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Executive summary

This report presents the first version of the urban public transport's requirements document within Work Package 3 of the SECONOMICS project. The report presents a series of security case scenarios in current Barcelona's underground which will be analysed and modelled by the RTD work packages (WP4, WP5 and WP6).

This report explains how the use case contributes to the SECONOMICS project. For this purpose the societal dimension of security in the urban public transport is analysed. An important aspect related to security and society in urban public transport is the perception of security that will be analysed in depth in the use case. The case study leads to a security resource allocation problem in which adversarial features need to be taken into account. Moreover, we have identified three policy making scenarios to be further considered.

The security risk models and methodology will be applied to the urban public transport use case as well as the economics and policy makings models.

Furthermore, the Metropolitan Transport of Barcelona (TMB) case provides inputs that should be worthwhile exploring and including within the SECONOMICS modelling tool.

The next version of the document on urban public transport's requirements will cover the full scenario definition and will identify the detailed requirements for the SECONOMICS tool development.

1. Introduction

European cities are increasingly becoming more and more populated. In such context, urban public transport plays a key role; more than 80% of the EU population lives now in expanding cities, where the metro and tram networks have increased by 16% over a decade [1]. Around **60** billion passenger journeys were made by public transport in 2008 in the EU-27 [2]. Furthermore, in the context of the current economic crisis, it is important to take into consideration that the contribution of public transport to the economy can be estimated as 1.2% of the EU's GDP whereas the direct jobs in public transport are estimated at around 1,200,000 [2].

In passenger transport services a customer pays a fare to use the public transport provided by an operator. In exchange, he/she expects a minimum level of service, which comprises an acceptable level of reliability, comfort, cleanliness, safety, security, timeliness, information and customer service [3]. Brackstone et al. cogently argue that for this reason two of the objectives of urban public transport operators are:

- to reduce threats or perceived threats to transport users;
- to reduce threats to transport operations or infrastructure from revenue fraud, vandalism, sabotage or terrorism [3].

In this deliverable we provide an initial outline of a case study in relation with security in urban public transport. The case study is based on the operations of TMB which, as we shall argue, may serve as paradigm for other public transport service providers across Europe. The case study will motivate methodological developments in WP4-6 and requirements for the SECONOMICS tool developed in WP8. The TMB case study leads, on one hand, to a security resource allocation problem with adversarial components typical of what is faced by public transport operators, as well as several broader policy making issues concerning the adoption of punitive or preventive security measures; security cost sharing allocation in public-private partnerships and security service level agreements.

We first provide the main features of the Barcelona public transport system. We, then, review a number of general findings and best practices in the area of security in urban public transport, identify the main stakeholders and decision processes as well as the regulatory framework. We then discuss several issues concerning social aspects of security in connection with urban public transport. In Section 8 we describe this initial version of the case study and then suggest possible methodological approaches and details to be considered within the proposed SECONOMICS tool.

2. The Barcelona Urban public transport system

We shall provide in this chapter the most relevant features of the Barcelona Urban public transport system. We shall also compare it with other European underground systems mainly to reflect the relevance and representativeness of the proposed case study.

2.1 Transports Metropolitans de Barcelona: An outlook

Transports Metropolitans de Barcelona (TMB) is the main public transport operator in Barcelona and Catalonia, with 730 million passengers per year, and 572 million ticket validations per year. The company manages the Metro and bus services covering Barcelona and ten townships in its hinterland, on behalf of the Entitat Metropolitana del Transport (EMT). The company also manages leisure transport services such as the funicular railway of Montjüic, the Blue tramway and the cable car of Montjuïc. Annex 1 displays the whole network of TMB. We shall focus on the Metro service, whose key features are presented in Table 1.

Table 1. TMB basic data and indicators

Nº of Lines	8
Length of the network (Kms.)	102,6
Number of stations	140
Trains on lines during rush hour	142
Rolling stock fleet	816 cars
5 car-trains	162
2 car-trains	3
Trains with air conditioning	100%
Avarage age of fleet (years)	9,5
Passenger capacity – Km (million)	16.062,46
Useful cars – Km (thousand)	87.625,22
Passengers/Vehicle-Km in operation	4,35
Passengers – Km (seats-Km/1000)	121,04
Avg. distance per trip (Kms.)	5,10

Source: TMB December 2010

Figure 1 provides the TMB metro public transport service hours:
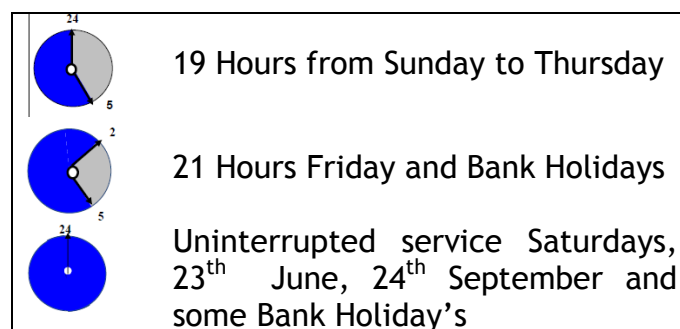
Figure 1. TMB public transport service hours   Source: TMB December 2010

Note that TMB operates 24 hours on Saturdays to improve its public service. However, the metro is clearly underutilized during night hours, there being many security problems that require the intervention of security staff at such time.

2.2 Representativeness of Barcelona metro system

Barcelona's representativeness for Metros of major cities in European countries may be assessed based on the results of the project 'Urban Transport Benchmarking Initiative' (UTBI) conducted in June 2006 [4]. Not all major European cities took part in this project and the data may be somewhat outdated to, but we believe that it is sufficiently informative for our purposes.

According to the above mentioned project, Barcelona has a population of 1.527.190 inhabitants, which reaches 2,8 million inhabitants if we included its metropolitan area. UTBI provides information about the population in other cities in Europe:
- Within the same range of population, i.e., cities with 1M – 2M inhabitants we find: Bucharest, Warsaw, Budapest, Vienna, Sofia, Prague, Dublin, Naples, Cologne and Brussels.
- Cities with over 2million people include Greater London, Rome, Athens, Madrid, Inner London and Paris – Ville [5].

Figure 2. Population of cities

Note that, while Barcelona was ranked eleventh in population size (Figure 2), it was ranked second in terms of population density, displayed in Figure 3.
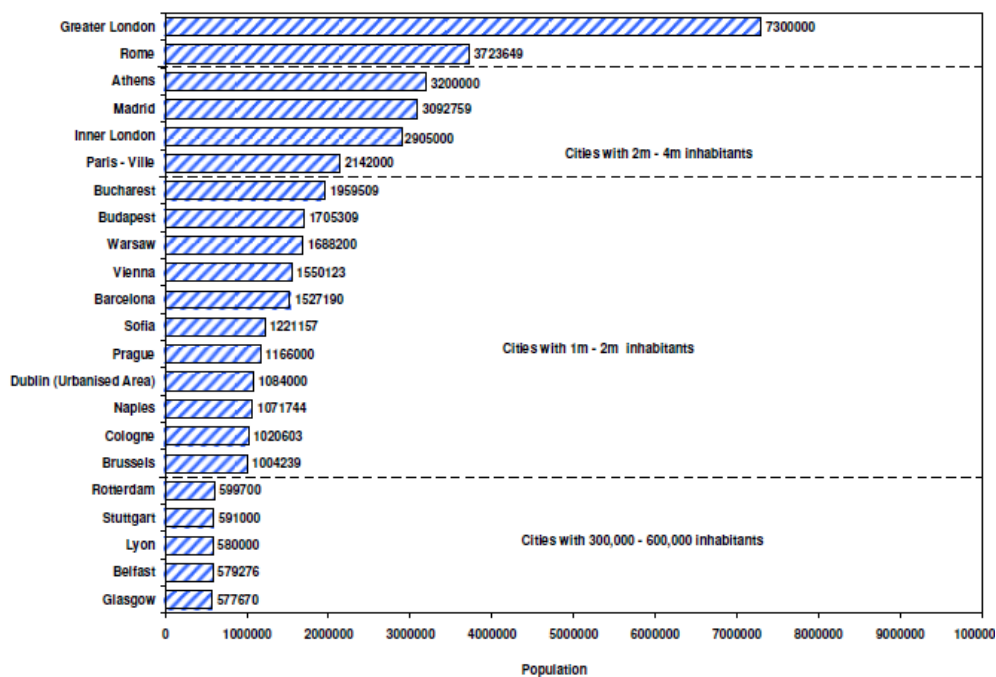
Source: Urban Transport Benchmarking Initiative Year Three
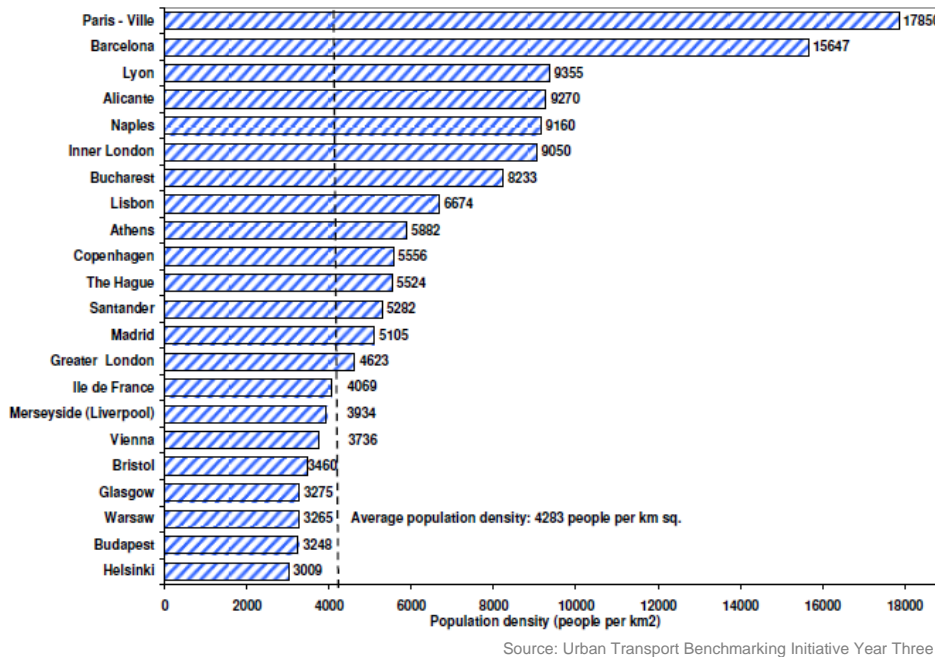
Figure 3. Population density of cities

Within the survey, all European cities with more than 500,000 inhabitants had a metro system, with the exception of Dublin, Merseyside and Belfast [5].

