportation for seated patients and public transportation in low-density area requires that one can put in the same vehicle people who are within different programs. This requires a suitable tool. Large parts of the Scandinavian subsidized transports are built around a booking, planning and dispatching system originally developed by Volvo in Sweden in the mid 80's that, over constant improvements, took the name "Planet". The public transport authorities of Denmark have created a public company, FlexDanmark, which has purchased a license for Planet, has adapted it to its needs under the name FlexTrafik, and makes an original use of it. FlexDanmark uses the Internet to make the system usable by regions that wish to

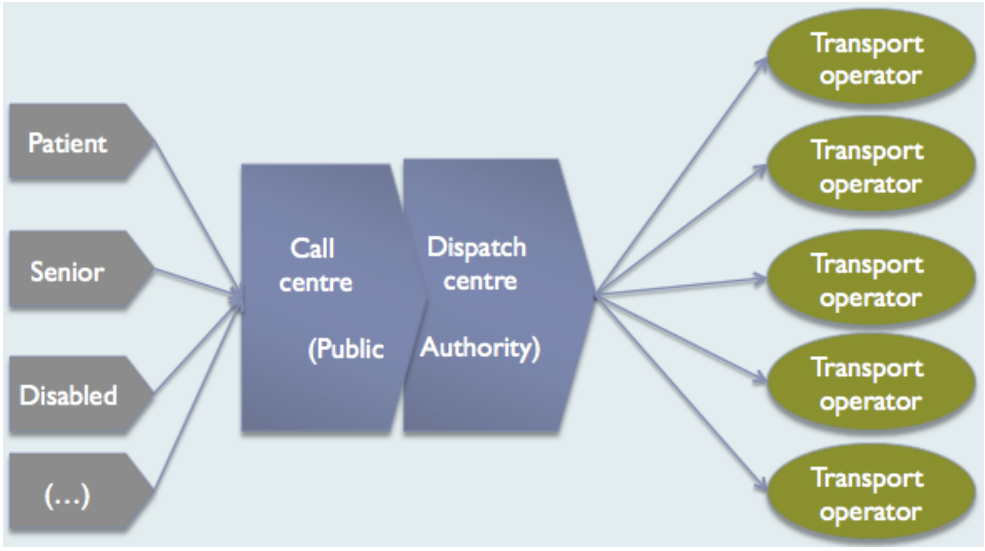
coordinate their DRT services. Several regions in Sweden now also use this booking and logistics system.

### Coordinating the demands

The first challenge in Denmark and Sweden was to coordinate as much as possible the various subsidized transport services to increase the volume of travel to be treated, and thus increase the likelihood that several passengers could share the same vehicle, thus increasing the vehicle occupancy rate. A larger volume to be treated can also bind the various trips optimally to reduce the dead mileage between the different assignments. The first systematic attempts to do this with an advanced information-and-communication technology (ICT) system (with mobile data communication) was implemented in the municipality of Borås in 1985 and later followed by others like Gothenburg (1993).

In 1998, the transport authorities of two Danish regions, the North Jutland (Nordjylland) and Zealand (Sjælland), jointly acquired the Planet system and have later created a public company, FlexDanmark based in Aalborg to adapt, develop and use this software for coordination of all subsidized transports that they provide under the name Flextrafik. FlexDenmark is a nation wide ICT infrastructure and competence centre. Its services allows for coordinating trips for various regional and municipal clients and assigning them to transport operators selected through the procurement process that will be described later in the paper.

**Figure 9 — When the public authority operates both call & dispatch, many small transport operators can be contracted (Denmark & some Swedish counties)**




FlexTrafic manages calls by phone or Internet, record orders, select the vehicle, optimize its route, and spread the cost of transport between the different entities responsible for the different passengers sharing the vehicle. The specificity of the FlexTrafic system over all the other DRT management software available on the market place, lies in its own way of selecting the vehicle that will perform the transportation and in the way its spreads the cost of this transport between different payers. The vehicle selection is intimately linked to the tendering system.

### Optimizing the transport supply

A complex tendering system was designed to make sure to get the lowest prices by opening competition to all the transport operators on the market, including the smallest. Indeed, in Denmark as in Sweden, the regional transport authorities make extensive use of taxis to provide DRT services.

This bidding system distinguishes two types of contracts: "day" contracts and "occasional" contracts:

In “day contracts”, the transport operators provide the Agency with a fixed number of vehicles for a given period of time, usually the day. This availability is paid whether the vehicles are used or not. The contracts also specify an "home area" where the vehicle is based. This type of contract is normally used for special vehicles, or for more or less regular circuits. The contract period is usually 2 to 4 years.

