FAS Lanciano Use Case set-up report

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A.SUMMARY SHEET

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C.DOCUMENT CHANGE LOG

Company	Names	Company Info
TUA	Sandro Imbastaro	Società Unica Abruzzese di Trasporto – Divisione Ferroviaria “Ferrovia Adriatico Sangritana”

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1. Executive summary

This report describes the use-case that will be performed in Lanciano in the scope of the ELIPTIC European project.

A feasibility study having as subject a tram-train service between San Vito Marina and Castel Frentano (Crocetta) is presented. This study shall include a detail part referring to a first step of service limited to the San Vito Marina to Lanciano stretch.
In this document a presentation of the geographic, economic and urban context conditions of the interested sites shall be initially carried out.
Then a description of the transport services currently involving that area shall be provided, and also details about the activities operated by Ferrovia Adriatico Sangritana in this district shall be pointed out
In the end, objectives, risks, detailed description, work plan and expected results of the use-case are provided.

2. Partner Contribution

Company	Sections	Description of the partner contribution
TUA		All the document

3. Context conditions

This section presents the context in which the use-case will take place.

Abruzzo region and particularly the four municipalities involved in the planned service will be described according to their special characteristics and to their items of interest. A brief description of the transport services currently offered in the considered district shall be also proposed and especially those offered by Sangritana. The final section contains detailed information relating to the feasibility study

3.1 Economic, geographical and urban context of the Use Case

The use-case will take place in Abruzzo.
Abruzzo is a region of Italy, with an area of 10,763 square kms and a population about of 1.3 million .The region is divided into the four provinces of L'Aquila, Teramo, Pescara, and Chieti (the use-case will take place in the province of Chieti).
Geographically, Abruzzo is divided into a mountainous area to the west, which includes the Gran Sasso D'italia, and a coastal area to the east with beaches and ports on the Adriatic sea.
This Region is known as "the greenest region in Europe" as one third of its surface, the largest in Europe, is set aside as parks and protected wilderness: there are three national parks, one regional park, and 38 protected nature safeguard precincts. These ensure the survival of 75% of Europe's living species including rare species, such as the small wading dotterel, golden eagle, Abruzzo chamois, Apennine wolf, and Marsican brown bear. In Abruzzo is also located the Calderone, Europe's southernmost glacier.

The economy of Abruzzo is expanding: actually, at the end of 2010, Abruzzo's growth was 1.47%, ranking four among the Italian regions with the highest annual growth rates. In 2011 Abruzzo's economic growth was +2.3%, the highest percentage among all regions of Southern Italy. The region is also the richest one in Southern Italy, with a GDP per capita higher than any other region of Southern Italy.