The project also identified that there is a strong relation between the metro network size and the urban population. The average network size was of 44 km per 1 million inhabitants, while Barcelona had 71 km per 1 million inhabitants.

The project also indicated that, in 2006, metro networks transported around 155 million passengers per day, 34 times higher than the average number of daily air passengers. This clearly demonstrates the economic and social relevance of developing, organising and operating a metro system [5]. Finally, the UTBI study concluded that metro is the most efficient transport mode in terms of energy consumption and space occupancy.

All this suggests, that Barcelona, which has a broad metro network and a high population density, seems an appropriate candidate in studies aimed at unveiling security policy issues in urban public transport systems.

3. Security in urban public transport

3.1 Introduction.

Urban transport is a priority for the economic and societal well-being of European citizens living in large cities. According to data from the International Association of Public Transport (www.uitp.org), urban transport ridership has increased steadily over the past 10 years in many EU countries [2]. This trend is expected to continue as cities grow, and challenges like traffic congestion and pollution become more of an issue. However, passengers may choose not to use the public transport system if they find it unsafe [6]. Therefore, it becomes paramount for operators to invest in security (and in strengthening the sense of security) to increase the number of passengers and revenue.

Regardless of geographic location and uniqueness in terms of transport network size and complexity, urban transport systems share characteristics as far as security is concerned. Such characteristics range from the high volume of passenger and the need for quick and easy access to the underground, local trains, buses or trams, to their operation along fixed routes with predetermined stops. All these aspects contribute, on one hand, to make urban transport prone both to daily operational security problems (e.g., disorder, vandalism, assault) and to exceptional security problems, such as terrorist attacks (outside the scope of this report for reasons given below). On the other hand, these characteristics also contribute to make security controls used in other types of mass transportation (such as passenger and luggage screening, and identity checks in airports), impractical for urban public transport [1] [6] [7].

In the domain of urban transport security, there is an important trade-off between, often conflicting requirements from two main stakeholders: passengers and operators. Specifically, security measures which impact negatively on service punctuality, frequency and price or on individuals' privacy are likely to face resistance from passengers, if they cannot perceive an improved feeling of security. Furthermore, security measures which might reduce the number of passengers, and revenue, or might increase operational costs in disproportion to the feeling of security they provide, will probably not be accepted by operators [1]. Security measures should therefore be employed only when a balance between transport service efficiency, effectiveness and security can be reached.

3.2 Projects and other initiatives review.

Table 2 shows some security research projects, indicating whether their research field is related with: risk assessment & methodologies, urban transport security measures, anti-terrorism, security tools development or security policy making and strategy. Furthermore, their connection with SECONOMICS and most significant results are also provided. Annex 2 - Project identification, includes a more detailed description of the projects.

Table 2. Security research projects

Project	Risk assessment & methodologies	Urban transport security	Anti-terrorism	Tools development	Security policy making and strategy	Connection to SECONOMICS project or significant results.
SECUR-ED	X	X	X			
COUNTERACT			X			Generic Guidelines for Conducting Risk Assessment in Public Transport Networks & Exchange of Security Policy Experience of Public Transport Operators
VALUSEC	X	X		X	X	Development of a tool-set to support policy decision makers
CPSI					X	Perception of security. Changing Perceptions of Security and Interventions methodology.
CRESCENDO						
DAMASST		X		X		Roadmap for mass transportation system of system development.
EUSECON			X		X	Policy Briefings on the Economics of Security
PROTECTRAIL				X	X	

There are also several platforms and organizations whose objectives include the cooperation, business development and sharing of know-how among public transport stakeholders, the more important being:

UITP (International Association of Public Transport) – www.uitp.org
The International Association of Public Transport (UITP) is an international network for public transport authorities and operators, policy decision-makers, scientific institutes and the public transport supply and service industry. It is a platform for worldwide cooperation, business development and sharing of know-how among its 3,400 members from 92 countries. UITP is the global advocate of public transport and sustainable mobility, and the promoter of innovations in the sector.

EUROPEAN RAIL RESEARCH ADVISORY COUNCIL - www.errac.org
ERRAC was set up in 2001 with the ambitious goal of creating a single European body with both the competence and capability to facilitate the renewal of the European rail sector and make it more competitive, by increasing innovation and guiding research efforts at European level.

ERTRAC (European Road Transport Research Advisory Council) - www.ertrac.org
ERTRAC was established to mobilise all stakeholders, develop a shared vision, and ensure timely, co-ordinated and efficient application of research resources to meet the continuing challenges of road transport and European competitiveness.

3.3 Urban transport security experiences in other European cities.

Table 3 summarizes the security threats in urban transport experienced by European cities and some of the countermeasures they adopted. Each cell in the table contains the ISO 3166 code of the countries where the threat and countermeasure were observed, as reported by the ECMT [8].

Graffiti can be performed inside or outside vehicles. The same happens with vandalism. Vandalism outside vehicles may take the form of window/metal scratching, etching or tagging, equipment breakage and missile-throwing incidents. Vandalism inside vehicles may take the form of damage to seats, floor, windows, "walls" and light. Assaults can be verbal, physical or sexual.

Table 3. Summary of security threats in public transport and countermeasures adopted

COUNTERMEASURES	Unspecific security threat identified	Graffiti (inside & outside vehicles)	Vandalism (inside & outside vehicles)	Misuse of emergency breaks & escalators	Pick-pocketing/ theft	Fare evasion/ fraud	Assault on drivers, staff or passengers
Unspecific countermeasure				FI	FR		
Cleaning by operators (contracts may set cleaning QoS parameters)		FI, BE, FR					
Protective coating of surfaces targeted by sprayers to facilitate cleaning/replacing		DE, FI, BE, FR, SE, IT					
Sprayers required to remove their own graffiti ("reparation")		DE, FI, FR					
Cooperation with police, legal and/or social authorities	FR	DE, GB	IT, GB		NL		
Surveillance technology inside and/or outside vehicles	GB, IT		DE, IE, BE, DK, FR				BE
Well-equipped security staff presence (e.g., guard-dog patrol) in transport facilities			IE, FR				BE
Windows fitted with plastic film to reduce risk of injuries			IE, FR				
Metro stewards or security personnel inside vehicles			DE, DK				
Expel of infringers (homeless, drug addicts, beggars) from transport facilities	DE		GB				

Re-direct infringers to social assistance facilities	FR						
Re-design vehicles to improve human contact & passenger control		DE					
Caught offenders sentenced to community services		CZ, FR					
Initiatives to reduce handling of money by drivers							DE, DK, IE
Awareness & citizenship campaigns in schools or community-wide discussions	SE, GB	FR	FR			FR	
Ban on transporting goods, smoking and/or alcohol	DE						
Security staff wears uniform visibly different from police	FR						
Differentiated fare structure to fit different user needs & economic circumstances						FR	
Software & databases to identify re-offenders		GB					
Controlled access: ticket barriers & ticket checks	GB						

3.4 Security best practices.

Best practice security measures may impact on actual security, reflected by a reduced number of offenses actually happening, or on perceived security, reflected by a reduced level of fear and anxiety among passengers who feel unsafe when traveling on public transport. They can also take one of these two perspectives: punitive or preventive security.

According to current consensus among operators and transport authorities, a security measure, either punitive or preventive, which may contribute positively to improve actual security but contributes negatively, to improve perceived security, is not a good strategy, [8]. An example could be the "zero-tolerance" approach adopted in New York in the 90's implemented by increasing the presence of police in the stations. The result was a "strong feeling of insecurity" among passengers, and a similar drop in the number of security occurrences, compared to Chicago, Boston and European cities such as Bilbao/Spain, which invested more on preventive measures to improve the perception of security [9].

Table 4 provides an overview of preventive and punitive measures which contribute to improve actual and perceived security collected from [8] [9] [10].

Table 4. Overview of preventive and punitive measures in terms of improvement to actual and perceived security.

	Improving actual security	Improving perceived security
Preventive security	Adequate lighting; Re-design of vehicles to improve human contact & passenger control; Ban on transporting goods, smoking and/or alcohol	Illuminated areas and vehicles; pleasant environment
	Staff training (importance to human factor); Metro stewards or security personnel inside vehicles	Presence of individual staff everywhere
	Individual security patrols (not in pairs or groups)	Security staff easily recognizable as not part of police
	Surveillance technology inside and/or outside vehicles (e.g., CCTV, presence detectors, intruder detectors)	Visible CCTV
	Emergency call-points in areas and vehicles	Prompt response to calls for help
	Damage from graffiti and vandalism removed ASAP; Cleaning by operators (QoS parameters); Protective coating of surfaces targeted by sprayers to facilitate cleaning/replacing	Well maintained areas and vehicles
	Cooperation with police & social authorities	Trained help specially at times of crisis
	Open layout (reducing occurrences of niches, corridors, corners, crowed areas); Windows fitted with plastic film to reduce risk of injuries	Elimination of threatening areas; safe feeling
	High quality passenger information system, and clear signs	Passengers informed accurately and promptly about transport services, fares, incidents, delays , changes
	Attended entrances; Controlled access: ticket barriers & ticket checks	
	Well-equipped security staff; Communication system for contact among security staff and central control point (linked to GPS systems)	
	Cooperation with social authorities; Re-direct infringers to social assistance facilities; Awareness & citizenship campaigns in schools or community-wide discussions; unemployed youth recruited to patrol the transport network	
	Initiatives to reduce handling of money by drivers	
	Differentiated fare structure to fit different users' needs & economic circumstances	
	Legal restriction on the open sale of spray paint	
Punitive security	Heavy police presence ("zero-tolerance" approach)	
	When caught, sprayers required to remove their own graffiti ("reparation"); Caught offenders sentenced to community services	

	Expel of infringers (homeless, drug addicts, beggars) from transport facilities	
	Ban of persistent offenders from the transport system	
	Cooperation with legal authorities for prompt law enforcement in case of uncivilized, anti-social and/or criminal offenses in transport system; awareness of magistrates and prosecutors about the extent of damage by graffiti and vandalism	
	Software & databases to identify re-offenders	

4. Urban public transport stakeholders

In general, the stakeholders of public transport system are represented by:

- Citizens, passengers and users in general;
- Local, regional and national politicians;
- Public authorities (ministries, local authorities, rescue services and police);
- Public Transport Operators;
- EU institutions;
- Non-governmental organizations and associations;
- Service and supply industry; consulting companies (security services companies).

In the specific case of the Barcelona Public Transport, such stakeholders would include:

Table 5. Barcelona urban transport stakeholders.

