

HOW TO CONSIDER FREIGHT IN URBAN TRANSPORT PLANNING?

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ABSTRACT

Urban freight transport is becoming more and more important in Switzerland and also other countries. On the one hand we face negative impacts on the environment and society and on the other hand urban freight distribution is getting more and more costly and less reliable due to traffic jams. Because freight transport is often neglected in transport planning a key question is “How to consider freight in urban transport planning?”

Within a Swiss project the goods supply and transport in conurbations has been investigated, key factors and sustainability indicators derived, an evaluation frame for measures developed, measures and strategies for more sustainable goods supply and transport carried out and assessed and an implementation plan developed. Within a follow up project guidelines for freight planning in urban areas have been carried out. Both projects have been co-financed by the Swiss Federal Roads Office (FEDRO), the Swiss Federal Office of transport, the Swiss Science Foundation, the Cantons of Zurich, Graubünden and Schaffhausen and the City of Zurich.



Figure 1 – Typical situation in Swiss urban areas

The planning guideline contributes to a better consideration of freight transport in transport and land use planning. The guideline also raises awareness for freight issues in conurbations. Target audience for the planning guidelines are authorities on national, regional and local level, consulting and planning companies, research institutes and shippers, logistics and transport service providers as well.

This paper describes how freight transport should be dealt with in urban transport planning and derives strategies and measures to reach more sustainable freight transport in urban areas.

1. PROBLEMS, IMPORTANCE AND CHALLENGES IN URBAN FREIGHT

1.1. Definition of urban freight transport

In the following figure the systematic of terms relating to transport is shown [1]. We can differentiate in a first step public transport, private transport and commercial transport.

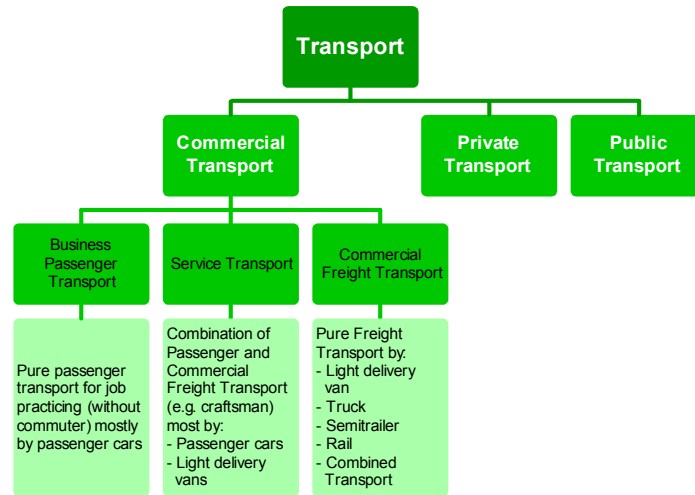


Figure 2 – Systematic of transport terms relating to commercial freight transport

Commercial transport includes business passenger transport, service transport and commercial freight transport. We define urban freight as the commercial freight transport in urban areas. Not included are service transports for example by craftsmen which also can contain materials.

1.2. Characteristics and problems of urban freight

1.2.1. Data Analysis

Socio-economic data and transport data (including accidents data) has been analysed for different Swiss conurbations [2]. A specific data base was built which processes and analyzes transport and socio economic data including combinations (Fig. 3). Analysis is possible for whatever spatial division on community level (based on approx. 2600 municipalities in Switzerland).

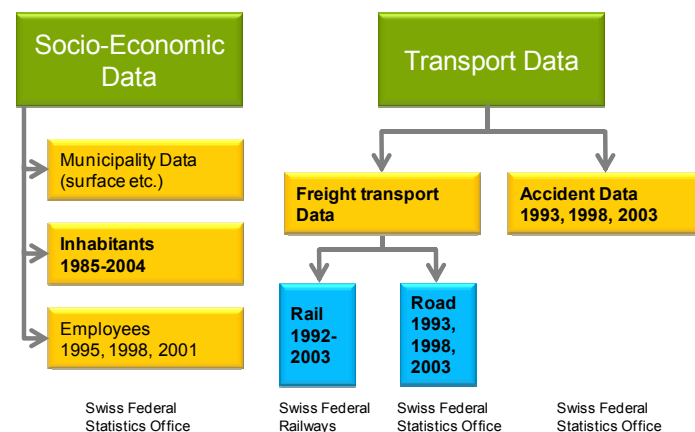


Figure 3 – Structure of the data base

1.1.1 Freight intensity

The freight transport intensity in respect of the number of trips per hectare and inhabitant/employee increased in the majority of the conurbations whereas the number of tons of freight per hectare and inhabitant/employee in the majority of the conurbations is decreasing or stagnating (Fig. 4). Reasons for this are mainly the shift from bulk to consumer goods, decreasing consignment sizes and increasing delivery intervals. The trip intensity is higher in the centre of conurbations which can be explained by the higher land use utilisation.

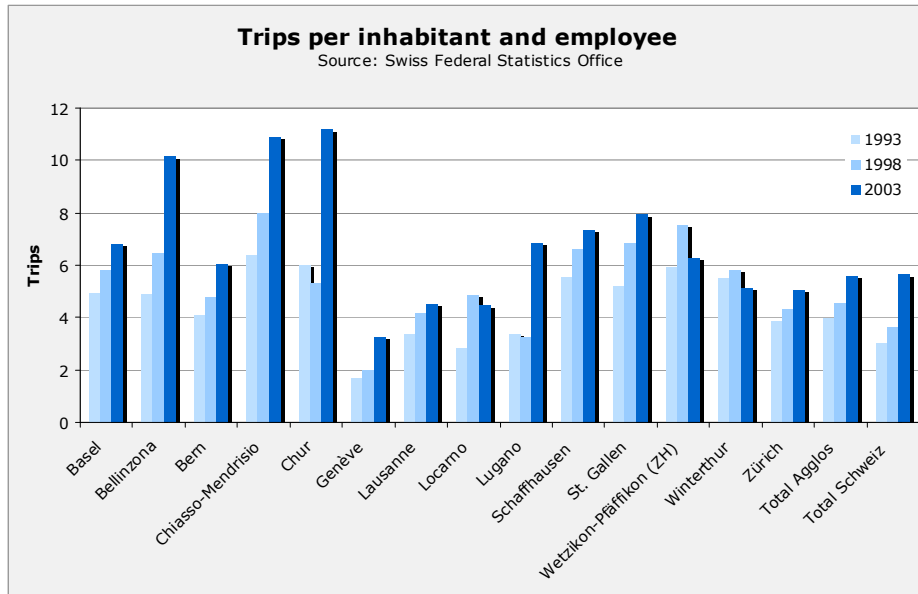


Figure 4 – Freight Intensity in number of trips per inhabitant and employee

The freight transport intensity in tons per inhabitant and employee is comparably low in densely populated areas and areas with a low share of employees in the second sector (Fig. 5). The freight transport intensity is high in a ring around the cities with more industrial activities and employees in the second sector. The smaller conurbations still have remarkable industrial activities in the centre of the conurbation.