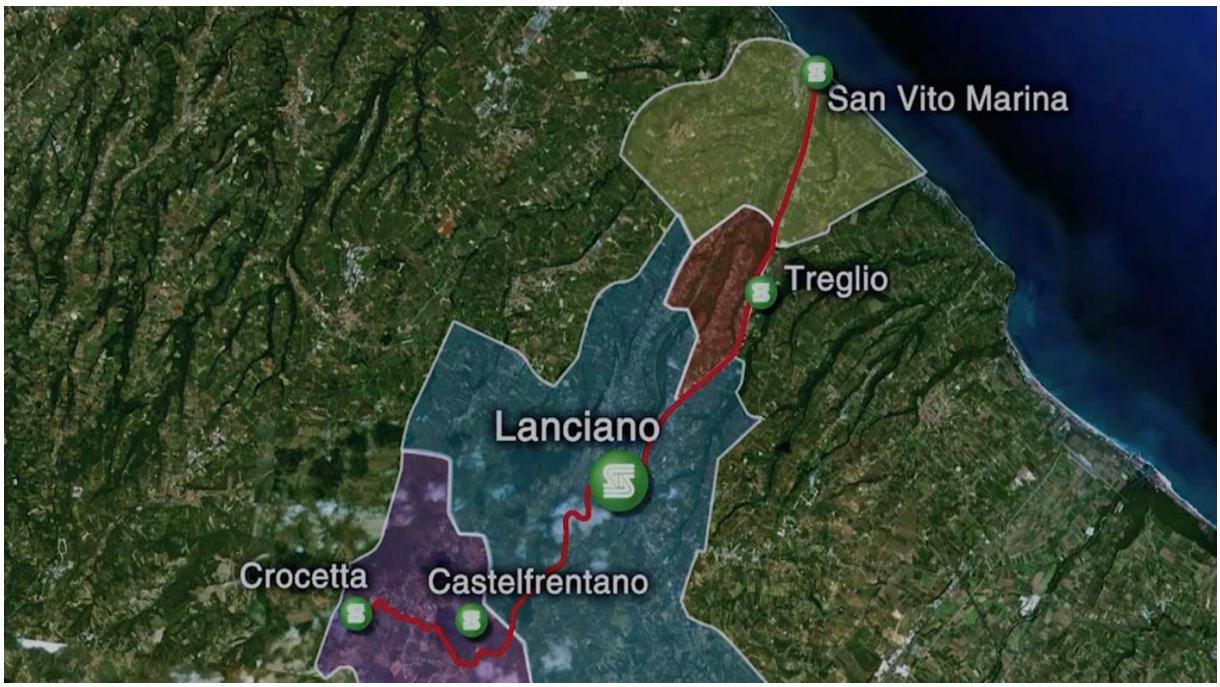
Abruzzo's industrial sector grew quickly, especially in mechanical engineering, transportation equipments and telecommunications. Although industry has developed strongly, it retains some weakness as only a few large companies have settled amid a huge web of small and medium-sized establishments. Both pure and applied research are carried out in the region, and major institutes and factories are involved in research in the fields of pharmaceutics, biomedicine, electronics, aerospace and nuclear physics. The industrial infrastructure is spread throughout the region in industrial zones which have already been mentioned, the most important of which are Val Pescara, Val Sangro, Val Trigno, Val Vibrata and Conca del Fucino. A further activity worthy of note is seaside and mountain tourism, which is of considerable importance to the economy of the region. Agriculture, mostly made of small farms, has succeeded in modernising and offering high-quality products, especially wine, cereals, sugar beet, potatoes, olives, vegetables, fruit and dairy products.

Regione Abruzzo	
Number of Municipalities	305
Total inhabitants at 1 Jan. 2014	1.333.939
Surface Kmq	10.763
Density inhab./kmq	123,9

Source: processing of Istat data

Abruzzo rail network

The area covered by the use-case includes four municipalities with about 50,000 inhabitants altogether: San Vito Chietino, Treglio, Lanciano, Castelfrentano.



San Vito Chietino

San Vito Chietino is an Italian town of 5,410 people in the province of Chieti in the Abruzzo region. Facing the seaside, its economy is based mainly on tourism, the town is located in the so-called Costa dei Trabocchi, and was appointed of European Blue Flag from 2010 to 2015. The most awarded beaches are the South Pier and Calata Turchino. Of particular beauty are also the beaches of Rocco Mancini, Valley Caves (the latter shared with Rocca San Giovanni), and other small beaches. The town is composed of a lower village on seaside dedicated to tourism, named San Vito Marina, and an upper chief town named San Vito Chietino located on a rocky hill that stretches down to the sea.
This location offers an important view of a wide horizon stretching from the Gran Sasso to Maiella and hills to Vasto, looking westwards; and of open landscape on Adriatic Sea looking easwards, taking up the entire coast from Fossacesia to Casalbordino. The municipalty also includes the hilly village Sant'Apollinare, which offers a peaceful view on rural areas, mainly cultivated with vines and olive trees, and a marina village which stretches along the coast of the Trabocchi.

The coast of the Trabocchi is very popular to tourists. It extends to the stretch of the Adriatic coast of the province of Chieti (Abruzzo) marked by the countless peculiar fishing machines on stilts, called precisely Trabocchi. It is a stretch of coast famous throughout Italy for its natural beauty and for its variety: each of the villages of the Coast actually has kept its own characteristics and traditions.

Treglio

Treglio is an Italian town of 1,613 inhabitants in the province of Chieti in Abruzzo, on the northern outskirts of Lanciano in direction of San vito. It is part of the Union of Municipalities "City of Frentania and coast of the trabocchi".

Lanciano

Lanciano is an Italian town of 35,624 inhabitants in the province of Chieti, in the Abruzzo region.
It is the main town in the district “Sangro-Aventino” in which top-level points of interest (schools, hospital, offices, shopping centers, etc ..), referred to this area that includes several municipalities, are located.
It is also a place of pilgrimage to the so called “Eucharistic miracle”, a subject of devotion preserved in a church in town.

