International Workshop
"Intermodal Connectivity at European Transport Network Points: Why so late?"

Intermodality of Network Points: The planners view

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Abstract

Intermodal nodal points concerning the passenger services and goods transport connect not only physical infrastructures but also transport services of different modes of transport. With it, they facilitate multimodal transport chains with an ecologically and economically optimal use of different means of transport. Planning, construction and running of such intermodal nodal points are complex tasks whereas their solution is often linked with additional expenditures concerning the transport suppliers and demanders. In a liberalised transport market, there is the danger that the individual participants abandon the running of multimodal transports and the construction of intermodal nodal points due to cost reasons. However, if they are to be more spread out with reference to the overall objectives (e.g. sustainability), the responsibility for a multimodal transport system as a whole with sufficient and suitably equipped intermodal nodal points must be looked after and be unquestionably promoted by the public transport and spatial planning of the public communities.
1  “Intermodal network points” concept

As a rule, the term "intermodal network points" stands for large systems in which the networks of various means of transport are connected, as for example airports with integrated railway stations, park and ride facilities, ports with rail access or terminals for combined rail/road transport. However, from the point of view of the transport and spatial planning, confining this term to large systems and to motorised means of transport falls short.

Most travels by people involve multimodal transport chains. Generally, destinations cannot be reached on a single trip by a single means of transport. Most people’s travel start with a walk to the parking place of their own individual means of transport (car, motorcycle, bicycle) or to the nearest public transport stop. Therefore, travels are mostly intermodal sequences of unimodal stages of various means of transport with interchanges from one means of transport to others. These interchange points are the intermodal network points within a multimodal transportation system.

1.1  Physical and functional dimensions of intermodal network points

To understand the importance and the problems of intermodal network points from a planners view, it is necessary to distinguish between physical and functional dimensions.

1.1.1  Physical dimension of intermodal network points

In the narrow physical sense, intermodal network points are structural transition or interconnecting points between the infrastructures of the various transport networks. They consist of structural and technical installations providing access to the networks (platform, transhipment installations, etc.).

1.1.2  Functional dimension of intermodal network points

In a functional sense, however, intermodal network points are also the interconnecting points between various transport services. With it, different logical transport networks are connected. Thereby the connections always occur in horizontal direction and sometimes simultaneously in vertical direction:

- Horizontal connection:
  connection of logical traffic networks
- on different modes of transport (road, rail, water, air)
- by different means of transport (pedestrian, bicycle, car, railways, ship, plain)

- **Vertical connection:**
  connection of logical transport networks on different spatial levels
  - Long-distance transports
  - Regional transports
  - Local transports

In order to facilitate these complex functional connections, various interconnections need to be offered at intermodal network points:

- **Interconnection of transport services**
  - functionally
    (guarantee of ongoing transport of all transport goods without interruption and transhipment
    e.g. luggage service in the passenger services)
  - in time
    (guarantee of providing connections without waiting periods)
  - spatial
    (guarantee of origin-destination-relations without detours)

- **Interconnection of transport information**
  - Intermodal timetables
    (door-to-door timetables)
  - Travelling and transport information
    (passenger's information, tracking and tracing)

- **Interconnection of booking**
  - Ticketing
  - Reservation
  - Check-in

- **Offering of special “interconnecting services”**:
  - Transfer support for passengers (e.g. for people in wheelchairs)
  - Passport control
  - Transhipment of goods
  - Intermediate storage, commission of goods
  - Customs clearance of goods
1.2 Facit

From the planners view the essential feature of intermodal network points is the combination of physical and functional connections of transport infrastructures and services. Not until through this double connections of transport networks, intermodal network points may comply with their task, namely to realise multimodal transport chains.
2 The current situation

Real intermodal network points, which comply with the complex, physical and functional demands, mentioned above, are still very rare, especially concerning passenger services.

2.1 Intermodal network points with the road network

First of all, it can be emphasised, that all railway stations, ports and airports are always linked to the road network. In this respect, intermodal network points with road connection are the normal case.

This universal physical connection of rail, water and air networks with the road network facilitate two completely different connections:

- Direct connections:
  functional and physical connection of rail, water and air traffic with the road traffic

  However, the mere existence of this connection possibility does not mean at all that all horizontal and vertical functional connections are realised in the same extent or quality.