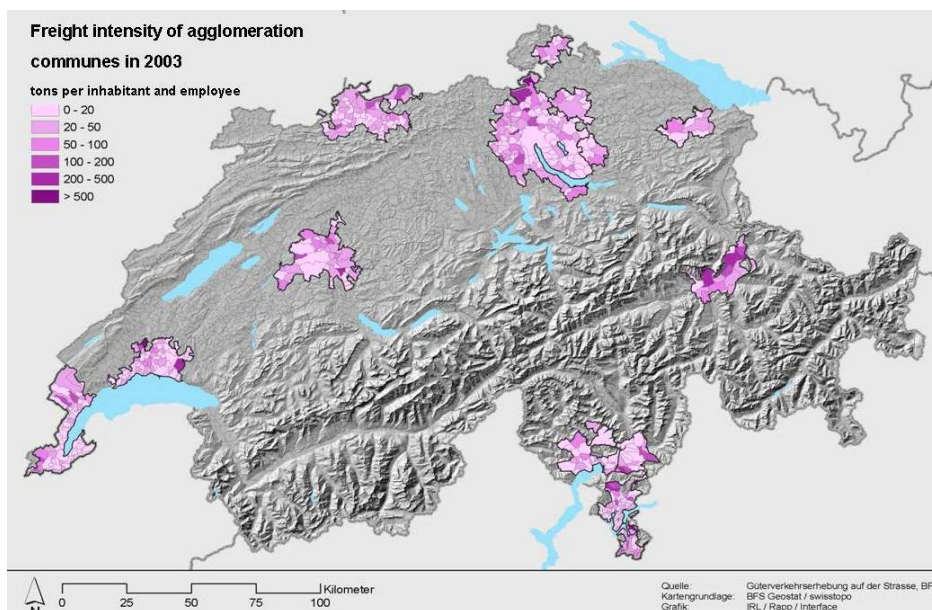


Figure 5 – Freight Intensity in tons per inhabitant and employee

1.1.2 Share of commodity groups relating to volumes

The commodity groups reflect the economic structure (procurement and production), the building construction activities and the consumption sector (Fig. 6). In all the conurbations, the commodity group with the biggest share of volumes at 30 to 60 % is the building materials group which is directly related to building activities. Also important are vehicles, machinery, semi and finished products with 20 to 40%. Consumer goods are getting more and more important against production oriented goods.

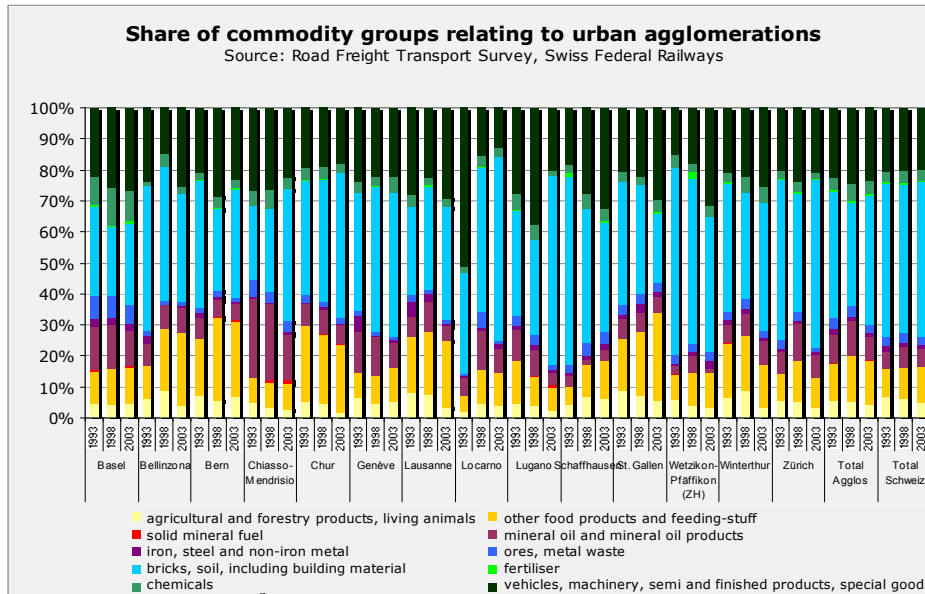


Figure 6 – Share of commodity groups relating to volumes (10 NST/R commodity groups)

1.1.3 Share of traffic volumes by area (inland, import, export, transit)

The share of freight traffic volumes by area is influenced by the size of the area and whether a motorway transit connection is going through the area or not (Fig. 7). Conurbations along the transalpine transit corridor have a transit volume share of 70 to 90% (e.g. Bellinzona, Chiasso, Lugano).

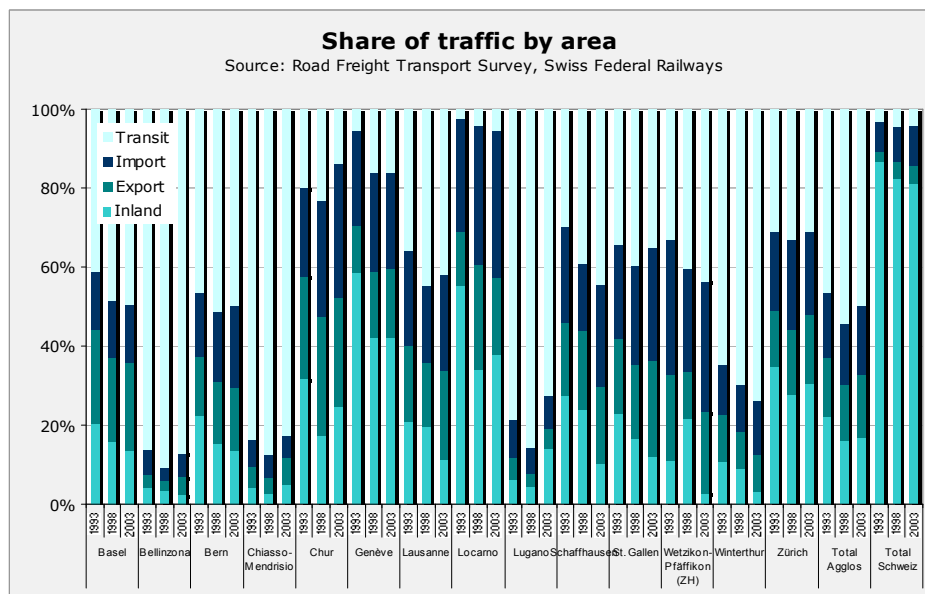


Figure 7 – Share of traffic by area (inland, import, export, transit)

Production oriented conurbations have a higher share of export traffic (Basel, Winterthur, Chur etc.) whereas consumer goods oriented conurbations have a higher share of import traffic (Zurich, Locarno, Geneva, Bern). Import traffic is gaining importance against export traffic and the share of inland traffic is decreasing because of the fast increasing international trade.

