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DETERMINATION OF OBJECTIVES FOR URBAN FREIGHT POLICY

Daniel Kaszubowski

Gdansk University of Technology, Gdansk, Poland

ABSTRACT. Background: Decisions regarding strategic planning of urban freight transport very often are based on superficial assumptions inadequately reflecting the actual character of encountered challenges. The trend may be observed to adapt isolated solutions without supporting measures and verification of expected outcomes. Selected urban freight solutions have a significant potential to alleviate transport related problems, but they require unorthodox approach beyond standard traffic planning and road management. City's current planning experience must be taken into account to plan an optimized sequence of actions.
Method: Due to complexity of the problem and specific decision making factors the analytic network process ANP was selected to determine relevant objective of the urban freight policy. Gdynia was selected as the subject for modeling with a review of the current freight planning practice as a first step. Then, classification of policy objective and their prerequisites were identified supported with descriptive feasibility assessment. This allowed for a development of the ANP decision-making model.
Results: Considered objectives for urban freight policy were identified were optimization, reduction and transfer. After verifying relevant decision factors optimization was selected as the most feasible option for Gdynia. Other alternatives were rated around four times lower with a slight prevalence of reduction over transfer. Such ranking reflects current planning practice and availability of transferable experiences. Despite the indicative results, it must be stressed that urban freight planning should be based on the long term methodical approach not to exclude any emerging possibilities.

Key words: urban freight policy, urban logistics, transport policy, multi-criteria decision making, analytic network process.

INTRODUCTION

Planning of urban freight activities remains a challenge for the most of municipalities across Europe. There is a growing concern about side effects of economic growth manifested in the form of a negative impact of transport on the urban environment and the growing demand for investments. Despite several successful and inspiring examples of practical solutions implementation planning of such measures requests a special attention. It is important to provide municipalities with the decision support method to start an evaluation of possible measures and policy options.

The aim of this paper was to develop a methodology for assessment of urban freight policy objectives with regards to the city current freight planning experience. Objective of the method was to provide a ranking of preselected policy objectives. This methodology was intended as the first step for in-depth planning resulting in implementation of operational solutions. The decision model was elaborated with the multi-criteria Analytic Network Process ANP method. To achieve practical results Gdynia was selected as a case-study. The paper is organized into 5 sections. Section 1 identifies challenges in urban freight planning providing an overview of high-level objectives. Section 2 introduces a methodology

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for urban freight self-assessment, which gives background assumptions for the model. In Section 3 a classification of urban freight policy objectives was provided. Section 4 contains the ANP model structure and results and section 5 is the summary

CHALLENGES IN URBAN FREIGHT TRANSPORT POLICY MAKING

In recent years there is a strong trend for coordinated actions towards urban mobility planning reflecting all aspects of this issue [COM(2013) 913]. The general objective is to achieve sustainable urban mobility by overcoming fragmented approach with standards of planning and evaluation. However, urban freight planning seems to be neglected in those efforts so far. Urban freight is vital for growing urban communities due to increasing demand and complexity of services. This is not followed by implementation of strategic planned measures based at city transport system analysis and stakeholders involvement. Thus, few cities have a comprehensive urban logistics strategy. Cities lack knowledge about logistics chains and their users' requirements. Survey among cities in Sweden revealed, that 43% don't spend any time working on freight transport despite 65% identify freight transport as an area of concern [Lindholm 2012]. Majority of urban logistics operations are carried out by private operators, with only small share of municipal services like waste removal or road maintenance etc. Private operators carry their businesses without purposeful dialogue with city authorities. However, when given a chance to cooperate towards problem solving and optimisation of every-day activities, operators are often keen to work co-operatively to implement solutions satisfying both private and public partners. The cooperation is crucial for implementation of applicable solutions for urban freight.

Without stable policy framework it is difficult for operators or retailers to see a clear business case to get involved and make investments required to change their urban logistics operations [SWD(2013) 524]. Clear strategies for managing urban freight are needed primarily on local level. Strategies must set clear objectives and measures to achieve them. To improve urban logistics in the long term better definitions, data collection, monitoring and evaluation is required. To achieve the goal of planning sustainability, strategic considerations of urban freight policy should be identified. They can be then translated into objectives and measures. Primary set of such considerations includes: [Tanguchi, et. al, 2004]:

- mobility - an ability to move the goods,
- sustainability - in utilization of existing resources i.e.: transport infrastructure, space, funds,
- livability - provision of optimal living quality for city inhabitants.

These factors may be broken down into more detailed issues:

1. Mobility:
   - provision of access to every form of economic activity within a city,
   - consideration of requirements of different urban freight transport users and stakeholders (retail, services, production, constructions etc.),
   - ability for a modal choice - as far as possible from economic and technical point of view,
   - support for innovative in urban supply chain management and transport services.

2. Sustainability:
   - access management to designated areas or infrastructure elements according to their purpose and technical standards,
   - reduction of extensive utilization of infrastructure leading to its premature deterioration,
   - using the transportation infrastructure to shape economic and spatial development processes,
   - implementation of advanced technologies (ITS) to improves efficiency of urban logistics processes,
   - inclusion of all transport externalities into regulatory policy.