The Municipality of Lanciano covers 66 square kilometers in a hilly area extending from the slopes of the Maiella mountain down towards the Adriatic sea. Its territory consists mainly of hills, but also includes an important flat land in Val di Sangro.
In Lanciano are located 19 preschools, 10 primary schools, 3 secondary schools and 8 high schools.
In Lanciano is located a branch of the University "Gabriele d'Annunzio" from Chieti. In the seat of the University Consortium, several courses related to post-graduate education are taught, with the collaboration of the University of Urbino "Carlo Bo".
The role of the traditional sectors must also be emphasized: agriculture and artisanship. The first is based on the cultivation of olive trees and vineyards, from which a large production of oil and wine (certified DOP and DOC) is achieved. The second is coming back into vogue especially with regard to crockery, in which Lanciano boasts a secular tradition.

The main routes of connection crossing the municipal area are the highway A14, with its own exit Lanciano, the National Routes SS 84, SS 17; the former SS 524, and the road Lanciano-Atessa.

Mobility within the municipality is provided by 11 bus lines. Inter-city and suburban services connect Lanciano with all the main towna in Abruzzo and the most important Italian cities.

Lanciano has its own railway station operated by Ferrovia Adriatico Sangritana, connected with a branch line to the Adriatic main route of the National Network in the station named San Vito-Lanciano. Direct serivices to Pescara and wider are offered.

The historical main route of Sangritana, reaching Castel di Sangro, is presently not in use due to refurbishment works

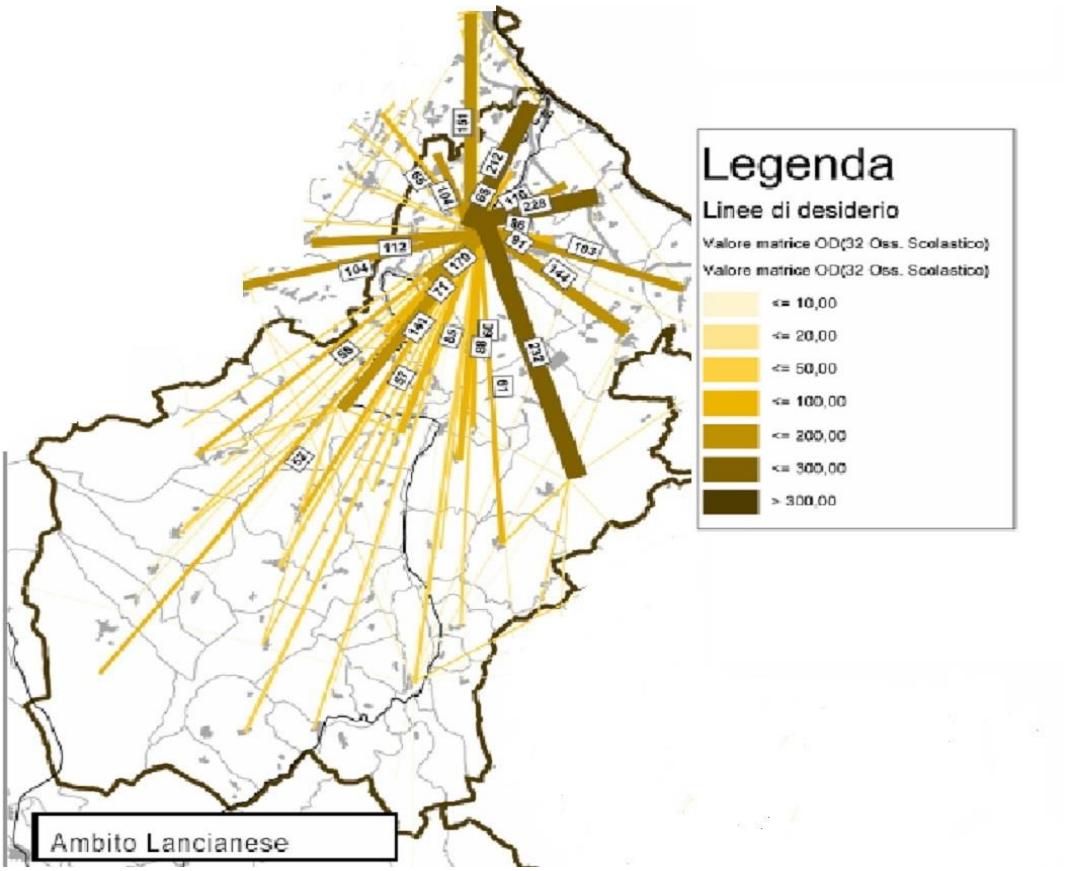
In the past twenty years in the Sangro-Aventino territory new urban polarities have been generated in the area of Lanciano. Here gravitate a number of public and private services and functions (head offices and / or branch offices of governmental agencies such as Health and Welfare [ASL and INPS], Province, Tax office, Chamber of Commerce, educational institutions both public and private, insurance agencies, shopping centers , etc.) that generate mobility and additional interests at the same time.