1.1.4 Modal split

Conurbations with a high share of rail and intermodal transport are Basel, Chur and Zurich (Fig. 8). There is a positive trend for rail and intermodal transport for most of the conurbations and Switzerland in total. There is a strong influence of construction sites for single years (e.g. Chur, Zurich) from infrastructure projects. After a long period of declining rail share there seems to be a trend change.

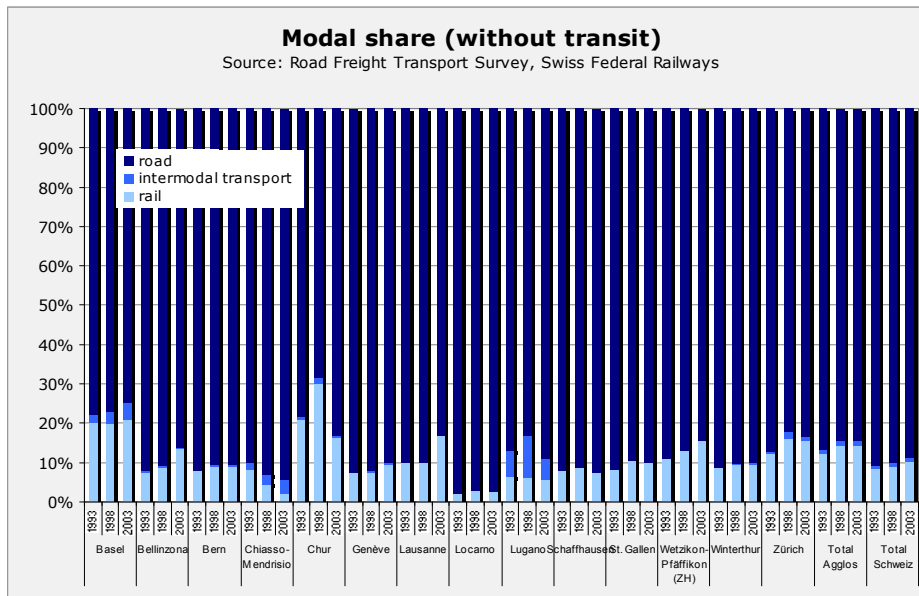


Figure 8 – Modal share (without Transit)

1.1.5 Accidents with freight vehicles

The share of accidents with freight vehicles increased significantly in most of the conurbations between 1993 and 2003 (Figure 9). Also the rates for casualties per million vehicle-kilometres are increasing, especially within conurbations.

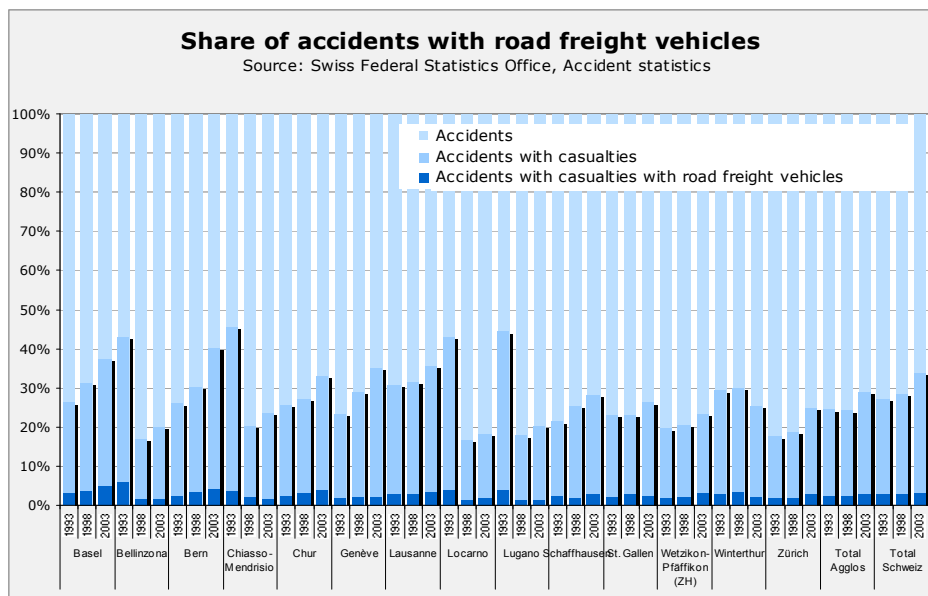


Figure 9 – Share of accidents with road freight vehicles

1.3. Key factors for urban freight development and need for action

Key factors for the development of urban freight transport volumes in tons are the development of GDP (production and consume), the development of population (consume), the development of employees (production) and the structure of the economy (e.g. branches). In Swiss conurbations the transport volumes in tons are decreasing or stagnating because of the still ongoing structural change from the industrial sector to the services sector.

Key factors for the development of the freight transport distribution and number of trips are the spatial changes of shippers activities (e.g. transfer of industrial activities from inner cities to outskirts or other areas, new shopping malls, logistics strategies of shippers, degree of outsourcing), the changes in the demand of the shippers (e.g. shorter delivery intervals) and the changing strategies of logistics service providers and transport operators (e. g. new locations of distribution platforms in the outskirts of conurbations, concentration of number of distribution platforms, fleet management). Key factors for the development of the freight transport distribution in urban areas are often also the access conditions (weight, size, time windows), the available space and facilities for loading and unloading incl. transshipment facilities and the traffic situation (e.g. travel times).

Need for action can be derived from the following trends: increasing freight intensity, capacity restraints in conurbations, increasing transport costs for the last mile, conflicts between freight and passenger transport, increasing use of space, increasing share of freight vehicles accidents and a high share of freight transport relating to pollution and noise.

The delivery and collection of goods within conurbations have a major impact on the local community concerning the economic power, quality of life, accessibility and attractiveness of a conurbation. This means that an efficient and environmentally friendly urban transport system is essential for the economic health and the quality of life in urban areas. We can state that today goods supply and transport in conurbations are not sustainable. The relevance of freight transport relating to infrastructure use, pollution and safety is increasing. On the other hand a prosperous economy is dependent on good accessibility and an efficient transport system.