3. Livability:
   - reduction of CO_2, noise and other emissions from freight transport,

- rationalisation of available city space design to achieve convenient access to services, leisure education for all users,
- improvement of traffic safety.

REVIEV OF THE EXISTING FREIGHT PLANNIG PRACTICE

One of the main factors restricting effective urban freight planning is absence of the proper planning procedure based on credible data. It is important to precisely evaluate the degree to which freight issues are addressed by existing or envisaged measures within planning documents. This identifies where the starting point in terms of strategic urban freight planning is. Overview of freight related problems and existing methods of addressing them is required for construction of multicriteria model for identification of strategic objectives of urban freight traffic policy. This can be achieved in three steps:

- Freight self-assessment - commodity flow characteristics, urban freight system characteristics and limitations, users of the system and their needs [NHCRP 2007].
- Definition of freight planning stage - on the basis of freight self-assessment, it will be possible to describe if freight planning is in the basic or advanced phase. Understanding this provides an opportunity to better define objectives of freight planning policy, with rational targets and activities reflecting real problems and available resources.
- Definition of strategic objectives by identification of measures and clustering them according to possible impacts and complexity level. It is important to have in mind the freight planning stage and results of freight self-assessment to choose appropriate set of measures.

The main purpose of self-assessment is to evaluate current level of understanding of freight issues and their presence in relevant policies to document was already has been done. It does not substitute the comprehensive urban freight profile, but provides a starting point for enhancing or creating urban freight transport policy. Different questions may be asked or issues addressed. Table 1 presents short overview of possible questions regarding city, freight stakeholders and organization responsible for planning [NHCRP 2007].

Table 1. Selected questions for urban freight self-assessment
Tabela 1. Wybrane pytania do oceny stanu wiedzy odnośnie miejskiego transportu ładunków

Self-assesment questions - city freight system
What is the nature of freight flows in the city - what is the share of internal and passing through flows?
What are the main freight terminals and what modes of transport do they serve?
Is the city a transportation hub and what is it catchment area - what are the key freight routes across the city and region?
What is the importance of freight related activities to local economy, ie. how many jobs is related to transport activities?
What conflicts or externalisties are related to freight transport - where to they arise?
Are there major freight related problems known to transport operators?
Self-assesment questions - urban freight stakeholders
What other institutions may be involved in urban freight planning?
What are the largest bussiness in terms of freight movements? What mode of transport does they use and does it have direct impact on the urban transportation system?
Are the main logistic chains identified in terms of type of cargo and flow direction?
Were the freight stakeholders given an opportunity to express their needs and concerns? What aspects of urban transportation systems they would like to be improved?
Has the private sector participated in urban freight policy planning? Are there organisations of shippers, retailers etc. involved in freight?
Self-assesment questions - planning organisation
What freight planning efforts were already undertaken?
What freight-related investments has been made?
What staff is involved into different urban freight related activities - planning, monitoring etc.?
What kind of data is accesible?
Is there a political support for urban freight measures?

Answers to those questions would be rather qualitative than quantitative. More detailed analysis should be performed during specific measure implementation planning. Detailed procedure for selection of urban freight measures on the operational level was

described in [Kaszubowski 2014]. Self-assessment provides information about system's weakest areas, impacts of transport activities and the level of freight competence within responsible organisation. As a result, current freight planning stage may be described in one of two ways: basic or advanced. Table 2 provides a description of these categories [NHCRP 2007].

Table 2. Description of basic and advanced urban freight planning stages
Tabela 2. Opis podstawowego i zaawansowanego poziomu planowania odnośnie miejskiego transportu ładunków

Freight planning stage	Characteristics
Basic Urban freight issues are handled as a part of general regalatory system relying on standard measures applicable to all users, no targeted or specific problem related actions are undertaken	– scattered or no urban freight related planning activities – limited reliabe data sources – little or no interaction with private sector (i.e:shippers, retailers) – limited knowledge of specific freight needs – urban freight is neglected as a part of larger investments carried by city
Advanced Urban freight starts to emerge as an planning issue or problem area, however there is no integration at the planning level with related strategic documents	– some urban freight related activities has been planned and implemented – initial interaction with private sector as a part of specific project – basic understanding about urban freight relation to the city economic base – urban freight initiatives start to form with local leaders

Table 3. Objectives in Sustainable Urban Transport Plan for Gdynia
Tabela 3. Cele Zrównoważonego Planu Transportu Miejskiego w Gdyni

Measure	Appears	Significance 1-5
Planning for cycling infrastructure	X	4
Planning for walking infrastructure	-	-
Measures to encourage low carbon vehicles	-	-
New ITS systems, traffic management to reduce congestion, encourage mode shift to public transport	x	5
New rail and/or tram system	X	4
Bus rapid transit or extensive bus priority measures	X	3
Public transport related measures, including improved interchanges and park and ride.	X	4
Measures to manage negative impacts of freight	X	1
Access management, shared space, reallocation of space to pedestrians	-	-
Mobility management	X	2
Road safety measures	X	4
Measures to improve travellers' personal security (reduced risk of attack/robbery) especially for PT users, pedestrians and cyclists.	X	3
Parking management	X	4
Maximum (limited) parking standards for new buildings	X	3
Speed management and traffic calming	-	-
Integration of planning on a scale of the city and metropolitan area	X	3
Reduction of transport needs	X	2
Modernization of public transport rolling stock	X	4
Information systems for travellers	X	4