- Indirect connections:
  only functional connection of rail, water and air traffic among themselves without direct physical connection, but meaning by the road

In principle, all land, water and air transport networks are interconnected physically. The road network is the interconnecting medium. This strong focussing on indirect network connections by the road is obviously problematic for ecological as well as for transport and spatial planning reasons. On one hand, that puts additional impacts on people and the environment close to railway stations, ports and airports. On the other hand, capacities of road networks are exhausted especially in agglomerations and cannot be extended due to spatial planning reasons.

2.2 Intermodal network points in passenger transport systems

2.2.1 In general

In a functional sense, passenger transport systems have a big number of intermodal network points.
But only a tiny part of them is physically equipped and operating as such. In a physical sense, most functional, intermodal network points are in fact two network points with an intermediate walk between them. Travellers cannot change from one transport network to another directly, and certainly not indoors.

2.2.2 Rail transport

To change from long-distance rail transport to the local public transport system (tram, car, bus), in most cases, rail passengers must leave the railway station and walk to a remote stop of the local transport networks. Such transfers often last long, without protection from the weather, and are dangerous (road crossings) and inconvenient (stairs). This is amazing since it does not only affect a small minority of rail passengers but most of them.

In recent times, real intermodal network points between long-distance and regional transport facilities on rail (suburban rail network) and road (regional bus) without a long intermediate walk have been built at least at some larger railway stations. These are for example stations of local and regional public transit below long-distance stations (e.g. in Zurich and Berne) or regional bus terminals above the tracks (Berne, Chur).

Whereas, railway stations have always provided access to taxis and private cars (kiss & ride). However, their limited capacity causes problems at peak times.

But most parking facilities are located outside railway station buildings, and the idea of incorporating them within such buildings is fairly recent (e.g. in Berne, Winterthur, (above the track), Basle (underground parking)).

2.2.3 Air transport

Quite different is the situation in air transport. Most airports are located far away from travel origins and destinations, and passengers must rely on other means of transport for transfers between the airports and the destinations.

From the very beginning, airports were built including access facilities for special shuttle buses to and from city centres, for regional buses, taxis and private cars (kiss & ride). Large parking facilities are also provided within the airport complexes. Most airports are connected to the national highway network.

The situation concerning linkages between airports and the railway network is quite different. Apart from a few exceptions (e.g. London Heathrow), most airports have been built far away from rail connections. Only recently, these facilities have been added to some airports (e.g.
Zurich, Geneva). Such integral airport railway stations are nearly ideal intermodal network points. Some of them even have their own check-in desks.

2.3 Intermodal network points in goods transport

Compared with passenger services, intermodal network points in goods transport are nothing new. Since goods cannot transfer themselves, suitable structural and technical installations had to be created at transhipping points between various means of transport right from the start. For example, sea and river ports were made accessible for railways at a very early stage. More recently, various highway and railway networks have been connected for combined services.

Generally, the transfer of goods from one means of transport to another can only be accomplished by the use of expensive transhipment or reloading facilities. To keep the costs of such operations as low as possible, goods handling intermodal network points are in general structurally highly integrated.

Intermodal network points close to national borders offer a wide range of additional services including customs clearance, duty-free stocks and consignment services.

The main problem, concerning goods traffic, is not the lack of intermodal network points but rather their inadequate efficiency. As a rule, intermodal reloading processes are very time consuming, personnel intensive and therefore cost-intensive. Additionally, there exist problems concerning safety and quality.
3 Problems and their reasons

3.1 Problems

Not only considering the aims of a sustainable development, the way in which the various means of transport are utilised should be always result in the best possible, modal cost-benefit balance in ecological, economic and social terms. The use of the various means of transport suited to their strengths requires multimodal transport chains for passenger and goods. Ideally, ships or planes should be used over long distances, railways over medium distances and cars over short ones. Adequate and sufficiently well equipped intermodal network points are crucial for such sustainable transport system. Their absence or unsuitable location will make the desired multimodal transport unattractive or even impossible.

The main problem with regard to this superior objective has to be seen obviously in the contradiction between the central importance of intermodal network points within an integrated multimodal transport system and its marginal status in current transport planning and policy. Thus the modal efficiency of the various transport networks for passenger and goods is increasing and involves huge expenditure. However, this does not mean that intermodal efficiency will simultaneously improve in step. This in fact makes multimodal transports less attractive than unimodal ones.