2. PLANNING PRACTICE

2.1. Roles and influencing opportunities of different actors

In urban areas different actors and stakeholders are involved identifying need for action, derivation of objectives, development of measures and [1]. The role of the administration is in the first place to set the framework conditions for a more sustainable goods supply and freight transport. There are the following options:

Fields of Action	Examples
Land use planning and town development planning	<ul style="list-style-type: none"> – Definition of industrial and commercial zones – Trans urban areas for freight-intensive facilities – Securing / definition of handling facilities and sidings
Construction and operating permits	<ul style="list-style-type: none"> – Development requirements – Modal-Split requirements
Infrastructure measures	<ul style="list-style-type: none"> – Rail and road network – Handling, loading and unloading zones
Regulations	<ul style="list-style-type: none"> – Access restrictions for inner cities – Loading / unloading regulations – Access control / Enforcement
Traffic management	<ul style="list-style-type: none"> – Truck routes / route settings – Heavy vehicle management
Financial incentives	<ul style="list-style-type: none"> – Vehicles, innovations – Cooperation
Best Practice dissemination and training	<ul style="list-style-type: none"> – Public relations – Support of education and training
Partnerships and cooperation	<ul style="list-style-type: none"> – Freight transport round tables – Agreements with private companies
Environment-friendly vehicle fleet for the municipality	<ul style="list-style-type: none"> – Low emission vehicles – Use of e-bikes

Table 1 – Roles and fields of action of administration

The role of the industry (shippers, logistics and transport service providers) is to design and implement more sustainable logistics and transport.

Fields of Action	Examples
Sustainable logistics strategies	<ul style="list-style-type: none"> – Concentration, bundling of transports / shipments
Location decisions	<ul style="list-style-type: none"> – Inclusion of environmental factors – Option of rail development
Products under consideration of sustainable aspects	<ul style="list-style-type: none"> – Climate neutral transport services – Use of alternative transport solutions, e.g. bike courier services
Optimisation of transports	<ul style="list-style-type: none"> – Bundling – Tour planning, routing – Combination of delivery and collection – Dynamic Tour planning (tour-redesign) – Reduction of delivery attempts – Use of I&C technologies
Efficient and sustainable infrastructure	<ul style="list-style-type: none"> – for logistics, handling and storage – for loading and unloading
Procurement and use of environment-friendly vehicles and equipment	<ul style="list-style-type: none"> – Low emission vehicles – Quiet handling equipment – Low consumption driving, Eco Drive
Partnerships and cooperation	<ul style="list-style-type: none"> – Shippers cooperation – Cooperation between logistics and transport companies

Table 2 – Roles and areas of action of industry

2.2. Public Involvement

In recent years it became obvious that public involvement also outside legal obligations is an essential precondition for good transport and land use planning [1]. For urban freight the following framework conditions have to be considered:

- The actors from the industry are working under a big pressure of the daily business. It is difficult to integrate them in a continuous public involvement process.
- The population concerned is often broad and not specific. Therefore it is not easy to find actors which are willing to participate in a large scale participation process.
- Within the administration often the staff is not available which has the resources, the necessary knowledge on freight transport and logistics and the necessary knowledge for designing public involvement processes.
- Therefore public involvement processes in freight transport are more complex and challenging than for other topics. They should only be done more for concrete projects and less for general strategies for freight transport.

Important success factors for public involvement processes are:

- Public involvement should start before the solutions are available and discussed.
- All the participants need to be open for the results.
- All the participants should represent the solution agreed in the public for their actor groups.
- The borders of the handling options have to be defined at the beginning.
- Involved should be persons which really represent their actor group and are well accepted. Especially organisation which are authorised for complaints should be involved at an early stage.
- The number of persons to be involved needs to be limited to have an effective and efficient public involvement process.
- Meetings have to be organised well and conducted tight to limit the time for participants.
- Excursions (to good practices) creates acceptance for innovations and set the ground for a closed cooperation between the participants.

2.3. Organisational integration and tasks relating to freight transport planning in authorities

The organisational integration of freight planning at the administration is an important precondition for sustainable and integrated transport and land use planning [1]. Especially the responsibilities and tasks for freight issues have to be governed. This is important administration internally and externally against the public.

A responsible administration contact point for freight issues for other authority units, planners, investors, the industry and the public is a suitable instrument for information and communication and supports the cooperation between the actors already in an early stage of a project. A core committee could be established consisting of the most important administrative units.

The organisational structure of communities and regions is very different, so there is not only one good solution for the integration of freight issues in the administration. The following figures show two examples taking into account the typical administrative structure in Switzerland.

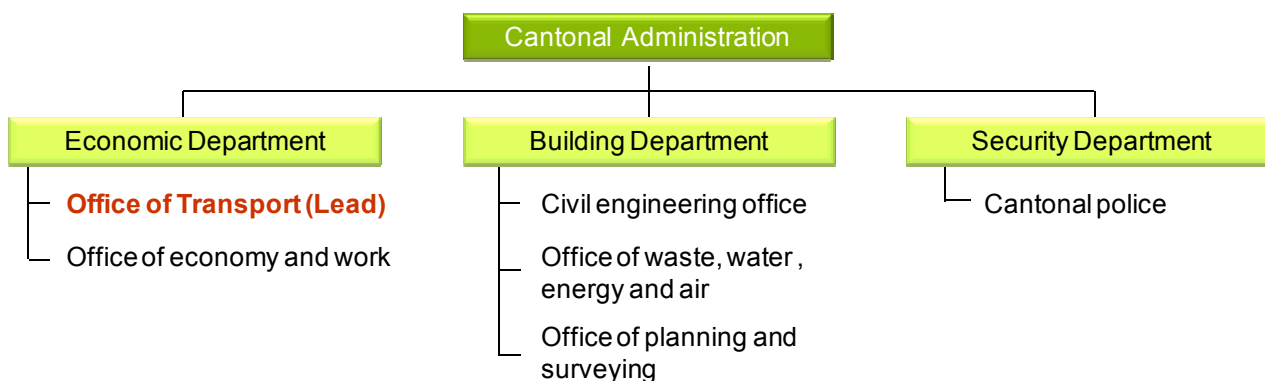


Figure 10 – Organisational integration of freight in the administration on regional level

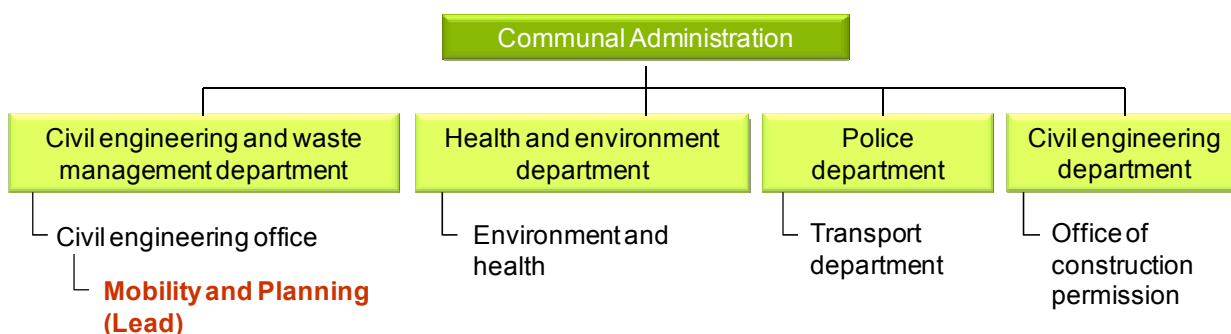


Figure 11 – Organisational integration of freight in the administration on community level

In the following tables the tasks and instruments of the administrations on regional/cantonal and community level is shown. The instruments used can vary depending on the local rules and regulations. The detailed formulation of tasks has to consider the local framework conditions and circumstances.