Urban freight self assessment for Gdynia was conducted with the above described methodology. Sustainable Urban Transport Plan 2008 - 2015 was used as a reference. It is a generalization of the city's Transport Policy adopted in 1998. Range of SUTP's objectives were verified according to their area of influence and perceived significance (Table 3). It is an adaptation of the Sustainable Urban Mobility Plan review template used in the Civitas projects evaluation.

SUTP analysis indicates that the plan is oriented towards public transport effectiveness, introduction of traffic management systems and road safety measures. Only one measure concerns urban freight and managing its negative impacts like pollution, noise and intrusion. Detailed verification of this measure reveals that there is no deeper understanding of the urban freight characteristics and stakeholders requirements. Delivery optimization envisaged in the SUPT is based

on the vehicle flows modifications rather supply chain management with regard to local market potential and actors involvement. No cooperation was planned with local stakeholders during the development phase hampering measure feasibility. However, main freight generators (seaport) and related problems with transit HGV traffic are properly highlighted. On the positive side one of the sub-tasks is to examine local delivery structure, receivers' location and population characteristics.

Consequently, urban freight planning stage in Gdynia may be described as basic. There is limited knowledge about supply chains characteristics and actors' needs, insufficient reliable data sources and scarce interaction with private sector. However, urban logistics is not completely neglected as awareness of freight related problems is growing among decision makers and residents. This gives an opportunity to introduce new concepts and embed urban logistics into planning practice.

IDENTIFICATION OF POLICY OBJECTIVES AND RELATED MEASURES

European Commission addressed urban freight in various documents and strategies so far. However, only recently this issue is considered as an integral part of sustainable mobility planning process. According to the latest Urban Mobility Package [SWD (2013) 524] on the basis of best practice review particular attention should be paid at the following areas:

- management of urban freight demand,
- modal shift,
- efficiency improvement,
- improved vehicles and fuels.

Management of urban freight demand may be achieved twofold: by proper land use planning at the city level and by consumers and operators introducing new schemes of ordering and deliveries. There is a mutual relationship between freight transport measures and land use planning, where the latter relates to all intervention that change the use of space. Such actions require consistent policy over a long period of and a holistic approach that takes into account the demand for urban freight transport generated through planning decisions and the needs of the freight industry.

Modal shift requires cross-sector actions integrating infrastructure, technology and regulation measures. Urban freight is dominated by road transport as most suitable for last-mile delivery. Under specific conditions selected cargo flows show a potential to be shifted to other modes of transport or at least other types of vehicle more suitable for operations in dense urban environment. This requires city authorities to provide right policy framework conditions to make these solutions economical viable, even if they deliver overall improvements from the operational point of view.

Efficiency improvement is the most challenging task in urban logistics. It may be considered as the reference for all planned actions. Efficiency is often limited by inadequate infrastructure provision, supply chain structure, poor service quality other factors. In addition, barriers tend to overlap making it difficult to find one common solution. Close cooperation between all involved actors is crucial due to diversity of problems and possible solutions, which should be feasible for implementation without negative impacts on business stability.

Urban freight has a substantial potential for improvement in vehicles and fuels. Operational characteristics of urban deliveries favor introduction of electric, hybrid or gas fuelled vehicles making urban logistics quieter and cleaner. The density and frequency of operations make urban areas attractive place for alternative fuel projects. Implementation of new technologies requires long-term legislative support to guide investments and technology development. New technologies would be attractive for potential users only when capital investments provide an opportunity for cost reduction and operational savings.

Successful identification of urban freight policy objectives requires a good overall understanding of the stakeholders involved in the city distribution. Stakeholders are defined as individuals or group of individuals that are able to influence the objectives of an organisation or who can be influenced

themselves. In the urban freight policy context five groups of stakeholders may be identified [Macharis, Verlinde 2012]:

- shippers,
- receivers,
- logistic service providers,
- local authorities,
- citizens.

These stakeholders interact in different fields where transport operations take place, like public space, transport market and traffic. They also have different objectives related to these fields, indirectly defining the scope of urban freight policy. Figure 1 presents stakeholders, their fields of interaction and objectives [Macharis, Verlinde 2012].