Stakeholder	Barcelona urban transport's stakeholder
Citizens, passengers and users	
Local, regional and national politicians	· Conseller territorial i sostenibilitat · Ministro del Interior
Public authorities (ministries, local authorities, rescue services, police)	· ATM (L'autoritat del Transport Metropolita) · Ajuntament de Barcelona (Barcelona council) Generalitat de Catalunya (regional government), Ministerio de Fomento (Spanish government), Mossos d'Escuadra (Regional police), Emergency services
Public Transport Operators	· TMB (Transports Metropolitans de Barcelona) · FGC (Ferrocarrils de la Generalitat de Catalunya)
EU institutions	DG Trans
Non-governamental organizations (associations)	· EUITP · Organization de Consumidores y Usuarios (www.ocu.org)., Associació de veins
Service and supply industry, consulting companies	· Security services companies

5. Security-related decision-making processes

Public authorities, organizations and institutions make decisions according to the public interest at three different levels: the strategic level to set the objectives and goals to achieve; the tactical level, in which the services and security measures are set and, finally, the operational level when the services and security measures are implemented [11].

In general, the security-related decision-making processes follow different steps from the identification and detection of a problem to the application of security measures and follow-up. In some cases, all decision making processes are developed within the organizations of an Urban Transport (UT) operator, so as to integrate safety and security measures within the whole operational security planning, and, indeed, within the whole operational planning. In other cases, the decision making processes involve stakeholders outside the organizations and risk assessment is an important tool to communicate and convince the stakeholders about the security needs [12].

6. Security regulatory framework

This section depicts the current security regulatory framework at national and European levels. We identified that TMB is less regulated than other transport modes such as airports and ports, for which there is a wide range of national-, EU- and international-level legislation and, in some cases, specific procedures and technologies [1].

In detail, the regulatory framework governing the TMB operation can be categorized into regional and national levels:

- o National-level regulations: Ley 39_2003, de 17 de noviembre, del Sector Ferroviario.
- o Regional–level regulations: LLEI 4/2006, de 31 de març, ferroviària and
- o Regulation of traveller of Metropolitan Railway of Barcelona (Ferrocarril Metropolità de Barcelona, SA)

As it is indicate in the publication Focus by UITP, an increasing pressure exists to standardize and regulate the security within public transport at European level. Otherwise, it is difficult to balance the standards applications with the risk to afford and the economic budget because it may change depending on the local laws, culture and circumstances. The UITP Security Commission strongly recommends that the urban public transport security regulation is responsibility of the local authorities and should remain under its responsibility. They encourage their members to share best practices and recommendations [6].

7. Societal dimension of security

As we have mentioned, risk perception is a key issue within security studies. We summarise here several key issues in connection with risk perception.

- **Risk Perception in Social Sciences**

The social science perspective on threats and risks is mainly developed by "risk assessment" analysts. Authors focus mainly on the concept of "risk perception" and draw particularly on psychology. Research on risk perception started in the late 60s, when risk perception was seen as the major cause of why people opposed to technology developments such as nuclear power [13]. Researchers started to point out that perception of threats and risks is not just a matter of technical knowledge but also that subjective aspects play a role in what people think about risks [14]. Within political science the issue appears mainly in political psychology and public opinion research. Political science scholars focus on risks and threats, especially in relation to terrorism.

- **Definition of Risk Perception**

In general terms, risk may be defined as the "likelihood that an individual will experience the effect of danger" [15]. Social scientists focus on the concept of perceived risk/threat/hazard. Perceived risk can be understood as the subjective assessment of the probability of this danger and how concerned people are with the consequences [13]. Risk perception hence includes three main aspects – subjective assessment of un/certainty that something with a negative outcome will happen [13].

Risk perception is studied as a targeted attitude to specific types of risks, such as terrorism, natural disaster, nuclear power, technologic development, crime, etc. As sociology and political science show, perceived threat can also fully come from social aspects of reality and not only from technologies or nature. People can perceive risk of losing their cultural identity, economic and political privileges, and feel threatened by specific groups of people, such as immigrants, and by specific policies [16]. There is a big variety of objects whose risks and threats individuals can assess.

There are two basic types of risk: personal and collective/national/general [17], [13], [14], [18]. A personal risk means a threat to the individual personally or her family and is often related to feelings of personal insecurity and fear of physical harm [17]. A general, national or collective threat is a threat understood as a risk for the country as a whole or society as a whole, and does not have to threaten the individual personally. They also differ in the consequences they lead to.

- **Consequences of Perceived Risk**

Various consequences of threat perception have been widely documented in the literature. Huddy et al. [17] summarize observed outcomes of threat perception in general: higher risk perception increases political intolerance, ethnocentrism, xenophobia, and prejudices. Threat perception also reduces cognitive abilities, leads to

closed-mindedness and intolerance to challenging opinions. Risk perception also supports individuals' willingness to forego basic civil rights and liberties [17]. Viscusi and Zeckhauser [19] analyse how people are willing to sacrifice civil liberties in the case of airport checks of passengers to reduce the risk of terrorism, i.e. whether they should be random and equal or targeted according to race, gender, nationality etc. Their analysis supports the perspective that the discussion about liberties and terrorism is not about keeping none of absolutely extreme positions, i.e. sacrifice all liberties or none of them in an effort to reduce terrorism risk. On the contrary, individual attitudes seem to be more of compromises and the result of trade-offs. Interestingly, the assessment of the general risk of terrorist attack showed no effect on the willingness to introduce targeted air checks.

The main difference between personal and national/societal threats should be on how they influence attitudes towards policies. Huddy et al. argue that the level of perceived personal threats do not influence attitudes towards national policy issues because individuals follow distinction between private and political arenas in their evaluation of general societal process and, specifically, policy issues [17]. Actually, they show that a perceived collective threat of terrorist attack will affect the evaluation of national consequences of terrorism, while the level of perceived personal threat of being hurt by a terrorist attack would have no effect. Similarly, Kam and Kinder [20] show that a perception of a higher national threat of terrorism increases the support for the war on terrorism such as higher expenses on security, defence, border control, or support for military action in Iraq.

- **Unsocial and antisocial behaviour**

As the SECONOMICS meeting in Barcelona in June 2012 pointed out, in order to capture the various facets of safety and security in the public transport scenarios, it is important to disentangle the categories of unsocial and antisocial behaviour. Whilst acknowledging, that in the practical day-to-day life, these are often found simultaneously, we provide the following definitions, based on publicly available sources from social and behavioural sciences as well as from social work.

The principal element of unsocial/antisocial behaviour is the lack of consideration for others, private property or public property. The second key feature is the fact that this type of behaviour often results in damage to society – intentional or by negligence. Unsocial behaviour can be defined as the lack of consideration for public property and public rules resulting in damages to established safety and security. Antisocial behaviour can manifest in various forms and intensities such as breaking formal rules and laws. In contrast, unsocial behaviour shows the lack of consideration for others, which can result in emotional or physical harm. In the public transport context, both forms of behaviour negatively affect the subjective feeling of customer satisfaction. Antisocial behaviour however also bears additional financial cost for the transportation authority.

8. Public urban transport scenarios

As outlined earlier on, there are varied types of incidents and situations in underground networks that may make the customer feel unsecure in the metro. Any public transport operator has the responsibility:

- to protect its customers;
- to reduce and mitigate threats (or perceived threats) to transport users;
- to reduce threats to transport operations or infrastructure, whether from revenue fraud, vandalism, sabotage or terrorism.

Furthermore, as we indicated, it should take into consideration the subjective perception of security of passengers (and staff). The terms "safety" and "security" play a central role on underground operation: while security refers to problems caused intentionally, safety deals with problems caused accidentally [6].

In order to better understand the security environment of TMB, we shall comment on some key findings within a systematic survey called "Customer Perception Study (CPS)" developed and conducted by TMB, aimed at identifying the most important issues around customer satisfaction. TMB uses the information gained from the survey for strategic decision making. The survey contains 21 basic service attributes listed in 8 categories in Table 6.

Table 6. Areas/attributes relation

Effectiveness
Speed
Reliability
Easy connections
Operation of stairs and elevators
Other

Comfort
Station temperature
Train temperature
No agglomerations
Accessible nodes

Information
General information
Information about incidents

Security
Security perception
No accidents or falls

Hygiene and cleanliness
Cleaning and conservation of stations
Cleaning and conservation of trains
No unpleasant odors

Customer attention
Friendly staff

Customer care system	
Attitudes	
TMB is well perceived	
TMB promote civility and culture	
Improvements/efforts	
TMB endeavor to improve	
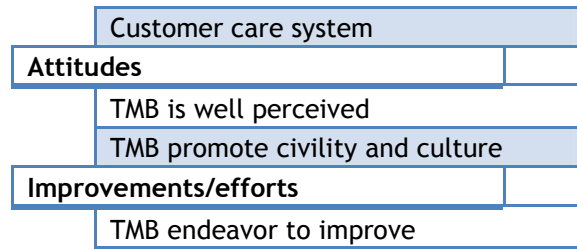
Source: TMB. CPS- November '11

Based on the customer responses, attributes classification based on Satisfactions and Importance:
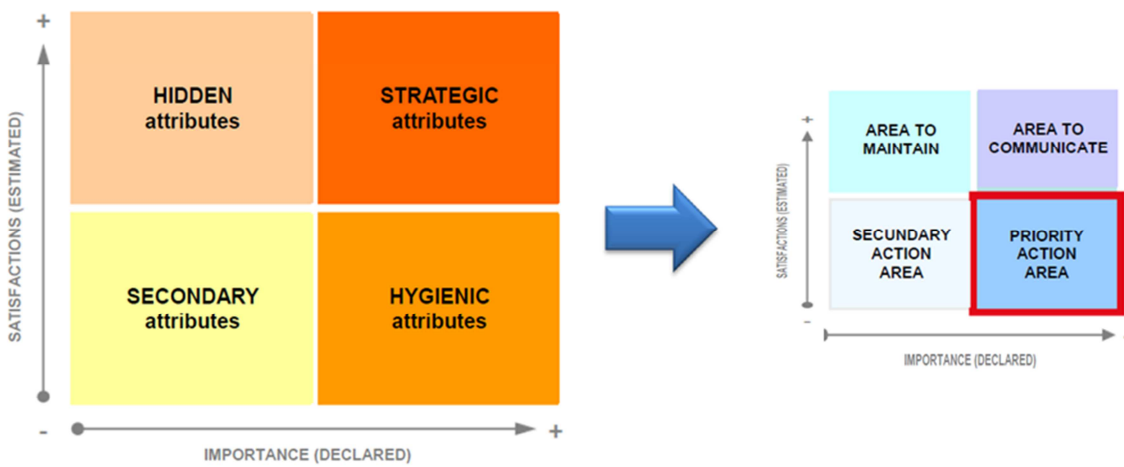
Figure 4. Attributes classification based on satisfaction and importance

According to the results of the 2011 survey, the security category was ranked very low while the customers participating in the survey valued the security very high.