The settlement of functional and directional structures outside the traditional city center determined the transition from the concentric city (Lanciano) to a polycentric city involving, besides Lanciano, also Treglio, Rocca San Giovanni, Fossacesia, Santa Maria Imbaro, Mozzagrogna and Castelfrentano. Actually, an urban network has been set up, capable of changing established urban structures by creating new poles (of various ranks) in tertiary and / or quaternary economics (Mario Negri Sud).

Lanciano plays a key role not only as an urban center attracting mobility from a wide surrounding area, but also as interchange point road-road and road-rail for people coming from the Lanciano hinterland and from middle and lower Val di Sangro, and directed respectively in Chieti or Pescara.

In the school year 2012/2013 young people registere in high school courses in the district counted up to 4339.

The figure below shows graphically the potential demand for student mobility to Lanciano.



Economy

Trade always played an important role in the history of Lanciano, due also to the fairs being historically held in the town. Lanciano is still the seat to an exhibition center of nationwide importance. Moreover, it is a reference point for all its commercial district (wholesale and large-scale retail operators).

About industry, In the seventies in Val di Sangro two large production factories were settled: one of Honda (motor bikes) and one of Sevel, a joint venture between Fiat and PSA for the production of vans. These plants have led to the development of an important related insustrial sector composed of specialized small- and medium-sized companies, grown over the years to bring the Val di Sangro to be nowadays the first industrial Abruzzo district. Positive economic effects resulted for all municipalities in a wide area surrounding.

Lanciano in 1995, due a specific law of the Abruzzo Region, was declared fairground for Abruzzo region, and a company was established with the name of Lancianofiera. It promotes every year several exhibitions in the fairground located in Iconicella street.

Castel Frentano

Castel Frentano is an Italian town of 4.337 inhabitants in the province of Chieti in Abruzzo. Its economy relies mostly on agriculture. Many cultivated fields near the village provide a large quantity of products. Another pillar is the bocconotto, a bakery specialty from which the country is well-known throughout Italy and abroad. Besides, as the town is very close to Lanciano, many commuters move daily between the two settlements. Other economic activities are the traditional gastronomy and groups of tourists coming in town in the summer. Crocetta is a village in the municipality of Castel Frentano.

Below are a few data on the affluence of tourists, in the described area, in Year 2012.

"Microarea" of reference	*ITALIANS*		*FOREIGNERS*		**TOTAL**
	arrivals	*attendance*	*arrivlas*	*attendance*	**arrivals**
Costa dei trabocchi	*30.079*	*154.794*	*3.476*	*12.023*	**33.555**
Lanciano	*9.789*	*22.372*	*3.126*	*8.168*	**12.915**
TOTAL	*62.252*	*245.478*	*9.660*	*31.573*	**71.912**

Total of arrivals in hotel and non-hotels per microarea of reference – Year 2012

"Microarea" of reference	**2009**		**2012**
	arrivals	**attendance**	**arrivals**
Costa dei trabocchi	29.688	157.354	33.555
Lanciano	12.954	32.459	12.915
TOTALE	**70.584**	**291.096**	**71.912**

Variance 2009-2012

3.2 PT service context

Currently there is no dedicated public service connecting the four municipalities involved. They are included in a more extensive network, operated by the Sangritana Company and others.

The Ferrovia Adriatico Sangritana, now part of the group TUA, performs public service passenger transport by road and rail.