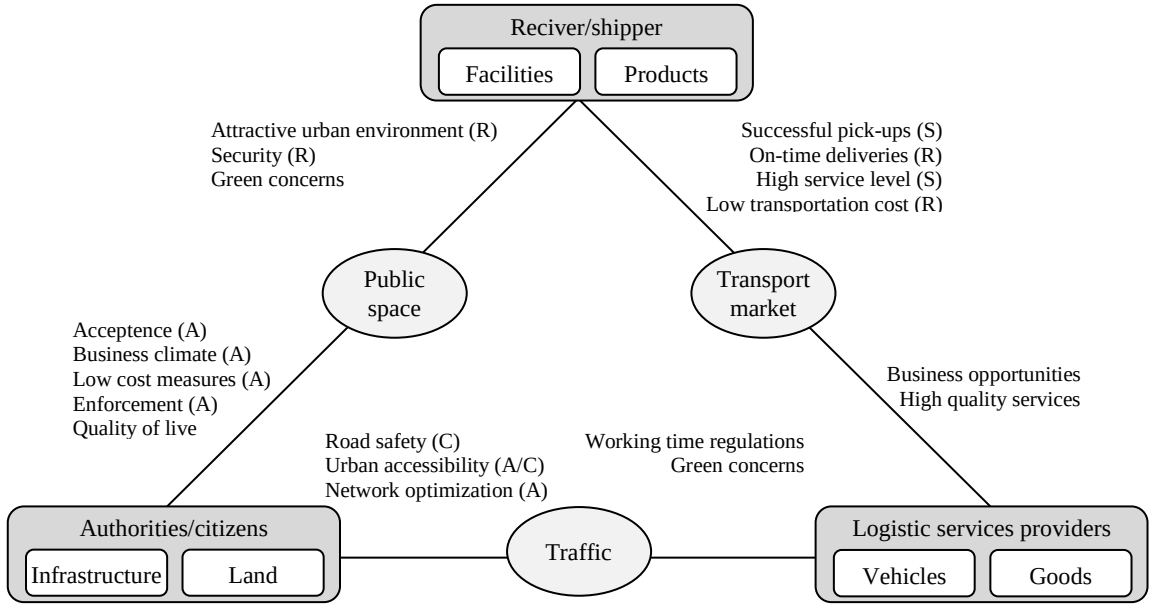

Fig. 1. Urban freight stakeholders and their objectives
Rys. 1. Cele podmiotów zaangażowanych w miejski transport ładunków

Analysis of issues regarding urban freight management on strategic level confirms the importance of proper definition of objectives. In this paper three functional objectives for urban freight policy were proposed together with corresponding sets of measures. Intention behind this selection was to create relatively homogenous groups reflecting major challenges in urban freight management. Another purpose of this categorization was to group the measures according to their complexity and implementation effort. As well as assessed interconnections between objectives and measures. The latter corresponds to a situation, when an advanced measure can't be implemented without meeting some preconditions provided by foregoing measures. An example may be delivery by electric vehicles, included into transfer objective. This measure requires supporting regulatory framework like low emission zone or pedestrian area in the city center or special permission to operation regardless existing time windows [Dziekan et. al, 2013]. Feasibility and complexity of selected objectives will be examined separately as a part of multicriteria decision model. Three groups of functional objectives are:

1. Optimization - of freight vehicles flows and demand for infrastructure; it requires traffic management, regulatory framework for different vehicle classes, access restrictions to selected areas, delivery zones etc. Main objective is to alleviate negative impacts of freight traffic on the affected communities and to induce changes in the characteristics of logistic service providers operations.
2. Reduction - of excessive demand for freight movements; problems may have multiple reasons originating in city spatial patterns, management of logistics chains, infrastructure provision or local economy

characteristics. This requires more sophisticated actions involving wide array of stakeholders and long-term planning based on business-case feasibility.

3. Transfer - shift of urban freight flows to more sustainable modes were applicable (rail or waterborne) or introduction of new vehicle types for road transport (electric, LPG).

Table 4 presents three objectives with main areas of implementation and measures assigned [Munuzuri et. al. 2005, Russo, Comi 2010, Lindholm 2010, DG MOVE 2012]. It should be noted that this classification is not exclusive and some measures may be interpreted as falling into more than one category. For example, night delivery schemes as introduced under PIEK certification programme contribute to freight optimization as a regulatory measure by avoiding peak hours. However, there is also potential to reduce demand for freight movements by bundling deliveries into one larger vehicle instead of few small deliveries. Selection of implementation areas was based on existing measures review:

– infrastructure, both linear and nodal,
– regulation/planning - measures related to governance of transport system and planning principles, like access regulations, HGV road network or planning the location of objects with high-transport demand,
– ITS (transport telematics) - this class includes among others traffic information systems, route optimisation software, vehicle capacity management systems,
– technical equipment - measures related to vehicles and loading units when applicable.