The tasks relating to public involvement include the co-operation between the administration and private actors within the administrative units themselves (Table 3).

Area	Task	Special instruments	Cantonal level	Municipal level
Participation	Inclusion of the needs of shippers, logistics and transport industry	Working group meetings, workshops with shippers, logistics and transport service providers	X	X
	Involvement of shippers, logistics and transport service providers in freight planning and implementation (participation, etc.)		X	X
	Coordination of spatial and transport planning principles, objectives and measures	Working group meetings, workshops with federal, cantonal and municipal authorities	X	X
	Coordination between location saving and location promotion		X	X

Table 3 – Tasks related to public involvement

The tasks relating to planning fundamentals include freight statistics, freight inquiries, freight transport analysis and forecasts (Table 4).

Area	Task	Special instruments	Cantonal level	Municipal level
Planning criteria	Evaluation of (national and cantonal) (freight) transport statistics		X	(X)
	Additional (freight) transport investigations / inquiry		X	(X)
	Freight transport analysis (modal split, freight-intensive facilities, etc.)		X	X
	Freight transport forecasts	e.g. by using the traffic model	X	X

Table 4 – Tasks related to planning fundamentals

The tasks relating to strategy development include problem analysis, derivation of targets, development of scenarios and integration of freight in the overall transport strategy (Table 5).

Area	Task	Special instruments	Cantonal level	Municipal level
Strategy development	Problem and conflict analysis, identification of weaknesses in freight transport		X	X
	Development of goals and planning principles for sustainable freight transport planning		X	X
	Development of scenarios and models		X	
	Integration of freight transport in an overall transport strategy		X	(X)

Table 5 – Tasks related to strategy development

The tasks relating to spatial planning include the implementation of national conditions, securing suitable spaces for logistics and transport activities and integration of freight transport in land use and transport plans. Also the freight transport access to buildings and areas should be dealt with regarding city development and freight intensive activities (Table 6).

Area	Task	Special instruments	Cantonal level	Municipal level
Spatial planning	Implementation of federal spatial planning guidelines	Cantonal planning and building laws, land use planning	X	
	Securing of suitable spaces for production, logistics and transport activities	Land use and town development planning	X	X
	Integration of freight transport in cantonal planning and building laws and land use planning	Cantonal planning and building laws, land use planning	X	
	Check of regional and local land use plans to the needs of freight transport		X	
	Integration of freight transport in land use planning, special land use planning, town development planning			X
	Control of applications for planning permission on the needs of freight transport	Building application, standards and guidelines, leaflets		X
	¹ The cantons ensure, as far as possible and relatively, by measures of spatial planning that the industrial and commercial zones are accessible by siding.			

Table 6 – Tasks related to spatial planning

The tasks relating to transport planning include the development of freight related measures and the integration of freight in the overall transport planning (Table 7).

Area	Task	Special instruments	Cantonal level	Municipal level
Transport planning	Development of measures for freight transport (various areas of measures)	Feasibility studies for freight transport measures	X	X
	Integration of freight transport in the overall transport planning		X	X

Table 7 – Tasks related to transport planning

The tasks relating to implementation/realisation include the implementation of national conditions, ex-ante evaluations and the coordination of implementation (Table 8).

Area	Task	Special instruments	Cantonal level	Municipal level
Implementation / Realisation	Implementation of federal or cantonal transport requirements	Federal plan for traffic, Cantonal land use plan	X	X
	Ex-ante evaluation and assessment		X	X
	Coordinating of implementation		X	X

Table 8 – Tasks related to implementation / realisation

The tasks relating to monitoring/controlling include the ex-post evaluation of measures, continuous observation of logistics and freight development and assessment of the need for action (Table 9).

Area	Task	Special instruments	Cantonal level	Municipal level
Monitoring/ Controlling	Ex-post control of actions with focus or influence on freight transport		X	X
	Ongoing monitoring of developments in logistics and freight transport		X	X
	Ongoing assessment of the need for action		X	X

Table 9 – Tasks related to monitoring / controlling

2.4. Integration of freight in transport planning process

The following flow chart shows the classical process of transport planning applied in Switzerland starting with the analysis of the actual situation and the previous development and ending with ex-post evaluation and (if necessary) concept adjustment ([1], Fig. 11).