Table 7. Satisfaction value ranking

Area	Value – Nov-2011
Attitudes	7,74
Effectiveness	7,35
Information	6,98
Improvements/efforts	6,92
Customer attention	6,89
Hygiene and cleanliness	6,81
Security	6,57
Comfort	6,24

Source: TMB. CPS- November '11

Table 8. Security values

Security	Value – Nov-2011
Security perception	6,31
No accidents or falls	6,82

Source: TMB. CPS- November '11

IMPORTANCE	2009	2010	2011
Reliability	1	2	1
Feeling of Security	2	1	2
Speed	3	4	3
Information about incidents	4	3	4
Ease in transfer to other PTS	5	5	5
Lack of accidents / falls	7	8	6
Efficient operation of ticketing machines and payment line	8	9	7
Metro tries to improve service	10	7	8
Efficient operation of escalators and elevators			9
Cleanness	7	8	10
Lack of crowding	13	10	13

Source: TMB. CPS- November '11

Figure 5. Attributes importance classification

Indeed, security is one of the most important items for customers and its value is under the mean valuation, the GAP being 0,97.

As a result, we can infer that security is one of the most important items for customers and the customers value the subjective feeling of security as very important. Given this illustration, we detail a security scenario in subsection 8.1-8.2.

8.1 Security threats at TMB

Security problems, or threats, are caused by people whose actions aim at undermining or disrupting the public transport system and/or harming passengers or staff. Public transport operators have to face a large range of security problems, such as disorder, vandalism, assault, and terrorist threats [6], as indicated earlier.

For the SECONOMICS project, TMB has defined a scenario based on a subset of the TMB metro network, which we shall designate Xarxa 4 for SECONOMICS. To show its relevance in terms of security, we outline in Table 9, the number of each type of incidents that Xarxa4 experienced from 2008 to 2011 [9].

Table 9. Types and numbers of incidents in Xarxa4 (TMB)

SECURITY	2008	2009	2010	2011
Sleepers	443	511	610	650
Pickpocketing warnings	420	1118	2276	2922
Tramps	226	378	362	444
Unauthorised animals presence	163	261	253	279
Antisocial behaviour against customers	149	122	410	360
Musicians	101	243	285	341
Smoking	26	41	54	51
Annoying/dangerous materials	40	71	59	47
Itinerant selling	19	71	76	75
Trespassing on tracks	33	36	74	69

Source: TMB. Xarxa4.

As we can see in Table 9, many types of security incidents have steadily increased. Indeed, Decision makers are much concerned with the increase of security threats, even more given the currently complicated socio-economic environment. However, they tend to invest in a range of security measures based mostly on the broken window theory of criminology (if nothing is done, the situation will escalate) rather than employing such measures based on ascertaining their effectiveness.

8.2 Scenario description

We outline now a case study which retains the essence of security environment that an urban transport (metro) (UT) operator faces. Details and data are fictitious to preserve confidentiality (and for security reasons). The study is structured in a way that an UT provider may insert their own details and undertake their own computations if required.

8.2.1 Description of Xarxa4 metro network

The enclosed graph describes the metro network of Xarxa4, with the nodes (stations) and arcs (tracks).
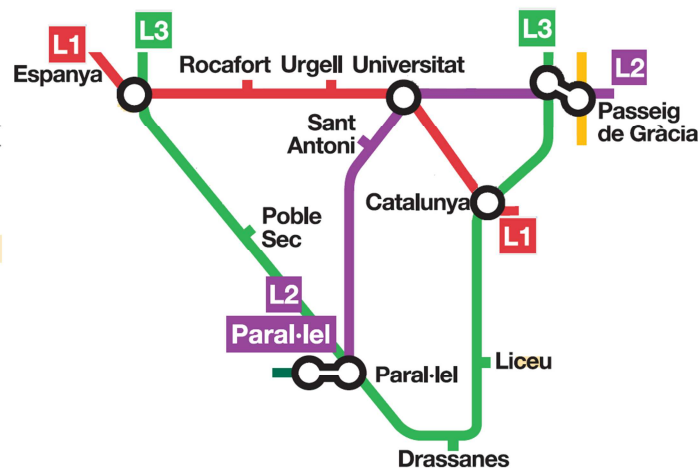
The enclosed table lists the names of the stations included in the subset:

Table 10. Name of the stations included in the scenario

Line	Station Number	Station Name
L1	122	Espanya L1
L1	123	Rocafort
L1	124	Urgell
L1	125	Universitat L1
L1	126	Catalunya L1
L2	210	Paral·lel L2
L2	211	Sant Antoni
L2	212	Universitat L2
L2	213	Passeig de Gràcia L2
L3	321	Espanya L3

L3	322	Poble Sec
L3	323	Paral·lel L3
L3	324	Drassanes
L3	325	Liceu
L3	326	Catalunya L3
L3	327	Passeig de Gràcia L3

Source: TMB. Xarxa4.

We also provide some relevant data the incumbent metro links.

Table 11. Description of relevant metro links included in the scenario

Node A	Node B	Underground time	Surface time
122	125	7	7
122	126	8	8
122	210	5	6
122	212	7	7
122	213	10	8
122	321	5	4
122	323	7	6
122	326	11	8
122	327	13	8
125	126	1	5
125	210	5	6
125	212	2	2
125	213	4	5
125	321	10	7
125	323	6	6
125	326	5	5
125	327	6	6
126	210	7	8
126	212	3	5
126	213	10	6
126	321	12	10
126	323	9	8
126	326	3	3
126	327	5	6
210	212	3	6
210	213	5	8
210	321	4	7
210	323	1	1
210	326	5	8
210	327	6	9
212	213	1	5
212	321	5	10
212	323	4	7
212	326	6	5

212	327	9	6
213	321	9	8
213	323	6	8
213	326	9	6
213	327	7	7
321	323	3	6
321	326	7	8
321	327	9	10
323	326	5	8
323	327	7	9
326	327	2	5

Source: TMB. Xarxa4.

Finally, we provide relevant data concerning structural and security issues at the incumbent stations.

Table 12. Name of the stations included in the scenario

Node A	Number of entrances	Average daily passengers	Number of cameras
122	5	45.700	37
123	4	13.200	30
124	3	10.800	27
125	4	23.900	17
126	3	56.100	34
210	4	24.200	60
211	3	11.800	18
212	4	23.900	37
213	2	33.200	33
321	2	45.700	24
322	3	13.800	18
323	4	24.200	35
324	3	14.200	26
325	4	20.100	19
326	5	56.100	38
327	3	33.200	31

Source: TMB. Xarxa4.

8.2.2 Description of Xarxa4 metro current security measures

Xarxa4 Metro currently spends 1,5M€ (1,5 million euros) in security measures to protect the network against various security incidents. Xarxa4 has developed a stronger security presence on the network with the deployment of inspectors, solo guards, patrols, mobile response teams and team supervisors to face the different threats. The security staff is provided by a private security firm. Xarxa4 has strengthened the security measures with security dogs and sniffers dogs.

A security control centre coordinates all security staff, which decides upon actions to be taken in case of incidents, and, if this is the case, they contact the police, medical services or the fire brigade, as required. As an example, during 2011, the police intervention was required 450 times (55%), the emergency services (ambulances) 348 times (43%) and the fire brigade 13 times (2%) [4]. There is a strong collaboration with the regional police (Mossos d'Escuadra).

Xarxa4 has emphasised security measures such as:

- Guards (all external employees);
- Solo guards;
- Teams and team supervisors;
- Mobile response teams;
- Security and sniffer dogs;
- Training and coordination of actors.

Furthermore, Xarxa4 has also invested in technical security solutions including:

- Cameras;
- On-board CCTV to improve passenger security;
- Presence detectors.

8.2.3 Xarxa4 security objectives

The initially identified objectives for the security resource allocation process will be:

- To minimise security costs;
- To minimise costs in relation with incidents;
- To minimise number of incidents of various types.

This will be subject to further scrutiny, as many other details of this case, in the final version.

8.2.4 Threats description and countermeasures

Over the years, Xarxa4 Metro has experienced various types of security threats, as tabulated above. All these threats are considered to decrease actual and perceived security. Of all threats identified by Xarxa4 Metro, particularly interesting cases are discussed and analysed (i.e., graffiti, vandalism, fare evasion, tramps and pickpocketing), and then categorized by their motivations (i.e., economic vs. social motives) and principals (i.e., individual vs. group) as shown in Figure 6. In detail, this figure indicates that Type I threats (i.e., threats caused by anti-social behaviour) are based on involved actors' organized and planned activities. Type II threats are based on actors' individual and instinctive activities, and categorized as threats caused by un-social behaviour. Types III and IV represent individual and group activities based on

economic motives. Since these activities commonly cause crimes, they are categorized as 'Individual Crimes' and 'Organized Crimes'.

On the other hand, some threats cannot be clearly classified by their motives and principals. For example, fare evasion by individual and by collusion is placed in between Types II and III, and Types I and IV, respectively, since it can take place either by social motives (e.g., social involvement and bonding) or by economic motives (e.g., saving money). The arrow in the figure indicates that the behaviour becomes more organized and planned, while the monetary gain from the behaviour becomes lower.
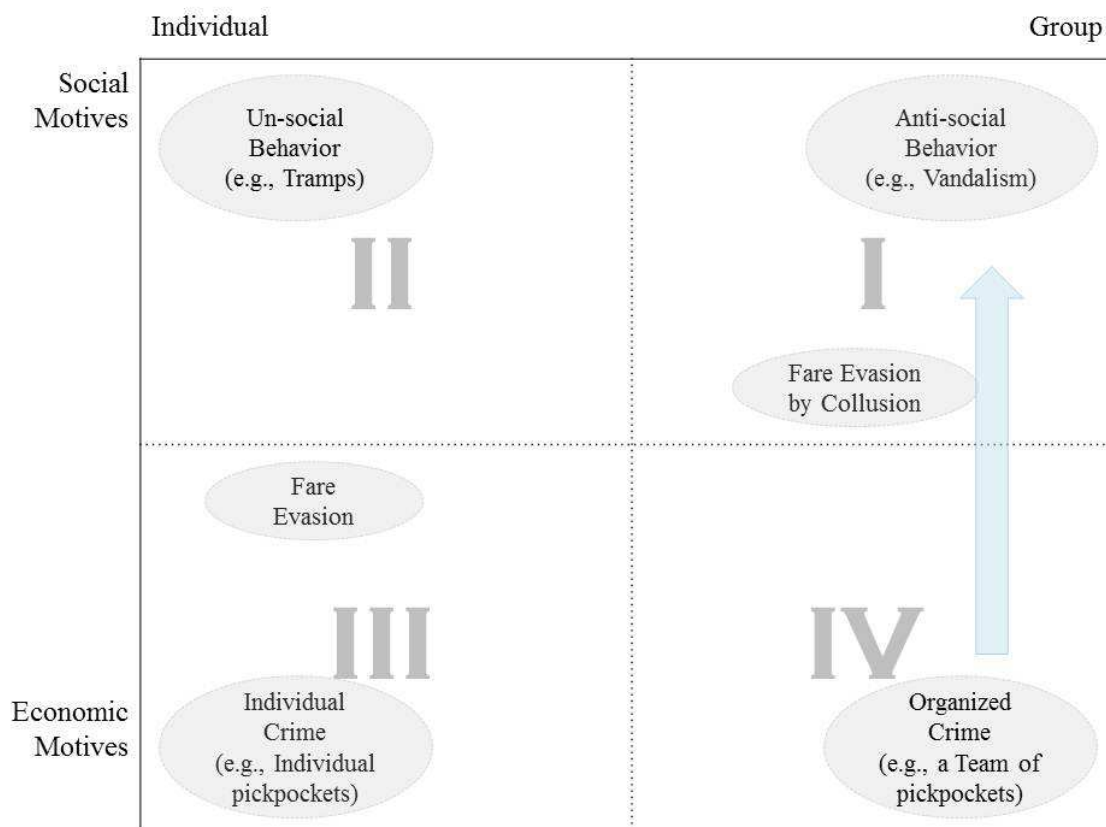
Figure 6. Classification of Security Threats by motives and principals

Note that, while a terrorist attack might also be a severe security threat to Xarxa4 Metro, it is not considered in this study due to the lack of competence of Xarxa4 Metro against terrorist attacks. It would however be of interest to consider contingency plans after terrorist attacks.