Table 4. Objectives and measures of urban freight policy
Tabela 4. Cele i narzędzia zarządzania miejskim transportem ładunków

Area of implementation	Objective		
	Optimization	Reduction	Transfer
Infrastructure	– provision of sufficient quantity of well designed delivery spaces – reduction of free parking spaces to improve freight vehicle flow on selected streets – use or public parking spaces or other restricted areas (taxi stops, bus lanes) – mini-warehouses – provision of delivery spaces in private or commercial buildings – buffer parking for HGV scheduled for a construction site or other delivery place	– city terminals/city consolidation centers – urban delivery schemes for shippers and receivers – construction consolidation centers	– utilization of existing rail or waterborne terminals as a transfer/consolidation hubs
Regulation/ planning	– access according to weight, length or other vehicle parameters – access to pedestrian zones – double parking short time restrictions – closing the center for private traffic – paid access to selected areas – adequate rotation in delivery zones – night deliveries – harmonization of regulations, also at regional level – delivery time windows – carrier classification – freight zone classification – street classification, dedicated roads for HGV traffic – limitation of loading and unloading times – signalling of truck routes	– location of freight high-demand facilities next to a transport infrastructure of high capacity – zoning of activities – service and delivery plans – relocation of freight generators according to urban renewal – safeguarding of rail-connected & water-connected sites for future use	– low emission zones/environmental zones
ITS	– access control – delivery zones monitoring – automatic toll systems – weight-in-motion for HGV – traffic management	– order processing and delivery/pick-up bundling and scheduling	
Technical equipment	– on line load zone reservation – vehicle navigation and fleet management systems (AVL/AVM)		– electric vehicles/hybrid vehicles – LPG vehicles – bikes, etc.

PRIORITIZATION OF URBAN FREIGHT POLICY OBJECTIVES IN GDYNIA

Multicriteria model for prioritization of urban freight policy objectives was elaborated with the analytic network process ANP method. ANP was developed as a generalization of analytic hierarchy process (AHP) method introduced by Thomas L. Saaty. Both methods share the same approach of paired comparison on a common criterion with a ratio scale. ANP provides a comprehensive framework for the analysis of complex decision problems in economy, investment, governmental, transportation and other sectors. It allows to include all the factors and criteria, both tangible and intangible, that have bearing on selecting the optimal solution among given alternatives. In contrary to hierarchical AHP method, ANP allows to both interactions and feedback within elements and clusters. Feedback approach renders complex relations within the structure of decision criteria.

ANP method has many applications in transportation and management sector. It was used for transport project selection and prioritization [Ivanović et. al. 2012, Onut 2011, Dikmen et al. 2007, Macura et. al 2011]. There are applications for risk assessment and decision analysis [Ergu et. al 2011], information system project selection [Liang 2008], R&D project selection [Mohanty 2005] and many others.

ANP procedure is described in [Saaty 2009]. There are several variations of decision-making frameworks of this method. Despite this each must provide set of alternatives, criteria grouped into clusters and a network of connections reflecting interactions between elements. Alternatives of the urban freight policy functional objectives were defined in previous chapter as optimization, reduction and transfer. Decision criteria were derived from examination of existing measures implementation and selected indicators of freight strategy effectiveness [Hensher 2000]. Subsequently the criteria were clustered according to freight related domains of the urban transport planning [Ruesch 2012] and strategic planning methodology [Köbl 2008]. Conclusions from evaluation of selected urban freight measures were incorporated into the decision making structure [Kaszubowski 2012].

Rating the relevance of alternatives on selected criteria was executed in accordance to the results of freight assessment in Gdynia and the implementation characteristics for urban freight policy objectives (table 8). General feasibility assessment of objectives (tables 5,6,7) was also examined. The set of verification criteria was designed to reflect major concerns of involved stakeholders when validating urban freight policy objectives. Suggested criteria for objectives assessment are:

- availability of good practices with thorough evaluation,
- transfer potential reflecting local authorities powers,
- ability to serve as a basis for more advanced measures,
- level of possible integration with existing measures,
- up-scaling potential.

The procedure would be descriptive in nature, corresponding with previously mentioned urban freight self-assessment method. Three objectives identified before were examined with above mentioned criteria with four grade scale: lower, moderate, good and high. Main question was the practicability of each objective for implementation within a policy system characteristic for the most Polish cities. For more transparency, also areas of implementation as presented in Table 4 were included to identify these with highest potential. Tables 5, 6 and 7 present analysis results with regards to mobility, sustainability and livability. This approach was intended to maintain the link between general policy considerations and objectives.

To summarize results of the objective feasibility analysis list of characteristics for each of the objectives was drawn and presented in table 8. This recapitulation would be used for creation of the multicriteria decision model.

Table 5. Feasibility of objectives regarding the Mobility general objective
Tabela 5. Ocena oddziaływania celów funkcjonlanych na realizację postualtu zapewnienia mobilności

	Feasibility for urban freight policy general objective: Mobility		
	Optimization	Reduction	Transfer
Infrastructure	high	moderate	lower
Regulation/planning	high	moderate	lower
ITS	good	lower	-
Technical equipment	moderate	-	moderate

Source: own elaboration

Table 6. Feasibility of functional objectives regarding the Sustainability general objective
Tabela 6. Ocena oddziaływania celów funkcjonlanych na realizację postualtu zapewnienia zrównoważonego wykorzystania dostępnych zasobów

	Feasibility for urban freight policy general objective: Sustainability		
	Optimization	Reduction	Transfer
Infrastructure	high	moderate	lower
Regulation/planning	high	lower	lower
ITS	good	lower	-
Technical equipment	lower	-	moderate

Source: own elaboration

Table 7. Feasibility of functional objectives regarding the Liveability general objective
Tabela 7. Ocena oddziaływania celów funkcjonlanych na realizację postulatu ochrony standardu życia mieszkańców