3.2 Reasons

From a planners view the reasons for the backwardness of intermodal links between networks and services compared with the increased efficiency of unimodal systems mentioned above are on one hand the high complexity of multimodality and intermodality and, on the other hand, the inadequate integration of the physical and functional aspects of the multimodal transport system and its inappropriate basic conditions.

3.3 High complexity

Controlling this comparably highly complexity system represents a heavy outlay concerning the co-ordination and co-operation for all involved planners, operators of intermodal network points, service providers and users.
3.4 Extra efforts for the users for multimodality and intermodality

Intermodal network points are a visible expression of a complex transport organisation. For passengers and shipping companies planning and realisation of multimodal transport chains is linked with an additional organisational and financial expenditure concerning both, passenger and goods traffic.

Transfers and transhipping processes in passenger and goods transport are connected with loss of time, costs, safety and reliability problems and loss of comfort.

Passengers and transport companies try to reduce these generalised transport costs. In practice, this means reducing the number of transfer or transhipping operations. This can be best achieved by using one single transport network and one type of means of transport over the whole transport route, that is, using an individual means of road transport, the car.

Badly developed or inadequate located intermodal network points or the lack of them have a direct and important influence on the choice of transport means for passenger services and goods traffic (modal split). The other way round, there is without doubt, the setting-up of attractive intermodal network points is - together with other measures - an important prerequisite in order to weaken or to overturn this undesirable trend.

3.5 Extra efforts for service providers for multimodality and intermodality

On the other hand, also the planning and realisation of intermodal network points is linked with considerable additional efforts for the suppliers of transport infrastructures and services and also for planners and operators of intermodal network points. Their planning, implementation and operation call for the interconnection of transport systems of a varying operational, technical and structural character and efficient interaction between many players.

This results from the necessity to overcome a variety of existing separations.

3.5.1 Physical separations

Separation in time

An important difficulty is the fact that many of the existing transport networks due to be connected were planned and built at quite different times. For example, around one hundred years had passed between the construction of most rail networks and airports.
Spatial separation

During this time spatial development of the various transport networks and location of network points followed very different criteria. Conurbations are linked by road and rail networks. On the other hand, most airports are located far away from conurbations due to the space required, noise and safety. Therefore and due to the close intermeshing of transport infrastructures and settlement structures connections between different transport networks (e.g. a rail connection to an airport) are difficult or even impossible.

In many cases, transport and spatial planning actually prevent the connection of airports to the national rail networks. But such a scheme is always very costly and only becomes economical when the number of passengers handled at a given cases is very high.

3.5.2 Functional separations

Separation by companies

In general, the various transport networks (infrastructure and services) are owned and operated by different independent public or private organisations, which in many cases compete against each other for a share of the transport market (e.g. road, rail, air). Therefore, each transport company endeavours to optimise the building and operation of its own unimodal network and the unimodal transport services. Unimodal operational and economic interests take precedence over customers’ intermodal interests. Passengers and goods are only of interest as long as they stay on a given network. It is a clear indication of this attitude that practically no data exists on the origin and destination of passengers changing trains or vehicles. Concerning goods transport, this function is being looked after by the haulier.

Particularly in passenger transports none of the various actors is responsible for the whole intermodal route from house to house or for intermodal network connection. No transport company is really responsible for building and operating intermodal network points either.

Commercial separation

Travel tickets are mostly valid only for parts of the route (e.g. long distance only). Each passenger buys individual transport services on specific networks. Access to and transfer between the networks is not offered as a rule and is the passenger's business. Some progress in this area has been made recently:

- Tickets for sport, cultural events and holiday arrangements which are also valid for transfers (taxi, rail, bus);
- Tickets for long-distance routes valid for local transport (e.g. Swiss Federal Railways).
Informational separation

In the case of intermodally interconnected multimodal transport chains it is necessary that users can obtain information on them quickly and easily. However, information on intermodal services offered (e.g. intermodal timetables) is still definitely rare.

Nonetheless, some railway companies (e.g. Swiss Federal Railways) have recently issued door-to-door timetables on the Internet.

3.5.3 Insufficient basic conditions

Legal separation

In many cases the legal frameworks in the matter of transport are more or less unimodal. Especially in federative states the transport legislation lies on various levels of the community.