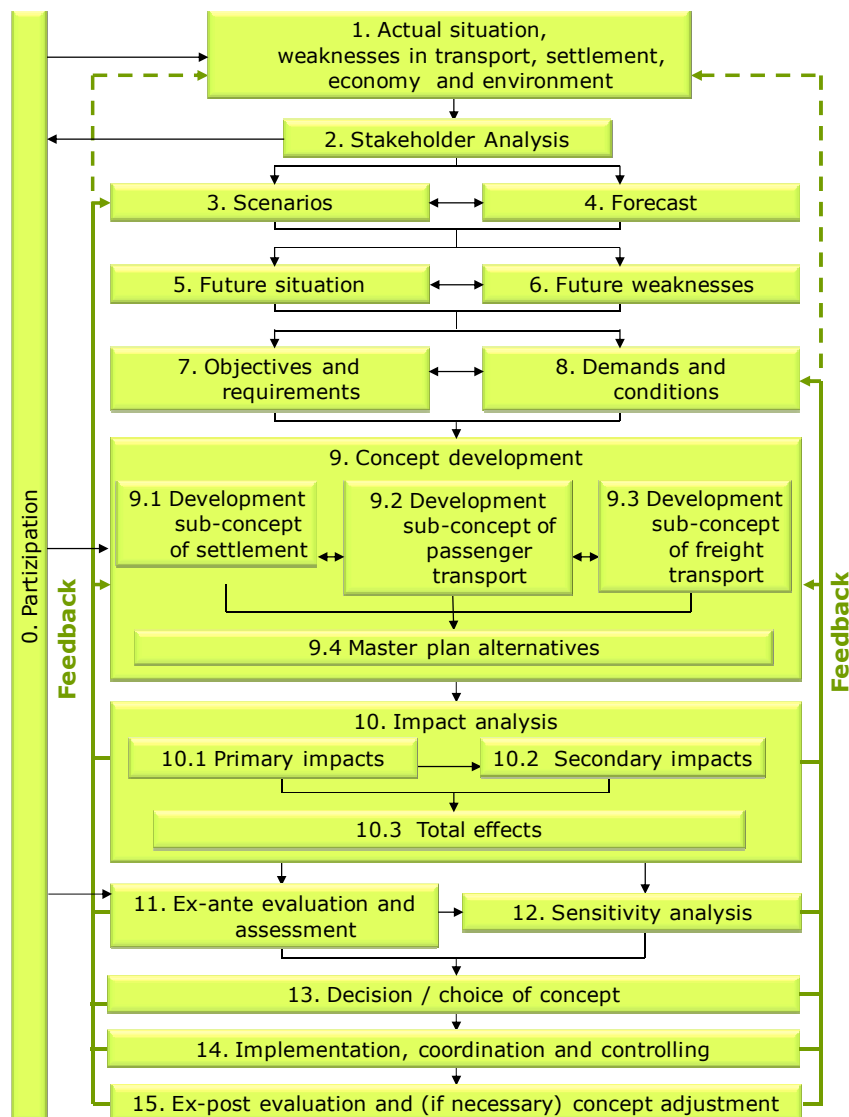


Figure 11 – Planning process in Transport Planning

Freight issues are relevant during all the working steps covering actual situation, forecasts, concept development, effects analysis, evaluation and implementation. Especially

important during the concept development phase is to carry out a sub-concept freight transport, with all the suitable measures from the logistics and freight transport view. For the impact analysis it may be suitable to use transport models which contains also freight transport. Feedback loops may be necessary depending on the results and political decisions. Participation / Public involvement is very important during nearly all the phases and workings steps.

2.5. Location planning

Location decisions of shippers, logistics and transport service providers and administrations as well have a significant influence on the freight transport structure and the freight transport generation. Therefore it is important to follow a systematic approach for location planning and evaluation considering besides economical criteria also environmental and societal criteria.

The following scheme shows the process of location planning and evaluation from the definition of the location requirements to the overall assessment and the location recommendation [1].

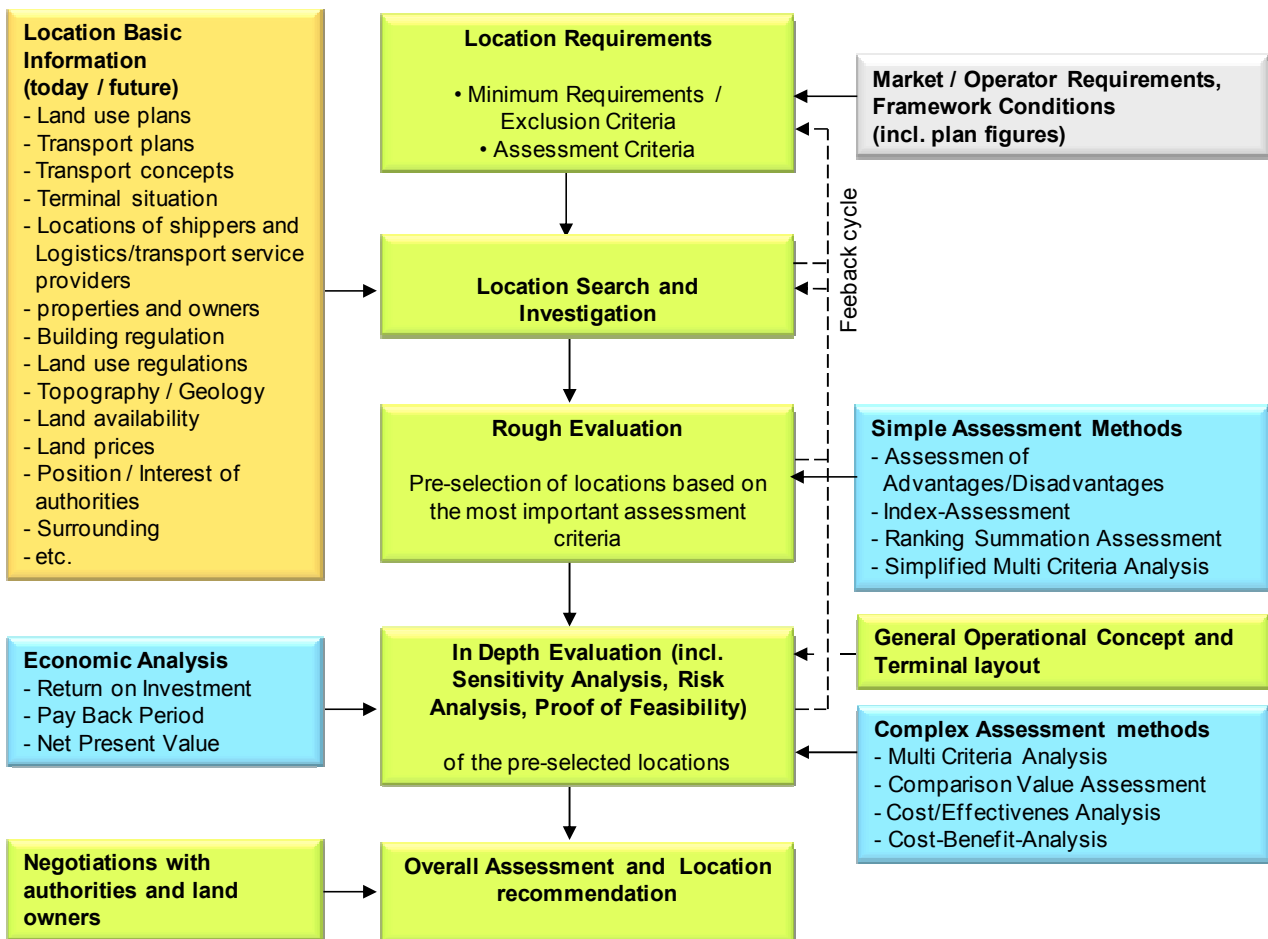


Figure 12 – Location planning and evaluation process

In this context local location planning in urban areas is relevant. Important quantitative and qualitative location criteria for freight intensive facilities are:

- Good access to motorways and main roads
- Suitable lot size and cut
- Synergies to other market actors

- Nearness to production areas
- Nearness to market areas
- Good accessibility of intermodal terminal
- Availability of private siding
- Low land price
- Surface reserves for extension options
- Availability of qualified staff
- High acceptance by public authorities
- Low taxes and fees
- Low risk of traffic jams (no relevant capacity restraints)
- 24-hours operation possible
- Low sensitivity of the location along the access roads and around the location
- Low land use and building restrictions
- Low risks (permission, construction, operation)

Depending on the project the importance of these criteria can be different. This approach was successfully used in different location planning and evaluation projects in Switzerland, especially also for freight intensive facilities.