	Feasibility for urban freight policy general objective: Liveability		
	Optimization	Reduction	Transfer
Infrastructure	good	moderate	lower
Regulation/planning	high	high	moderate
ITS	moderate	lower	-
Technical equipment	lower	-	moderate

Source: own elaboration

Table 8. Summary of general characteristics of urban freight policy objectives
Tabela 8 Zestawienie głównych cech dla analizowanych celów zarządzania miejskim transportem ładunków

Objectives		
Optimization	Reduction	Transfer
– significant number of evaluated examples – relatively easy to integrate with existing measures – cost-effective – immediate results for regulatory measures – high level of public acceptance regarding reduced traffic intensity, noise and other emissions – limited stakeholder involvement required – limited impact on supply chains structure and freight demand factor – concerns freight traffic than rather logistics issues – useful as a basis for more complex measures – suitable to start competition in logistics industry in terms of new technology and systems – suitable for up-scaling	– high potential for supply chains redesign, but interaction with market proves challenging – proper business case in required for financial feasibility – few successful examples without external support – close cooperation of stakeholders is required, both private and public – dedicated private partner with clear business concept is essential – public involvement is often required in terms of regulatory framework, – for UCC's implementation only the exemptions and regulations that are not exclusive – for regulatory measures effects may be deferred, especially for planning, zoning etc. – planning measures must outreach the transportation issues only – potential for implementation innovative technology solutions	– for infrastructure: location-specific solutions with limited transferability potential – limited number of examples – detailed planning and ax-ante evaluation necessary – requires strong regulatory support, also on the national level – measures must be implemented as a part of complex concept with a well designed system of supporting actions – private sector involvement is essential – technology solutions must be proven and based on sound business case

Source: own elaboration

Figure 2 presents the structure of an analytic network process model created in accordance to previously identified conditions. It consists of the alternatives cluster and five criteria clusters: transport system, planning requirements, economy, environment and society. ANP method allows to assign weights to clusters as well as to derive the weight of cluster's elements with respect to the alternatives. It is important to identify the importance of the clusters because final priorities do depend on that. For the presented model weights for clusters are: planning requirements (0,293), transport system (0,250), economic development (0,217), society (0,130), environment (0,11). This reflects basic planning stage of urban freight policy in Gdynia, where a thorough approach is crucial placing high requirements for the planning system.

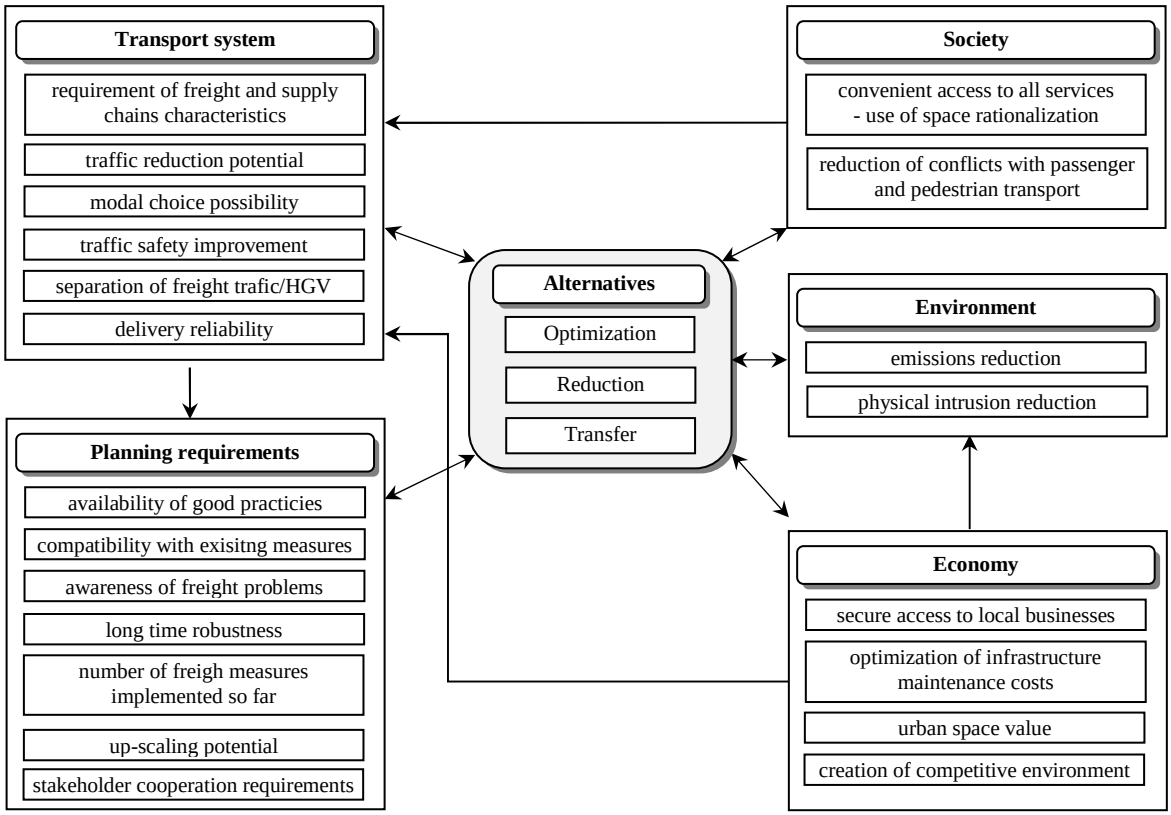

Fig. 2. Multicriteria model for classification of urban freight management objectives in Gdynia
Rys. 2. Wielokryterialny model decyzyjny dla klasyfikacji celów zarządzania transportem ładunków na przykładzie Gdyni