Institutional separation

As a rule, permissions and concessions for operating transport networks and providing transport services are given only to separate companies and for a specific network. They are strictly of a unimodal character.

A similar situation also exists on the part of the authorities. Depending on the organisation of public affairs, the financing and concession is in the responsibility of completely different offices and sometimes of various government levels. Thereby, this seriously obstructs or even prevents public authorities from gaining an overall view of the situation and exercising their responsibilities in these matters.

3.6 Conclusion

From the planners view, the following conclusion can be drawn:

The planning and realisation of intermodal network points requires the co-operation of different participants in completely different political issues. For nearly all of the participants, these tasks are linked with some bigger or lower additional effort. The economical obligation to reduce the internal costs leads all partners to avoid such additional effort whenever possible. This tendency is even strengthened by the ongoing liberalisation of the transport economy. This could mean to give up the construction and running of intermodal network points and therefore to impede multimodal transports or to make them impossible.
4 Solution approach

From the point of view of planning, there is one main approach on which the solution of all further specific matters can be achieved:

Intermodal network points are the key points within an integral multimodal transport system. Therefore, all transport infrastructures and transport services should be regarded as parts of one single integrated multimodal transport system and not as a collection of a large number of different isolated unimodal subsystems. Intermodal interconnecting must not appear to be welcome although unintentional side effects of independent planning of unimodal transport subsystems.

Above all, specific efforts are inevitable in the transport and spatial planning but also in their financing.

4.1 Transport planning

Primarily needed is a concept of a multimodal transport system including all modes of passenger and goods transports. This concept must not only include the transport infrastructures but also all transport services provided on them. Only such a concept can be the basis for clear definitions of need, specification and location of intermodal network points and also for promoting them.

Transport planning must concentrate especially on optimal interconnecting of various subsystems creating a well functioning overall system. Therefore, the extension of transport networks and transport supplies of all modes of transport has to be consequently orientated on their optimal connection.

Of great importance are a consistent planning and policy here as well. It should be abstained from the simultaneous promotion of both unimodal and multimodal transports. For example, if new rail transverses are built through the Alps, motorways through the Alps should not be additionally extended at the same time.

4.2 Spatial planning

Spatial planning will have to find suitable locations for intermodal network points as well as generally for suitable routes for transport infrastructures. Securing the necessary areas in good time and within regional development planning is of central importance here.
However, it is just as important to concentrate regional development planning, land use planning, housing and industrial location planning on producing optimum functional benefits from intermodal network points.

### 4.3 Overall financing

If the development of multimodal transport systems has to be promoted, the construction and operation of intermodal network points has to be done so as well. This requires a special financing of the extra expenditure needed for each intermodal project.

But not only a special financing for constructing and operating intermodal network points is needed. Not less crucial are incentives for using them. Extra efforts for multimodal transports chains should be compensated.

### 4.4 Planning policy

Promoting multimodality and intermodality needs an overall view and responsibility. But ongoing liberalisation of transport markets brings with it the danger of fragmentation of responsibilities in transport policy. Public planning and concession authorities must therefore more be aware of their responsibilities for the overall multimodal transport system. The organisation of the structures and the processes of planning and concession procedures has to be appropriate to allow such responsibilities to be performed effectively.
5 Conclusion

In the planners view, intermodal network points are much more than only physical connection points between the infrastructures of various transport networks. They also connect non-physical transport supplies, i.e. transport services.

Intermodal network points are the expression and the prerequisite of multimodal transport chains.

Multimodality and intermodality are more complex than unimodality. Planning, realising and operating of intermodal network points as well as the use of them require a higher effort for co-operation and co-ordination than unimodal transportation.

The overcoming of the higher complexity of multimodality and intermodality is linked to extra efforts for operators and users of intermodal network points.

For directly involved ones multimodality and intermodality are less attractive than unimodality.

Multimodality and intermodality lie in the interests of a sustainable transport system. Therefore, intermodal network points are central prerequisites of a sustainable transport system.

In a liberalised transport market the responsibility for an efficient multimodal transport system and especially for intermodal network points cannot be left to the market forces or in the hands of individual carriers but must be assumed by the public authorities. They have to take suitable measures in the fields of transport and spatial planning as well as planning organisation.

A decisive role will have financial compensation of the extra efforts of operators an users of intermodal network points.
6 Literature