In “occasional contracts” the transport operators undertake to make available to the agency a maximum number of vehicles at certain times of the day (generally by the hour). Transport operators are paid only for vehicles actually used, including the return trip to the base or “home area”. The contract period is usually shorter than for day contracts. In Denmark, carriers can updated their prices annually by Internet.

For both types of contracts, transport operators bid a price per minute. Prices per minute are generally lower for “day contracts”.

When it gets a booking for a trip, the software selects the vehicle with the lowest cost. This can be a vehicle from the operator who offered the lowest price per minute, but it can also be the vehicle whose home base is the closest to the starting point of the journey, or even a vehicle already assigned that the change in route will not too much delay the travellers already in the vehicle and will be cheaper than the use of an empty vehicle, coming from farther away or more expensive by the minute. Normally, the system also takes into account the remuneration of the empty return to base. As the vehicle is also monitored in real time while returning empty to its base, it may at any time be reassigned to a new journey if it is the best placed.

In the region of Zealand in Denmark, Movia, the transport authority in the region, uses FlexTrafic to manage 160 vehicles in “day contract” and 1200 vehicles in “occasional contracts” for a population of about 2 million inhabitants.

Two counties on the west coast of Sweden: Västra Götaland and Halland, use a system very similar to the Danish system, adapted from the Planet software. The “occasional contracts” generally involve taxis, and the “day contract” make use of both taxis and providers with "special vehicles", often minibusses adapted to transport disabled persons in wheelchairs.

**The service**

The planning process is the same for FlexTrafic and Planet. The only differences lay in the parameters that define the service levels. These parameters are detailed in appendix 1.

When a user calls to book a trip, the software first checks if he is entitled to subsidized transport. It then notes the starting address of the trip, its destination and the time at which the person wishes to leave or to arrive. It searches for the vehicle that will make the trip’s (generalized) cost lowest depending on the scheduling algorithm. This vehicle can be a vehicle available that is not yet in service and located at its base, or a vehicle to which one or more trips have already been allocated and will be diverted to take this additional traveller. The different parameters (detailed in Appendix) such as time of booking, pickup window, or potential detour, allow the software to optimize, within certain limits, the path of the vehicle to increase its occupancy rate.

When the passenger boards, its identification allows the software to spread the cost of running the vehicle between all the passengers on board and to charge the various agencies that fund the mobility of these travellers. The cost that will be billed to the payers depends on the filling ratio of the vehicle. This is an incentive for hospitals to coordinate the treatments of their long-term patients and for municipalities to encourage their citizens to travel at the same times.

Regularly, a sample of travellers is surveyed to assess their trip of the day before on a scale of satisfaction with different aspects of service such as timeliness, quality of care, comfort, etc. The transport authority to apply any sanctions to operators who do not deliver satisfactory service uses these evaluations. They are also used during the renewal of tenders.

## Conclusion

The growth of subsidized transportation needs strains public institutions and local government budgets. The technical tools that would contain or even reduce these costs are: GPS, Internet, mobile telephony, etc. But their implementation is hampered by institutional and regulatory problems, which are specific to each country. Various local authorities in Sweden, Denmark and the Netherlands have provided original solutions to these problems. Before even discussing transferability, it would be interesting to compare the effectiveness of these solutions in terms of economic gain. Such a comparison, however, poses difficult methodological problems due to differences between countries in terms of labour cost, taxation, geography, etc. An approach based on technical ratios would overcome some of these methodological difficulties. Indicators such as the percentage of dead mileage, or the ratio travellers-km over vehicles-km, correlated to

variables such as population density or the ratio of eligible population over total population, would release an indication of the gains that could be expected from comparable reforms if carried out in other places.

The tight budget of this research did not provide the means to conduct such comparisons. A number of lessons can nevertheless be drawn from our analysis.

If it is certain that bringing together the different DRT services streamlines the use made of vehicles, we also saw the dangers of carrying out tenders that systematically favour the biggest companies. These companies certainly master the logistics and own the equipment to manage economically bundled services, but the loss of transparency to the public agency adds to the danger of crowding out the small taxi companies in rural areas, and, with them, the social role these small operators play in their activity besides subsidized transportation.

Our analysis also shows the vital role an inter-municipal transport authority must play, not only to procure the services, but also to closely supervise the entire activity as in the province of Gelderland, or even to manage itself the entire logistics system, as in many Scandinavian regions.