Synthesized judgments reveal final ranking of alternatives for urban freight policy in Gdynia with regards to previously identified baseline situation. Priorities of alternatives in direct and normalized form are:

- Optimization 0,677726 (1,000000),
- Reduction 0,184776 (0,272641),
- Transfer 0,137499 (0,202883).

To illustrate a background of the final result part of the supermatrix from the SuperDecision application was presented. It is a weighted matrix of feedback link between criteria and alternatives including cluster weights. It describes the importance of criteria with regards to implementation characteristics of three objectives.

Table 9. Weighted super-matrix for priorities with respect to alternatives
Tabela9. Ważona macierz wag nadanych poszczególnym kryteriom w odniesieniu do alternatyw

Cluster	Criterion	Optimization	Reduction	Transfer
Economic Development	Securing access for local businesses	0,1153	0,1237	0,0902
	Infrastructure maintenance cost	0,0637	0,0459	0,0676
	Increased value of urban space	0,0257	0,0332	0,0451
	Creation of competitive environment	0,0126	0,0146	0,0145
Environment	Reduction of emissions	0,0906	0,0870	0,0906
	Reduced physical intrusion	0,0181	0,0217	0,0181
Planning requirements	Availability of good practicies	0,0226	0,0133	0,0144
	Compatibility with existing measures	0,0245	0,0310	0,0238
	Awareness of freight problems	0,0954	0,0261	0,0386
	Long time robustness	0,0589	0,0282	0,0210
	Number of freight measures	0,0215	0,0680	0,0594
	Stakeholder cooperation	0,0592	0,1159	0,1260
	Up-scaling potential	0,0114	0,0109	0,0104
Society	Convenient acces to all services	0,1087	0,0978	0,0870
	Reduced conflicts with passenger and pedestrain transport	0,0217	0,0326	0,0435
Transport system	Requirement of freight and supply chains characteristics	0,0182	0,0848	0,0144
	General traffic reduction	0,0646	0,0601	0,0659
	Modal choice possibility	0,0125	0,0164	0,0225
	Overall traffic safety improvement	0,0347	0,0288	0,0409
	Separation of freight traffic/HGV	0,0886	0,0362	0,0799
	Delivery reliability	0,0315	0,0238	0,0264
		Σ 1,000	**Σ 1,000**	**Σ 1,000**

Source: own elaboration

CONCLUSIONS

The aim of this paper was to choose the rank urban freight policy objectives for Gdynia with a developed multicriteria model. The approach was intended as the first step in planning procedure towards selection of applicable set of practical measures. Selection of optimization objective was influenced by several analyzed factors, both external and internal in relation to current situation in Gdynia. Due to initial stage of urban freight planning in Gdynia and scarce transferable examples from Poland effort should be made first to thoroughly examine the freight system from the logistics point of view. It requires different approach than the traffic management systems implementation which is well advanced in Gdynia. Currently introduced systems would of course benefit perspective urban freight solutions. Logistic solutions indicate another factor, that is high requirements for stakeholder participation in preparation and implementation phase. Most measures included into optimization objective may be introduced by the city as a part of regulatory system. Reduction of demand for goods and transfer for less-intrusive types of transport involves deeper interaction with supply chains structure and economic processes. This is not a common attitude within existing planning system, but indispensable for more advanced urban freight solution demanding with solid business case and private sector cooperation. It is advisable to approach these objectives with a solid experience from previous actions to plan more sophisticated measures aiming at more complex problems. Further research should be aimed at development of guidelines for inclusion of urban freight traffic management into city's sustainable transport planning as a standard procedure meshing with other fields of planning.