In the following, detailed descriptions of the selected threats are presented.

1) Vandalism and Graffiti: Anti-social behaviour (Type I)

- Description:

Vandalism and graffiti can be categorized as anti-social behaviour since they mostly intend to be against the system (e.g., authorities). Vandalism and graffiti therefore deteriorate the feeling of security, and reduce reliability and service quality. Repairing

the assets is likely to be very expensive and transport operations are clearly affected. For instance, in April 2012, passengers were informed about one hour service interruption due to people invading tracks. This caused an immediate effect on public and pressure on policy-makers. This type of activities is identified as a European-wide problem and might be related to the current social and economic situation.

- Motivation:
  - o Most of these activities are brought about by thrill-seeking and enjoyment of feeling of power and peer recognition (no monetary profits).

- Impact. According to TMB, the following costs and indicators have been identified:
  - o The costs for cleaning the trains and repair vandalism is around 100.000€/year;
  - o The indirect costs of vandalism on the feeling of insecurity may be estimated on 1% loss in traffic, or the equivalent in direct revenue [8];
  - o Quality service decreases: service is affected;
  - o Social image: customers feel less secure.

- Countermeasures:
  - o C1.1 Protect the trains and facilities:
    - ▪ Surveillance technology inside and/or outside vehicles and infrastructure (e.g. CCTV, presence detectors and intruder detectors).
  - o C1.2 Inform the metro users that these acts have a cost:
    - ▪ High quality passengers information system, inform about the cause of service interruption.
  - o C1.3 Change the law (Current law too soft, but politicians do not see the problem):
    - ▪ Cooperation with legal authorities for law enforcement in case of vandalism and graffiti;
    - ▪ Awareness of magistrates and prosecutors about the damage of vandalism and graffiti.
  - o C1.4 Awareness & citizenship campaigns in schools to reduce vandalism and graffiti;
  - o C1.5 Software & database to identify re-offenders and to get statistics.

2) Fare Evasion by Individuals or by Collusion

- Description:

For many years, fare evasion has resulted in enormous financial losses to TMB. While there are different forms of fare evasion including turnstile vaulting and avoidance of paying correct fare payment, they are carried out by individual unorganized actions. More recently, however, a new trend has emerged: fare evasion by collusion (i.e., between passengers or between passengers and employees). This new type of fare evasion is more problematic than the traditional forms of fare evasion since it can cause higher revenue losses than the traditional ones: fare evaders cooperate with each other to avoid ticket inspections and penalties, and share information online about the location of ticket inspectors and guards (e.g., http://www.memetro.net/ and http://www.facebook.com/memetro.net). According to TMB, in 2011, fare evasion

consisted of 3.2% fraud estimate and 6.600 penalties were imposed (through 506.000 inspections).

These jointly-led fare evasion activities become closer to anti-social behaviour as they are more organized and coordinated.

- Motivation:
  - While traditional forms of fare evasion were based strongly on economic motives (e.g., saving money), joint fare evaders are more likely to be motivated by social reasons (e.g., social bonding).
- Impact:
  - Financial loss;
  - Social image (Fare evasion decrease the feeling of security radically, while ticket inspection increases customer satisfaction).
- Countermeasures
  - C2.1 Federation team asking for ticket in a platform:
    - TMB staff makes random ticket inspections in the platform to all metro users to avoid discrimination;
  - C2.2: Technological measures: Automatic access doors;
  - C2.3: Portable inspection devices (ticket readers);
  - C2.4: Organizational measures (communication plan & customers information: poster, flyers);
  - C2.5: Penalties if they are found – 50€ on the spot and 100€.

3) Pickpocketing: Individual Crime (Type III) and Organized Crime (Type IV)
- Description:

Of the various types of crimes resulting from criminal intention (e.g., pickpocketing, drug transaction, harassment and robbery), pickpocketing is known as one of the most pervasive types of crime in the subway. Pickpocketing usually takes place in busy subway cars, particularly, in the first and last subway cars. As a result, pickpockets are not easily recognized and it is difficult to catch them even when they are recognized. Since they work individually or collaboratively in a team, pickpocketing can be either individual or organized crime. TMB estimated that there were 2.922 incidents in 2011.

- Motivation:
  - Pickpockets' motivation is sorely on criminal and economic motives.
- Impact
  - Social image: pickpocketing radically decreases the feeling of security;
  - Security costs;
  - Impact of mass media in public security.
- Countermeasures
  - C3.1 Technological measures:
    - Video surveillance and security control centre;
    - Radio equipment & Geo-localization
  - C3.2 Organizational measures:

- Random routes of patrols
- Random routes of solo-guards and dogs
- Coordinated actions with dogs
- Criminal prosecution. Xarxa4 process:
  Detect criminals and communicate with the police office, and try to take the criminals out of the metro (possibly with the aid of a dog).
- Customer information: public awareness plan (posters, flyers).

4) Tramps: Un-Social Behaviour (Type II)
- Description:

Tramps (or sleepers) are commonly unemployed or homeless people staying in subway stations. The current economic crisis is entailing an increase in their number. Since some tramps tend to be mentally unstable and disordered, and/or aggressive, they might reduce the passengers' feeling of security and service quality. During 2011, 1.090 tramp cases were identified.
- Motivation

Their behaviour is based on unsocial emotions.
- Impact
  o Social image: tramps and sleepers decreased the feeling of security radically.
  o Security costs.
- Countermeasures
  o C4.1 Technological measures:
    - Video surveillance and security control centre.
    - Radio equipment & Geo-localization
  o C4.3 Organizational measures:
    - Random routes of patrols;
    - Random routes of solo-guards and dogs;
    - Coordinated actions with dogs;

The meeting with TMB pointed out that organized and planned threats are more problematic than individual and impulsive threats, since they have become more aggressive and may have a bigger impact on the public's security perception. As a result, we generated the following table focusing on the characteristics of organized threats.

Table 13. Characterization of organized threats

Cases	Main Reasons of the behavior	Economic Damage	Reputation Damage	Impact on passengers' feeling of security
Pickpocketing by a team	Collude (to do something and) to gain something	Only for victims	High impact only on individual affected	Low ~ moderate
Fare Evasion by collusion	Collude to do (or avoid) something (and to gain something)	Missing income	Indirect only (e.g., sense of free riding)	Low ~ moderate

Organized Vandalism	Collude to do something	Positive loss	Highly visible to passengers	High

In the case study, we aim at dealing simultaneously with the three threats as:

- The three are considered important by Xarxa 4;
- There is a single budget to deal with all of them;
- Countermeasures may have effects on various types of threats simultaneously, as shown in Table 14.

Table 14. Countermeasures applied in different threats

Countermesures	Threats			
	Vandalism and Graffiti	Fare evasion	Pickpocketing	Tramps
Protect trains and facilities	X			
Inform the users, communication plan	X	X	X	
Change the law	X			
Ticket inspection		X		
Ticket readers		X		
Automatic access doors		X		
Pentalties	X	X		
Video surveillance	X		X	X
Security control center		X	X	X
Radio equipment & geo.localization			X	X
Patrols			X	X
Solo guards and dogs			X	X
Coord. Actions with dogs			X	X
Collaboration with police authorities			X	X

8.2.5 Tactical-operational scenario

Based on the identified threats, topology, constraints, objectives and topology, we aim at solving the outlined security resource allocation problem and then identify how such security resources are best deployed. Indeed, we aim at:

1. Identify how to best allocate the available security budget in various security resources so as to improve the current security status. By this we mean:
   1.1 To reduce the likelihood and eventual impact of threats (e.g., by developing deterrence strategies and appropriate fining schemes);
   1.2 If happening, how to best recover from the attacks.
2. Identify how to best deploy such security measures (e.g. decide what is the best random routing of strategy of guards-dogs).

Through this, we aim at optimizing the security impact given the limited resources, by improving the methodology and organization, the applied technologies and the customer information.

8.3 Strategic-tactical scenarios

In previous sections we have also outlined several policy issues that are relevant in relation with security and public transport. Here we shall briefly single out a few of them that we might consider as examples of scenarios of a more strategic nature to be fixed in the next version of this deliverable and treated through the technical workpackages.

8.3.1 Security partnerships

At various points we have outlined within our case the presence of security partnerships, with possibly several public and several private partners which contribute to security. Public partners contribute to security as part of their mission of preserving well-functioning of a nation; private partners partly contribute to this, but also have operational business interests. We may consider that as a partnership which together invests resources to achieve certain security level. Once we have decided the appropriate investment-security level, we should aim at discussing how to share costs among partners.

8.3.2 Security versus service quality

We have also mentioned at various points the tension between security and service quality. In many cases, they will emerge as conflicting objectives. One example is 24h metro service at weekends. This entails excellent service, but, beyond the high (and profitless) costs, also an opportunity for further security breaches. We may then wonder in such situations which is the right balance between service quality and security.

8.3.3 Security Service Level Agreements

Within the above mentioned security partnerships it may be the case that some partners outsource security to third parties, which, as we have mentioned, has a cost, but also has an impact on the use of the public transport system. One may then wonder what would be the appropriate service level agreement, for a given cost, that the partner should reach with the third party provider.

8.3.4 Preventive vs. punitive security measures. Security vs. perceived security

We have mentioned above the issue between preventive and punitive security measures and their impact over security and perceived security. Positive security contributions but

negative perceived security contributions for a measure tend to be perceived as a bad strategy, but this is mainly a matter of intuition and practice. Models supporting such issues would then be relevant, especially in reference to whether preventive or punitive measures are preferable.