Taxis seem to be an essential element of any solution, because they are scattered all over the entire territory, including near the relatively isolated populations, and also because of their exclusive right to pick up passengers at stations and in the street.

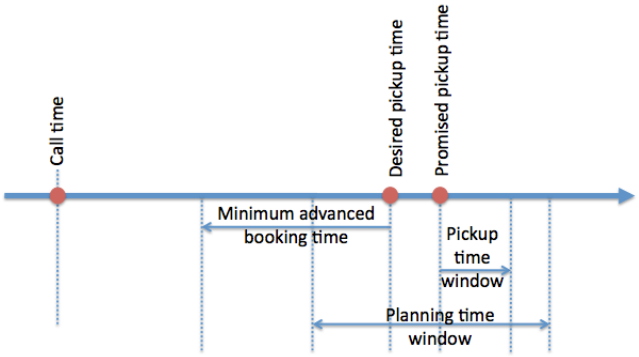
We have also seen that the regulation of taxis is not a major obstacle to the implementation of such policies. Indeed, one can find almost identical models of tendering and managing DRT services in both Sweden and Denmark, while in the first country the taxi industry is completely deregulated and in the other the sector is highly regulated with, as in France, a quota on the licenses and administrated fares.

## Appendix 1: Services Settings in the case of the province of Halland in Sweden

In the region of Halland, the parameters used by Hallandstrafiken, the transport authority, in its planning process are:

- SPT service (for disabled and elderly) is available during the same hours as regular public transport, 06-24 in weekdays and 06-02 in weekends.
- A minimum “advance booking time” is imposed on the customer between the time he calls to book a ride and his desired pickup time.
- A “planning time window” of +/- 30 minutes, which means that when calling, customers must be prepared to be picked up from 30 minutes earlier and at the latest 30 minutes after the desired pick-up time. The customer gets a “promised time” after a calculation in the system (takes only seconds).
- A “pick-up window” of + 20 minutes which means that the trip will start no later than 20 minutes after the “promised time” in the moment of ordering. (This is +10 min in Västra Götaland – 20 min is rather long…) In a similar manner there is a drop-off window of -20 minutes for customers that prefer a promised drop-off time. They will arrive no more than 20 minutes before the promised time – this is normally used for appointments etc.
- There is a “travel guarantee” in a similar way as for regular public transport, with a compensation to the user if these time limits are not met and a penalty for the operator if he has caused a delay.
- In case of a last minute call, the vehicle must arrive within the hour following the call. If the vehicle is more than 20 minutes late, the trip is given for free.

**Figure 10 - Booking and assignment parameters**




The service level also is affected by some deviation parameters for extra travel time due to coordination of trips (ride-sharing) in the system. In the case of Halland:

- 20 minutes deviation time is always permitted – independent of trip length.
- There will never be more than 100% extra time, i.e. a trip with ridesharing will not take more than twice as long as an exclusive taxi trip.

Other planning parameters that are used in the optimization process are:

- The characteristics of the selected vehicle have to match the needs of each individual customer (as recorded in his profile).
- The service area (region) is divided into a number of zones in which customers and vehicles are located. The purpose of this zoning is to simplify the calculations required to find the shortest routes.
- A matrix of driving time between zones is used to calculate the optimal route between the taxi base, the picks up and the drops off; with a provision for individually set extra times for pick-up/drop-off of customers with special needs.
- The operators' bid prices per minute to select the cheapest among the vehicles available.
- The real time geographic position of vehicles that allows to book orders onto existing assignments.

## Appendix 2: Regiotaxi service main characteristics

Regiotaxi Gelderland is a partnership between the Province of Gelderland and 38 municipalities. The area is divided into 5 regions where a total of 5 carriers and over 20 subcontractors supply each year 1.6 million journeys. That equates to around 135,000 rides per month.

The main characteristics of the Regiotaxi operations are: [8]

— Demand responsive shared taxi, door-to-door;
— Users book their trips at least 60 or 30 minutes before the requested departure time;
— A time window of +/- 10 or 15 minutes around the requested time;
— Detours are allowed due to ridesharing, can be maximized as a parameter;
— Open to the public but mainly used by elderly and disabled people;
— Fares: for disabled equal to public transport fare, for others fares are about 3-4 times the normal public transport fare;
— Average subsidy rate is 50-70 %, equal to normal public transport
— Focus on rural areas.
— Maximum trip distance: 20 km.

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