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OKREŚLENIE CELÓW POLITYKI ZARZĄDZANIA MIEJSKIM TRANSPORTEM ŁADUNKÓW

STRESZCZENIE. **Wstęp:** Decyzje dotyczące planowania strategicznego transportu miejskiego towarowego są często oparte na założeniach nieodzwierciedlających aktualną sytuację i charakter napotkanych wyzwań. Można zaobserwować pewien trend przystosowywania pojedynczych rozwiązań bez pomocy środków wspierających oraz bez weryfikacji oczekiwanych rezultatów. Wybrane rozwiązania transportu miejskiego towarowego posiadają znaczny potencjał łagodzenia problemów transportowych, ale ich zastosowanie wymaga niekonwencjonalnego podejścia wychodzącego poza granice standardowego zarządzania i planowania ruchu drogowego. W procesie planowania poszczególnych działań należy uwzględnić dotychczasowe doświadczenia planistyczne danego miasta.
Metody: Ze względu na kompleksowość problemu i specyficzność czynników wpływających na podejmowaną decyzję, sieciowy proces analityczny ANP został wybrany dla określenia istotnych celów polityki transportu towarowego miasta. Gdynia została wybrana jako miasto poddane analizie. Jako pierwszy krok przeprowadzono przegląd obecnie stosowanych metod planistycznych w obszarze transportu towarowego. Następnie przeprowadzono klasyfikację celów polityki oraz ich warunków wstępnych wraz z opisową oceną ich wykonywalności. To pozwoliło na opracowanie modelu decyzyjnego ANP.
Wyniki: Zidentyfikowane cele polityki transportu towarowego miejskiego to optymalizacja, redukcja i transfer. Po zweryfikowaniu czynników wpływających na podejmowane decyzje, wybrano optymalizację, jako opcję najbardziej wykonywalną dla Gdyni. Inne możliwości oceniono czterokrotnie niżej, z lekką przewagą redukcji nad transferem. Taki ranking odzwierciedla aktualne praktyki planistyczne oraz dostępność doświadczeń związanych z transferem. Pomimo uzyskanych wyników, należy podkreślić, że planowanie miejskiego transportu towarowego powinno być oparte na długoterminowym metodologicznym podejściu bez wykluczenia żadnej z pojawiających się możliwości.

Słowa kluczowe: polityka transportu towarowego miejskiego, logistyka miejska, polityka transportowa, wielokryteriowe podejmowanie decyzji, analityczny proces sieciowy

ZIELSETZUNG DER POLITIK FÜR DIE AUSGESTALTUNG DES STÄDTISCHEN TRANSPORTVERKEHRS

ZUSAMMENFASSUNG. Einleitung: Die die strategische Planung innerhalb des städtischen Transportverkehrs anbetreffenden Entscheidungen stützen auf die Annahmen, die kaum aktuelle Situation widerspiegeln und Charakter begegneter Herausforderungen wahrnehmen. Man beobachtet einen Trend der Anpassung von einzelnen Lösungen jedoch ohne die Inanspruchnahme von unterstützenden Mitteln und ohne Verifizierung der zu erwartenden Resultate. Ausgewählte Lösungen innerhalb des städtischen Transportverkehrs besitzen ein bedeutendes Potenzial für die Milderung von Transportproblemen, allerdings deren Anwendung bedarf eines unkonventionellen Herangehens, das über die Grenzen der standardmäßigen Management und Planung des Straßenverkehrs hinausgeht. Daher müssen im Prozeß der Verplanung von eizelnen Aktivitäten die bisherigen planungsrelevanten Erfahrungen einer Stadt berücksichtigt werden.
Methoden: Angesichts der Komplexität des Problems und der Eigenart von Einflußfaktoren beim Entscheidungstreffen wurde der analytische ANP-Netzprozeß für die Bestimmung von wesentlichen Zielsetzungen für die Ausgestaltung der Politik für den städtischen Transportverkehr in Anspruch genommen. Die Stadt Gdynia wurde für die betreffende Analyse ausgewählt. Einleitungsmäßig führte man einen Überblick über die gegenwärtig angewendeten Planungsverfahren innerhalb des Transportverkehrs durch. Demzufolge hat man eine Klassifizierung der Zielsetzungen und deren Voraussetzungen samt einer Bewertung ihrer Ausfürbarkeit vorgenommen. Dies lag der Bearbeitung des ANP-Entscheidungsmodells zugrunde.

Ergebnisse und Fazit: Die in diesem Rahmen ermittelten Zielsetzungen der Politik des städtischen Transportverkehrs sind Optimierung, Reduktion und Transfer. Nach der Verifizierung der Einflußfaktoren beim Entscheidungstreffen wurde gerade die Zielsetzung der Optimierung, als die meist in Gdynia ausführbare Option, ausgewählt. Andere Möglichkeiten hat man vierfach niedriger bewertet, mit einem leichten Übergewicht der Reduktion dem Transfer gegenüber. Eine solche Abstufung widerspiegelt die gegenwärtigen Planungsverfahren und die Verfügbarkeit der mit dem Transfer zusammenhängenden Erfahrungen. Abgesehen von den Ergebnissen sei hervorzuheben, dass die Planung des städtischen Transportverkehrs auf ein zeitlich kontinuierliches, methodologisches Herangehen, ohne die alternativen, in Erscheinung tretenden Möglichkeiten auszuschließen, gestützt werden soll.

Codewörter: Politik des städtischen Transportverkehrs, Stadt-Logistik, Transportpolitik, Mehrkriterien-Entscheidungstreffen, der analytische Netzprozeß

Daniel Kaszubowski
Politechnika Gdańska
Wydział Inżynierii Lądowej i Środowiska
Katedra Inżynierii Drogowej
80-233 Gdańsk
ul. Narutowicza 11/12
e-mail: daniel.kaszubowski@pg.gda.pl