9. A hint on methodological approaches

This section describes the methodological approaches to the suggested case studies.

9.1 Tactical-operational scenarios

The proposed tactical-operational scenario may be described as a security resource allocation problem. It may be solved, in principle, within the risk analytic framework. In order to do that, we shall proceed as follows:

- Identifying the management objectives of the case study owner, as far as the case study is concerned. As a key step, we need to identify the stakeholders and get ideas concerning their risk perceptions to further identify relevant objectives.
- Identifying the relevant threats to be considered in the problem, a detailed description, underlying motivations, involved agents and interactions.
- Assessing the risks associated with such threats. This entails assessing their probability of occurrence and describing their impact and the impact distribution, given that the threat happens.
- Identifying the countermeasures and how do they impact on the various threats, i.e. how they reduce the likelihood of occurrence of such threats and/or how do they mitigate the effects, should they occur.
- Identifying various constraints, including the budget available for risk management and possible legal constraints in reference with countermeasures.
- Formulating the utility function for the problem at hand, identifying the trade-offs between various objectives, as well as the impact of risk perception on the utility function.
- Finding the optimal risk management portfolio, which is that maximizes the expected utility, while satisfying the constraints.
- Communicating the risk management portfolio and describing how the impact of such portfolio may be monitored.

At first sight, the problem might seem to be based on a standard risk analysis approach but four features described below may require introducing novel methodological features:

- The explicit introduction of issues in relation with risk perception may require novel features in preference modelling.
- The adversarial nature of the problem, with most of the threats having a clear intentional nature. This requires trying to forecast such intelligent driven and adaptive activities, thus entailing developments from the recent field of adversarial risk analysis.
- The underlying structure of the problem, which is a network, thus with arcs and nodes, but such that only value is retained at nodes. The arcs serve only for rapid

deployment of security resources. Therefore, they have only impact on constraints.

- The combinatorial nature of constraints over portfolios of countermeasures, probably entailing novel computational schemes.

Once with the optimal resource allocation, we may solve how to optimally deploy such resources, which as well will require novel methodological input. The whole approach is fully described in the Figure 6:
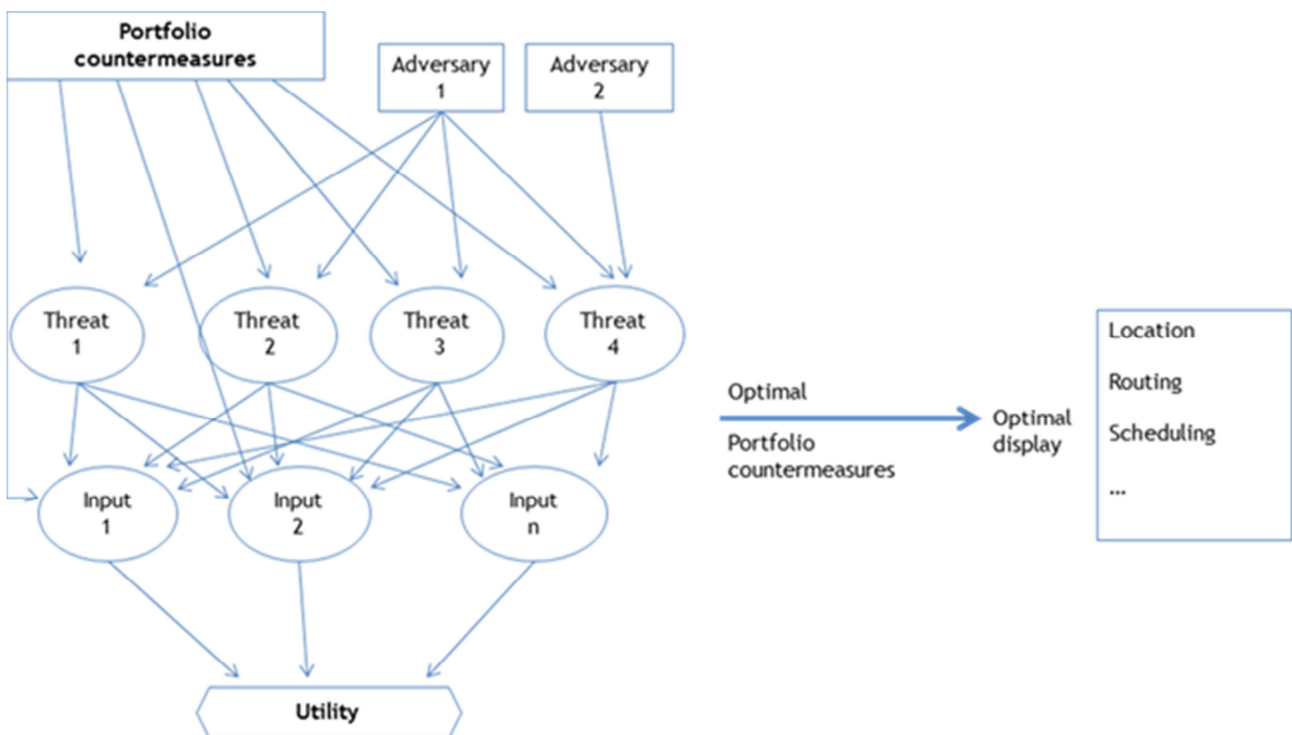
Figure 7. Operational Scenarios Modeling in the Urban public transport Case Study.

Once solved the problem, the novel essential methodological features will be extracted to develop templates for solving similar problems in the future and for implantation within the SECONOMICS tool.

9.2 Strategic scenarios

The strategic scenarios outlined above require the use of game theoretic concepts. Here we just sketch some of the ideas that we might use.

For the security partnership problem, we may view a coalition of defenders who invest in security resources and two types of users, one with just provides benefits to the service provider and another one who threats the service provider. Thus, we might view this as a sequential defend-attack problem. Once solved, we would need to uncover how to split the costs among partners, a problem that may be dealt with through cooperative game theoretical concepts. The security versus service quality problem may be seen as a

multi-objective optimisation problem in which the Pareto frontier could be displayed to reach an agreement on the security-cost compromise. The security SLA problem may be seen as a negotiation problem between the service provider and the security third party, which could be possibly solved in an integrative manner. The security vs. perceived security problem might be seen again as a sequential-defend attack problem, perhaps with two non-independent objectives.

10. Public urban transport requirements for tool development

In the following, the initial requirements for the tool development are identified. The final version will include additional details.

- General tools characteristics and requirements:
    - Usability: easy to use and without training required;
    - Interoperability: it will allow integrating data from different systems;
    - Flexibility to facilitate the adaptation to different user scenarios and to develop further functionalities if it is necessary;
    - Different users' profiles access and different functionalities for users;
    - Reporting and data visualization;
    - Web-based platform;
    - Data security.

- Tool functionality:
    - Threats identification;
    - Risk ranking taking into consideration the probability of occurrence and the impact;
    - Security measures identification and prioritization;
    - Estimate cost and benefits of measures;
    - Security scenarios (measures, risk, resources, costs,…) and alternative scenarios;
    - Reporting for different criteria

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ANNEX1. TMB network graph

ANNEX2. Projects identification

This Annex explains some current and past projects about security in public transport or related to public transport and other initiatives related to security in public transport.

SECUR-ED

- Project objective:

The SECUR-ED Project is a demonstration project with an objective to provide a set of tools to improve urban transport security in Europe. Participants include all the major stakeholders from across Europe. Based on best practices, SECUR-ED will integrate a consistent, interoperable mix of technologies and processes, covering all aspects; from risk assessment to complete training packages. These solutions will also reflect the very diverse environment of mass transportation and also considers societal and legacy concerns.

- Project results:

The project is also dedicated to delivering system-of-systems architecture definition and aims to develop an interoperable language, as well as a description of tools and guidelines for modelling and simulation of specific threats situations. The different modules (made up of best practices, procedures, training, hardware and software) are selected and packaged with interoperable interfaces, ready to be integrated. Similarly standard interfaces are developed to host such modules in respective legacy transport infrastructures. Integration will be demonstrated in the four demo cities (Madrid, Paris, Milan and Berlin). Each city will play host to several distinct scenarios. These demonstrations will seek to validate the security enhancement packages, acting as the showcase for this unique European initiative. Further "satellite" demonstrations will also occur in other cities which will utilize the "tool-kit" of solutions developed in this project to assess their own risks and thus design solutions to be used in these adapted demonstrations.

Deliverables available on the website:

- o Public summary D.36.2 – Definition of the events, signals and phenomena to be monitored
- o Public summary D.36.1 – Review of security solutions related to preventive and early intervention
- o D.41.1 Preliminary architecture and set of ICDs
- o D.23.1 First platform and SECUR-ED standards for distributed simulation
- o D.22.1 Interoperability concept
- o D.21.2 Survey report on current PTO security practices
- o D.22.2 Interoperability Notation (Public Section only)
- o D.21.3 Overall Approach to Security Management and Emergency Preparedness (Public Section only)
- o D.21.1 Public Transport Security Terminology and Definitions (Full Deliverable)

URL: www.secur-ed.eu

COUNTERACT

COUNTERACT (Cluster Of User Networks in Transport and Energy Relating to Anti-terrorist ACTivities) is a European research project funded under the Sixth Framework Programme by the Directorate-General for Transport and Energy of the European Commission.

- Project objective:

The main objective of the project, which came to a close in Spring 2009, was to improve security against terrorist attacks aimed at public passenger transport, intermodal freight transport and energy production and transmission infrastructure.

- Project results:

The following reports are the result of the work of the **Public Passenger Transport Cluster**:

- o PT1: Impact Assessment on "Rail and urban passenger transport security at the European Level regarding terrorist threats in railways and urban passenger transport.
- o PT2: The Exchange of Security Policy Experience of Public Transport Operators;
- o PT3: Anti-terrorism Public Awareness Campaigns;
- o PT4: Generic Guidelines for Conducting Risk Assessment in Public Transport Networks;
- o PT5: Public transport Security Planning – Organisation, Countermeasures & Operations guidance
- o PT7: Potential Terrorist Action – Decision-making;
- o PT9: Anti-terrorist Public Awareness Campaigns 2;

URL: http://www.uitp.org/Public-Transport/security

VALUSEC

Economics of Security -VALUSEC: Cost-benefit analysis of current and future security measures in Europe.

- Project objective:

VALUSEC overall goal of this project is to develop a tool-set to support policy decision makers in balancing decisions with overall policy objectives, political and ethical values, and societal concerns.