3. URBAN FREIGHT STRATEGIES AND MEASURES

3.1. Policy targets and evaluation frame

The evaluation of measures should increase the quality of decisions by the authority by measuring the effects of measures against the objectives defined. Evaluations can be done ex ante (for planned measures) and ex post (for implemented measures).

The following evaluation frame outlines a standardized process for the assessment of urban freight measures and strategies [3, 4]. It considers the perspective of the authority and has therefore a politico-economic view. On the basis of this evaluation frame existing situations and planned measures can be assessed.

An evaluation frame has the following content:

- Objectives and responsibilities for evaluation
- Instruments for monitoring and controlling
- General impact analysis model
- Impact areas and effect targets
- Set of indicators.

The following figure shows a generalized impact model [3]. For each of the measures such an impact model with the effect chains has to be developed and analysed.

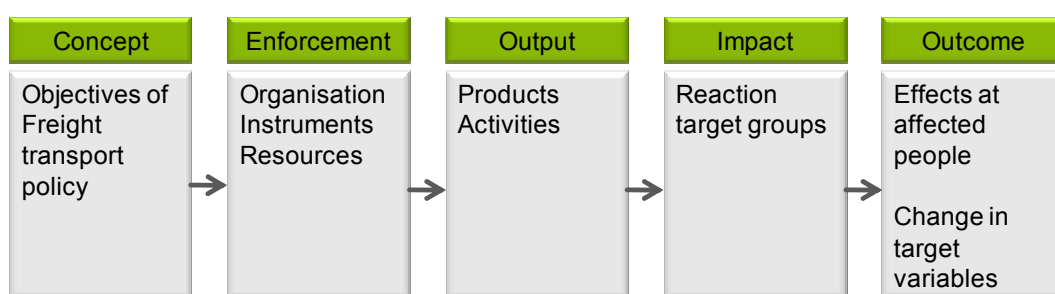


Figure 13 – Generalized impact model

Objectives can be differentiated in 5 impact areas and distributed to the three sustainability dimensions [3]:

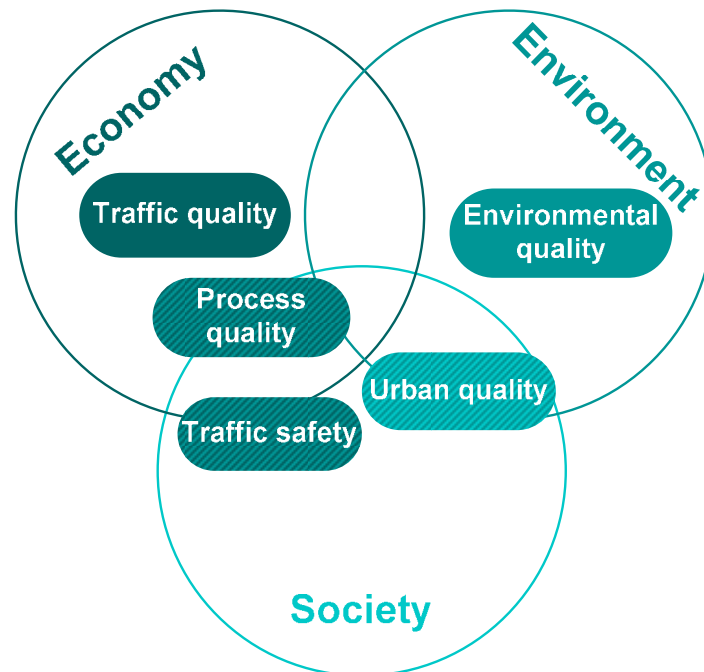


Figure 14 – Impact areas and sustainability dimensions

The impact areas are traffic quality (with 9 effect targets), traffic safety (3 effect targets), environmental quality (3 effect targets), urban quality (4 effect targets) and process quality (2 effect targets). For every effect targets indicators have to be identified considering the relevance, representativeness, traceability, data availability and quality and the suitability to identify trends. The result is a set of indicators which can be used for the assessment of measures.

3.2. Urban freight strategy lines

For the political discussion and implementation a concise formulation of a strategy is necessary. Therefore 7 strategy lines have been derived from the need for action, the evaluation frame and the catalogue of measures. These strategy lines are:

- To secure and increase efficiency and quality of the goods supply
- To improve the accessibility of freight transport intensive land use (incl. establishment of land use premises)
- To minimise the negative impact of freight transport
- To reduce the conflicts with passenger and pedestrian transport (incl. bicycle)
- To support and encourage the awareness for freight/logistics issues, education and innovation
- To improve data and modelling instruments
- To improve cooperation.

3.3. Urban freight measures

There is a broad spectrum of measures relating to urban freight transport. The measures can be organised into 8 fields: infrastructural measures, operational and organisational measures, economical measures, land use measures, technological measures, legal

measures, co-operational and educational measures [2]. Figure 15 shows the spectrum of investigated urban freight measures.

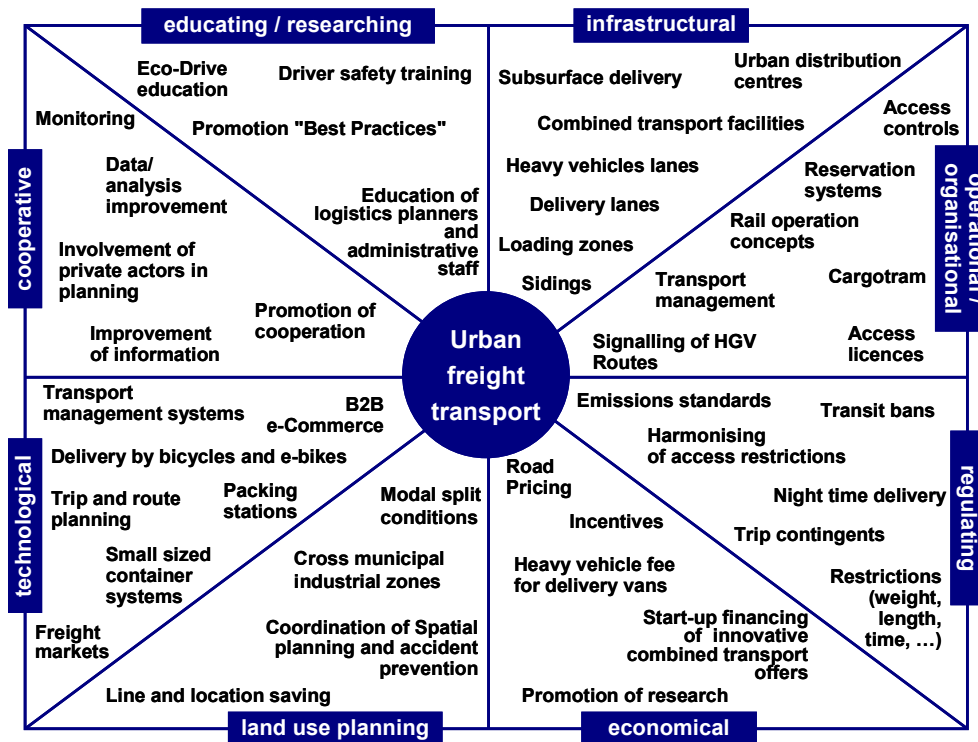


Figure 15 – Spectrum for urban freight measures

3.4. Good Practice Case Collections

Within several European and national research projects good practice cases have been collected and evaluated (BESTUFS [5, 6], NICHES [7]) addressing the relevant urban freight problems. These good practice collections are a good source for potential solutions. It is important to look at the transferability of good practice cases to local conditions in the planning area.

4. IMPLEMENTATION AND SUCCESS FACTORS

4.1. Implementation steps

For the implementation of freight strategies and measures in urban transport planning besides the political support also the acceptance by the stakeholders is an important precondition. A systematic approach is recommended from the problem analysis until the implementation (Fig. 16).



Figure 16 – Systematic approach for implementation

4.2. Action Plans

Action plans are an important and suitable instrument to implement the strategies and measures developed. They also should consider the local framework conditions and problems and aim at tailor-made solutions. Important requirements for action plans are

- Concentration on the most important measures
- Covering the strategy lines
- Cost-effective measures relating to the targets set
- Acceptance and feasibility of measures (including public and stakeholder involvement).

Action plans should have the following content:

- Objectives
- Measures and priorities
- Necessary steps for implementation
- Responsibilities
- Resources needed
- Time frame / dead lines
- Controlling.

For the conurbation action plans the measures can be classed with the strategy lines. The action plan for a specific conurbation was derived from the problem-measure table for conurbations in general considering the local freight problems and already planned or implemented measures. Positive experiences with developing such action plans have been made with the conurbations of Zurich, Lugano and Chur. They have been created in workshops. The implementation process has still to be started.

4.3. Guidelines and leaflets

Guidelines, leaflets and check lists are important instruments to support transport and land use planning processes which consider freight issues in a proper way. They can be used by authorities, planners and consultants and also other actors. The city of Zurich for example developed a guideline for freight access planning for buildings and areas [8].

4.4. Success factors for implementation

An important precondition for a successful urban freight strategy is the organisational implementation of the related tasks and resources in the planning department. There are further success factors relevant for the implementation of urban freight measures (Fig. 17).

The following points are important:

- Planning authorities need to be aware of freight and logistics issues to ensure that these issues are tackled in the field of transport and land use planning.
- In addition to urban deliveries, the impact on the total logistics and transport chain must be considered.
- More cooperation and communication is needed; on the one side between authorities and shippers and logistics and transport service providers and on the other side between private parties and even between different authority departments.
- Innovative solutions are needed taking into account technical progress.
- Different local framework conditions require tailor-made solutions.

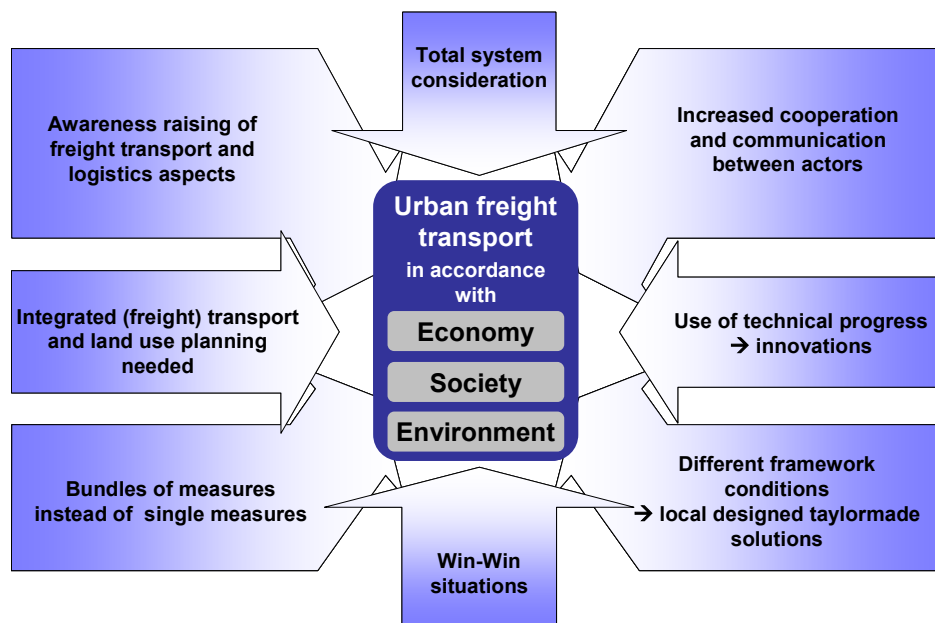


Figure 17 – Critical success factors for implementation

- Authorities and the transport/logistics industry have different views on measures to solve today's problems. A successful urban freight strategy has to consider this by trying to find a series of measures which create win-win situations for the public and private side. Such a strategy is the only way to achieve the necessary acceptance for the implementation of measures.
- An integrated approach to transport and land use planning is useful in both the medium and long term.

CONCLUSIONS

Based on the former investigations and experiences we can derive the following conclusions:

- Relating to freight transport in urban areas there is a need for action to secure an attractive and efficient goods supply and for mitigation of negative impacts of freight transport.

- Freight and logistics aspects have to be better considered in land use, transport and infrastructure planning.
- An important precondition for this is besides the political will a better organisational integration of freight transport in the administration with clear tasks and responsibilities. On the other hand there is a need to raise awareness for freight issues considering all relevant actors.
- Important for a factual and target oriented discussion it is important to close data gaps, to improve education and training and to further develop methods and instruments for analysis and transport modelling.
- Suitable methods and instruments can support the development of sustainable transport strategies. A stronger involvement of private actors as shippers, logistics and transport service providers in the land use transport planning is needed.
- Innovative freight strategies contribute to a more sustainable goods supply and transport in urban areas. It is important that these measures are integrated in urban and regional transport and land use plans.
- Both the administration and the industry can contribute to a more sustainable transport in urban areas. The administration is responsible for setting the framework conditions and the logistics and transport industry for designing logistics and transport systems. A close cooperation between administration and industry is essential.
- Not single measures but a strategy with a bundle of measures is needed to contribute better to reach the targets. Attention should be paid to a balanced bundle of measures, which leads to a win-win situation for the administration and private actors.
- Until freight issues are considered adequately in transport and land use planning compared to passenger transport efforts are needed from the public and private side on different levels.

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