- Project results:
  - o D2.1 Decision domains concepts and trends
  - o D2.2 Data model and decision model
  - o D2.3 Relational concept between security and politico-economic sphere
  - o D2.5 Report on workshop on user needs and requirements
  - o D3.1 Framework for the assessment of methods and tools
  - o D3.2 Catalogue of evaluated methodologies and tools available
  - o D3.3 Evaluation of methods and tools , and the required improvements

URL: www.valusec.eu

CPSI (Starting: 01/04/2008 Finalizing: 01/04/2010): Changing Perceptions of Security and Interventions

- Project objective:

CPSI aims to create a methodology to collect, quantify, organize, query, analyses, interpret and monitor data on actual and perceived security, determinants and mediators.

- Project results:

Envisaged end-users include governmental bodies at the local, provincial, national and international levels, law enforcement organisations, emergency services, other organisations engaged in policy making and strategy development. With information from the implementation of the CPSI methodology, it will be possible for end-users to:

  o Monitor security down to the neighbourhood level,
  o Implement interventions in a more focused (and cheaper) manner,
  o Formulate better policy,
  o Learn from the experiences of others.

URL: www.cpsi-fp7.eu

CRESCENDO: Coordination action on Risks, Evolution of threatS and Context assessment by an Enlarged Network for an r&D rOadmap

DEMASST: Demo for mass transportation security: roadmapping study

DEMASST is the first phase of the FP7 demonstration programme for security in mass transportation with the task to provide a roadmap for the development and integration of system-of-system solutions. By virtue of the similarity of problems across big cities in Europe, such security solutions have a potentially very important EU-wide market.

URL: www.demasst.eu

EUSECON: New Agenda for European Security Economics
EUSECON strives to create an analytical framework for complementary research within the discipline of security economics. This framework relates human-induced insecurity (terrorism and organised crime) to other forms of insecurity (industrial accidents, natural disasters, geo-political insecurity) and security measures.

- Project results:
  Policy Briefings on the Economics of Security
URL: www.economics-of-security.eu/eusecon/resources

PROTECTRAIL (Start: September 2010 – End: March 2014)
Railway-Industry Partnership for Integrated Security & Rail Transport
Protectrail focuses on providing "a viable integrated set of security solutions" with the focus on rail transportation systems.
The PROTECTRAIL objective is to provide a viable integrated set of railway security solution, by considering:

  o the extent of the assets involved,
  o the nature of the possible threats,
  o the amount of technical requirements and operational constraints.

The approach hereby considers the perspective of "layered 'system integration'", in order to "address this main goal" of solving "the railway security problem" by "dividing the global mission into a limited number of submissions that respond to well identified needs / concerns of rail operators, within a framework of general coherence and integration of technical and organizational solutions" (PROTECTRAIL 2011).

ANNEX3. EPC_ Quest Metro

EPC METRO – 2ª ola 2011 – Cuestionario con importancias

Transports Metropolitans de Barcelona — TMB

INFO PROVEÏDOR

Buenos días / tardes, estamos consultando la opinión de los clientes de metro de Barcelona

De acuerdo con la LEY DE PROTECCIÓN DE DATOS vigente y el código CCI ESOMAR referidos a la protección y tratamiento de datos, toda la información que nos facilite en este cuestionario será tratada exclusivamente con fines estadísticos no pudiendo ser utilizada de forma nominal ni facilitada a terceros.

FILTROS DE ENTREVISTA

F1. ¿CUÁL ES SU EDAD, POR FAVOR?

Menos de 15 años → **FIN ENTREVISTA**

EDAD:

F2. (Si es una estación de transbordo) ¿HA ACCEDIDO USTED AL METRO POR ESTA ESTACIÓN?

No................... **FIN ENTREVISTA**

F3. ¿CUÁL ES EL BILLETE O PASE QUE VD. LLEVA?

BILLETE SENCILLO..	1
TARJETA T-10	2
TARJETA T-50 / 30	3
T-FAMILIAR (T-70 / 30)..	4
T-MES	5
T-TRIMESTRE	6
TARJETA ROSA: TARJETA REDUCIDA (T-4)...........	7
TARJETA ROSA: TARJETA GRATUITA.....................	8
T-JOVE	9
OTROS Títulos..	0
PASES GRATUITOS (empleados, etc)	**FIN ENTREVISTA**

F4. ¿CUÁNTAS ZONAS TIENE EL TÍTULO QUE HA VALIDADO?

1 ZONA	1
2 ZONAS	2
3 ZONAS...	3
4 ZONAS...	4
5 ZONAS...	5
6 ZONAS...	6
NO SABE /NO CONTESTA	7

DATOS DE INICIO

I1. INICIO ENTREVISTA
HORA (DE 0 A 24) Y MINUTOS (DE 00 A 59)
_____ --- _____

hora	hora	minuto	minuto

I2. ESTACIÓN DE SELECCIÓN COMO ESTACIÓN DE ORIGEN
(nombre, ver código en cartón auxiliar)
_____

código

I3. ¿EN QUE ESTACION –Y DE QUE LÍNEA- SALDRA VD. DEL METRO? *(nombre, ver código en cartón auxiliar)*
_____

código

I4. ANOTAR EL SENTIDO DE VIAJE DE LA ENTREVISTA (Iba con sentido a/hacia…)

	SENTIDO 1 Hacia..		SENTIDO 2 Hacia…	
LINEA L1	Fondo	1	Hospital de Bellvitge	2
LÍNEA L2	Badalona-Pompeu Fabra	1	Paral·lel	2
LÍNEA L3	Trinitat Nova	1	Zona Universitària	2
LÍNEA L4	Trinitat Nova	1	La Pau	2
LÍNEA L5	Vall d'Hebron	1	Cornellà Centre	2
LÍNEA L11	Can Cuiàs	1	Trinitat Nova	2
LÍNEA L9	Can Zam	1	La Sagrera	2
LÍNEA L10	Gorg	1	La Sagrera	2

CANAL DE VENTA

C1. ¿DISPONE USTED DE TARJETA DE DÉBITO/CRÉDITO?

DISPONGO DE TARJETA/S DE DÉBITO /CRÉDITO	1
NO DISPONGO DE TARJETA S DE DÉBITO/CRÉDITO.....................	2

C2. ¿DÓNDE HA COMPRADO EL TÍTULO DE TRANSPORTE?

No lo he comprado yo (Pasar a W1).....................	0
En una máquina de venta de títulos en las estaciones de Metro..............	1
En una máquina de venta de títulos en las estaciones de otros operadores de transporte: FGC-RENFE-TRAM	2
En los centros de información y atención de TMB (PUNTS TMB)............	3
En una panadería, quiosco, tienda de lotería o en el centro comercial "la illa"...	4
En una caja de ahorro o banco............................	5
En algún otro punto de venta...............................	6

C3. ¿CÓMO HA PAGADO EL TÍTULO DE TRANSPORTE?

EN METÁLICO	1
EN TARJETA DE DÉBITO/CRÉDITO	2
OTRA FORMA DE PAGO	3

Filtro: Si dispone de tarjeta de crédito/débito (Preg. C1 cód.1) y ha comprado el título en una máquina de venta en una estación de metro (Preg.C2.cód.1)

C4. ¿HA COMPRADRO ALGUNA VEZ EL TÍTULO DE TRANSPORTE CON TARJETA BANCARIA?

Sí, siempre compro el título con tarjeta bancaria..........................	1
Sí, alguna vez compro el título con tarjeta bancaria.....................	2
No, nunca compro el título con tarjeta bancaria..........................	3
NO SABE/NO CONTESTA (NO LEER))......................................	4

Filtro: Si dispone de tarjeta de crédito/débito (Preg. C1 cód.1) y ha comprado el título en una máquina de venta en una estación de metro (Preg.C2.cód.1) y no compra siempre el título con tarjeta bancaria (Preg.C4<>1).

C5. TMB QUIERE INCENTIVAR EL USO DE LA TARJETA BANCARIA EN LAS COMPRAS DE TÍTULOS DE TRANSPORTE EN LAS MÁQUINAS DE LA RED DE METRO. CADA VEZ QUE USTED EFECTÚE UNA COMPRA EN UNA MÁQUINA AUTOMÁTICA DE METRO UTILIZANDO LA TARJETA BANCARIA PARTICIPARÁ EN EL SORTEO DE 1.000 ABONOS MENSUALES PARA VIAJAR DURANTE 5 DIAS CONSECUTIVOS EN TRANSPORTE PÚBLICO. ANTE ESTA PROMOCIÓN, COMPRARÍA EL TÍTULO CON TARJETA BANCARIA?

Sí, seguro que sí	1
Sí, probablemente sí	2
No, probablemente no	3
No, seguro que no...	4
No sabe/No contesta (No leer)...........................	5

Filtro: Si dispone de tarjeta de crédito/débito (Preg. C1 cód.1) y ha comprado el título en una máquina de venta en una estación de metro (Preg.C2.cód.1) y no compra siempre el título con tarjeta bancaria (Preg.C4<>1).

C6. ¿SI EN LAS MÁQUINAS DE VENTA DE TÍTULOS DE LAS ESTACIONES DE METRO SÓLO SE PUDIERA PAGAR CON TARJETA BANCARIA, COMPRARIA ENTONCES EL TÍTULO CON TARJETA?

Sí, compraría con tarjeta bancaria................	1
No, compraría el título en otro sitio (estanco, Punt TMB, etc).....	2
No sabe/No contesta (No leer)	3

TMB Transports Metropolitans de Barcelona

IMPORTANCIAS

W1. QUISIERA QUE ME DIERA SU OPINIÓN EN CUANTO A LA IMPORTANCIA QUE PARA VD. TIENEN ALGUNOS ASPECTOS RELACIONADOS CON EL VIAJE. AQUÍ TENGO ALGUNOS **(ENTREVISTADOR: ENTREGAR TARJETAS)** QUE OTRAS PERSONAS HAN VALORADO AL HABLAR DE LOS TRANSPORTES EN GENERAL. TODOS SON IMPORTANTES. PERO QUISIERA QUE ME LOS CLASIFICARA EN CUATRO GRUPOS: DESDE LOS **MENOS IMPORTANTES**, POR UN LADO, LOS QUE NO SON TAN IMPORTANTES PERO QUE VD. **TIENE EN CUENTA**, LOS QUE SON **BASTANTE IMPORTANTES**, Y LOS QUE SON **MUY IMPORTANTES** PARA VD.

GRUPOS:	Nº	Menos	Poco	Bastante	Mucho	5 + IMP
EFICACIA:						
Que tarde poco en llevarte a destino, sea rápido.............................	01	1	2	3	4	5
Que no haya averías, ni interrupciones del servicio	02	1	2	3	4	5
Que resulte cómoda la conexión con otras líneas / medios de transporte	03	1	2	3	4	5
El buen funcionamiento de las escaleras mecánicas y ascensores	04	1	2	3	4	5
El buen funcionamiento de las canceladoras y máquinas de venta automática.	05	1	2	3	4	5
CONFORTABILIDAD						
Que la temperatura en las estaciones sea la adecuada	06	1	2	3	4	5
Que la temperatura en los vagones sea la adecuada..........................	07	1	2	3	4	5
Que no haya aglomeraciones en andenes, ni dentro del tren	08	1	2	3	4	5
Que las estaciones sean cómodas y accesibles	09	1	2	3	4	5
INFORMACIÓN						
La información en el metro: tarifas, horarios, transbordos, tiempo de llegada del próximo tren..	10	1	2	3	4	5
La información al momento sobre interrupciones del servicio.	11	1	2	3	4	5
SEGURIDAD						
Que haya sensación de seguridad en el metro..................................	12	1	2	3	4	5
Que no haya peligro de resbalones, caídas, atrapamientos por puertas y escaleras mecánicas,	13	1	2	3	4	5
HIGIENE / LIMPIEZA						
Que las estaciones y pasillos estén limpios y bien conservados.	14	1	2	3	4	5
Que los vagones estén limpios y bien conservados	15	1	2	3	4	5
Que no haya olores desagradables en el metro..................................	16	1	2	3	4	5
ATENCIÓN AL CLIENTE						
Que los empleados sean amables, informen, atiendan y resuelvan los problemas cotidianos (canceladoras, máquinas de venta automática, billetes,…).	17	1	2	3	4	5
El sistema de atención al cliente de Metro de TMB (oficinas de atención cliente, web, reclamaciones, teléfono,..)	18	1	2	3	4	5
ACTITUDES						
Que ir en TMB no esté mal visto..	19	1	2	3	4	5
Que TMB promueva el civismo, la cultura, el cumplimiento de las normas, respeto al medio ambiente, la accesibilidad, etc...	20	1	2	3	4	5
MEJORAS / ESFUERZOS						
Que TMB se esfuerce en mejorar día a día el servicio de metro y autobuses	21	1	2	3	4	5

W1. NIVEL DE IMPORTANCIA / W2.

W2. **[ENTREVISTADOR: HACER REFERENCIA AL GRUPO QUE HA CALIFICADO COMO MUY IMPORTANTE, si hay más de 5]**
Y de entre estos aspectos muy importantes, ¿cuáles son los cinco más importantes?

SATISFACCIÓN

S1. ¿SEGÚN SU PROPIA EXPERIENCIA Y OPINIÓN VALORE DE 0 A 10 EL CUMPLIMIENTO DE LOS SIGUIENTES ASPECTOS <u>EN ESTA LÍNEA</u> DE METRO? **(CITAR LA LÍNEA QUE SE VAYA A UTILIZAR) (ROTAR ÍTEMS)**

EFICACIA:

Que tarde poco en llevarte a destino, sea rápido..
Que no haya averías, ni interrupciones del servicio ....
Que resulte cómoda la conexión con otras líneas / medios de transporte............
El buen funcionamiento de las escaleras mecánicas y ascensores
El buen funcionamiento de las canceladoras y máquinas de venta automática. ..

CONFORTABILIDAD

Que la temperatura en las estaciones sea la adecuada ....
Que la temperatura en los vagones sea la adecuada ....
Que no haya aglomeraciones en andenes, ni dentro del tren ....
Que las estaciones sean cómodas y accesibles ....

INFORMACIÓN

Información en el metro: tarifas, horarios, transbordos, tiempo de llegada próximo tren, etc..............................
La información al momento sobre interrupciones del servicio. ....

SEGURIDAD

Que haya sensación de seguridad en el metro..
Que no haya peligro de resbalones, caídas, atrapamientos puertas y escaleras

HIGIENE / LIMPIEZA

Que las estaciones y pasillos estén limpios y bien conservados...........................
Que los vagones estén limpios y bien conservados..
Que no haya olores desagradables en el metro ....

ATENCIÓN AL CLIENTE

Que los empleados sean amables, informen, atiendan y resuelvan los problemas cotidianos (canceladoras, billetes,…)...
El sistema de atención al cliente de Metro de TMB (oficinas de atención cliente, web, reclamaciones, teléfono,..)..

ACTITUDES

Que ir en TMB no esté mal visto..
Que TMB promueva el civismo, la cultura, el cumplimiento de las normas, respeto al medio ambiente, la accesibilidad, etc…...

MEJORAS / ESFUERZOS

Que TMB se esfuerce en mejorar día a día el servicio de metro y autobuses .

S2. Y AHORA, TAMBIÉN SEGÚN SU PROPIA EXPERIENCIA Y OPINIÓN, DÍGAME, POR FAVOR CUÁL ES SU VALORACIÓN A NIVEL GLOBAL SOBRE ESTA LÍNEA DE METRO (SIGUIENDO LA ESCALA DEL 0 A 10)?

VALORACIÓN GLOBAL	

S3. EN GENERAL, TENIENDO EN CUENTA TODOS LOS ASPECTOS DE UN VIAJE EN EL METRO DE BARCELONA, ¿DIRÍA VD. QUE ESTA LÍNEA OFRECE UN SERVICIO EN EL QUE SE PUEDE CONFIAR?

(entrevistador/a: no aceptar respuestas dependientes (según, depende, NS, a veces…) intentar que se decante por un sí/no, estimular si es preciso (en general, la idea que tenga,…))

SI	1
No	2

HÁBITOS

H1. ¿CON QUÉ FRECUENCIA UTILIZA UD. EL <u>METRO</u> DE TMB?

	H1	H2
TODOS LOS DÍAS (INCLUIDOS O NO EL FIN DE SEMANA)	1	1
DE 3 A 4 DÍAS A LA SEMANA...	2	2
DE 1 A 2 DÍAS A LA SEMANA...	3	3
TRES VECES AL MES	4	4
UNO O 2 VECES AL MES..	5	5
HACE MESES O AÑOS QUE NO LO UTILIZO..............................	6	6
NUNCA	7	7
NO SABE / NO CONTESTA (no leer)	8	8

H2. ¿Y CON QUÉ FRECUENCIA UTILIZA UD. <u>EL AUTOBUS</u>?

Entrevistador: los autobuses de color rojo

H3. ¿EN QUÉ OTROS MEDIOS DE TRANSPORTE HA VIAJADO UD. DURANTE LA ÚLTIMA SEMANA?

RODALÍAS / CERCANÍAS RENFE	1
FERROCARRILES DE LA GENERALITAT (FGC)	2
TRAM (TRAMBAIX, TRAMBESOS)...	3
OTROS TRANSPORTES PÚBLICOS..	4
VEHÍCULO PRIVADO	5
NINGUNO DE LOS ANTERIORES	6
NO SABE / NO RECUERDA (no leer)..	7

EPC METRO – 2ª ola 2011 – Cuestionario con importancias

Transports Metropolitans **de Barcelona** TMB

DATOS DEL ENTREVISTADO

D1. SEXO

Hombre	1
Mujer	2

D2. (MOSTRAR CARTÓN) ¿QUÉ GRADO DE INSTRUCCIÓN ALCANZÓ **USTED** EN SUS ESTUDIOS? UTILICE POR FAVOR ESTE CARTÓN QUE LE MUESTRO.

Sin estudios / estudios incompletos	1
Primarios (Primaria, EGB, ESO)	2
Secundarios (Bachillerato, PREU, BUP, COU)	3
Secundarios profesionales (Comercio, FP1, FP2, módulos profesionales)...........................	4
Universitarios (diplomatura, grado medio, superior, postgrado, doctorado, máster)	5
No sabe (no leer)	6

D3. ¿CUÁL ES SU SITUACIÓN LABORAL?

Propietarios / Directivos...................................	1
Profesionales liberales cuenta propia / Autónomos...................	2
Cuadros medios / Técnicos	3
Capataces / Encargados	4
Empleados / Administrativos	5
Subalternos / Peones	6
Estudiantes	7
Ama de casa	8
Pensionista / Jubilado...............................	9
Parado	0
No sabe (no leer)	X

D4. LUGAR DE NACIMIENTO: ¿DONDE HA NACIDO VD.?

Barcelona Ciudad	01
Badalona...	02
Cornellà	03
Esplugues...	04
L'Hospitalet..	05
Sant Adrià	06
Sant Just Desvern	07
Sant Joan Despí	08
Santa Coloma de Gramanet	09
El Prat del LLobregat.................................	10
Montcada i Reixac	11
Resto del Área Metropolitana	12
Resto de Catalunya...................................	13
Resto de España	14
Extranjero → **Marruecos o Argelia**................	15
Extranjero → **Ecuador**	16
Extranjero → **Argentina**	17
Extranjero → **Colombia**........................	18
Extranjero → **Rumania**.........................	19
Extranjero. Otros: Anotar:	20
_____	

D5. MUNICIPIO DE RESIDENCIA: ¿DÓNDE VIVE VD? ¿EN QUÉ MUNICIPIO/CIUDAD?

Barcelona Ciudad.....................................	01
Badalona	02
Cornellà...	03
Esplugues	04
L'Hospitalet..	05
Sant Adrià	06
Sant Just Desvern	07
Sant Joan Despí	08
Santa Coloma de Gramanet...............................	09
El Prat del LLobregat	10
Montcada i Reixac	11
Resto del AMB..	12
Resto de Catalunya	13
Resto de España	14
Extranjero	15

Filtro: Si reside en un municipio del AMB (Preg. D5 cód.<13)

D6. TIEMPO RESIDENCIA ÁREA METROPOLITANA: ¿CUÁNTOS AÑOS HACE QUE RESIDE EN SU MUNICIPIO?

Años residencia municipio

_____

		.

D7. ¿DISPONE DE TELÉFONO MÓVIL DE PREPAGO?

Sí, dispongo de teléfono móvil de prepago.................	1
No, no dispongo de teléfono móvil de prepago	2
No sabe/No contesta......................................	3

Filtro: Si dispone de teléfono móvil de prepago (Preg. D7 cód.1)

D8. ¿SABE QUE EN LAS MÁQUINAS DE VENTA DE TÍTULOS DEL METRO SE PUEDEN REALIZAR RECARGAS DEL MÓVIL DE PREPAGO DE TODOS LOS OPERADORES?

Sí, conozco la existencia del servicio............................	1
No, no conozco la existencia del servicio	2
No sabe/No contesta......................................	3

NOMBRE ENTREVISTADO/A: _____

TELÉFONO DE CONTACTO:_____

DATOS DEL ENTREVISTADOR

ENTREVISTADOR/A: _____

E1. CÓDIGO ENTREVISTADOR

E2. CÓDIGO ENTREVISTA

E3. FECHA ENTREVISTA:

DIA	MES	AÑO

E4. HORA FINAL ENTREVISTA
HORA (DE 0 A 24) Y MINUTOS (DE 00 A 59)

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Hora	Hora	Minuto	Minuto