Railway

The Sangritana is engaged in a project to strengthen Regional public transport on rail along the Adriatic route, on a stretch from Termoli to Giulianova, with a branch to Teramo.
Thanks to its modern trains " Lupetto", " Orsetto" and " Aquilotto", Sangritana offers to users a fast mobility service of good quality, as well as a fare system integrated with the other operator Trenitalia.
As part of the social network, the new railway connecting Lanciano to San Vito station offers passengers the opportunity to reach Pescara with direct services in just under 40 minutes, thanks to a linear path and the use of modern, fast and comfortable trains.
Particular attention will be devoted in the future, to the historical main route Marina San Vito - Castel di Sangro, to be seen within a metro-like transport service to the inland areas and the Industrial Val di Sangro, mainly intended as a link between the Adriatic and the Tyrrhenian coasts.
For passenger services, Sangritana uses n. 6 complex CTR S03 Minuet (Lupetto), n. 5 railcars diesel Aln 776 SG, n. 5 56 AM (formerly Belgian) and n. 2 complex Fervet consisting of n. 2 pilot and 1 towed wagons in blocked formation.
During the year 2012, the trains of Sangritana carried n.528,427 passengers on board, covering a total of 639,862 km.
Sangritana also operates freight services on rail as a haulier with its own locomotives and manages rail embranchments for industries in several locations

Road
In road transport, the specificity of Sangritana is due to articulated services concerning train rides relieve, urban and suburban services in the entire basin Sangro-Aventino, commercial long haul (for example Lanciano-Bologna no stop) and chartered tourist travels. This activity, certified ISO 9001, is carried out with modern and functional buses, regularly maintained, and entrusted to drivers who have gained experience and expertise in many years of duty.

In PT field, these are the data recorded in 2012 for the different road services of Sangritana:

- 1,908,000 km / year in suburban runs,
- 873,000 km / year in train rides relieve runs,
- 281,000 km / year in urban runs,
- 148,000 km / year courses in long-haul runs Lanciano-Bologna,

for a total of 3,210,000 km / year.

3.3 Information about the Use Case

Concerning the realization of a tram-train service from San Vito Marina to Crocetta, Sangritana has decided to start in an early step with a first stretch between San Vito Marina and Lanciano in consideration of the tourist attractiveness of these locations.

According to this choice the feasibility study will be carried out both in the case of the first step and for the project as a whole. The two models this way achieved shall be finalized to the implementation of a service that can initially operate between the towns of San Vito Marina and Lanciano and then be extended to Crocetta terminus.

The feasibility study shall provide important information about the demand for mobility and network infrastructure allowing to achieve the creation of multiple operating models to be evaluated according to:

- type and performance of vehicles;
- organization of operational service;
- interaction with external systems;
- variability of demand flows.

Once determined the most efficient model, direct and indirect costs shall be evaluated and benefits referring to users and community analyzed.

4. Objectives

4.1 Objectives of the Use Case

The Use Case “tram-train service between San Vito Marina and Crocetta “ consists in a STUDY conducted by Ferrovia Adriatico Sangritana – TUA Group, prior to the reactivation of a PT service based on the existing railway from San Vito Marina to Crocetta.

The feasibility study aims to acquire a number of useful information to evaluate the quality of service to provide.

The main objectives are:

• estimate the theoretical demand of mobility in the involved centers. This will be used to scale the service as a function of the required capacity (pax / h);

• determine the performance of the optimized service;

• assess the direct and indirect costs;

• analyze the arising benefits.

4.2 Expected impacts

The expected impacts of the project related to the use-case are:

. increase the accessibility of inland areas and the relationships between the towns of SanVito, Lanciano and Castel Frentano

. connect the suburbs with the city center, the largest urban attractors (hospital, educational institutions, governmental offices) with the renewed station Lanciano FAS intended as a passenger intermodal hub

. ensure and promote pedestrian mobility

. discourage car use. enhance accessibility of local public transport and implement functional integration of transport modes

. improve air quality in urban areas

. reduce pollution and congestion arising from use of private cars

4.2. Use Case KPIs

In the two stages of the feasibility study it will be necessary to compare two models or two solutions to assess the quality of the project. First the characteristics of different operational models will be compared, and subsequently a cost-benefit analysis shall be carried out, according to the following chart of activities:

City *fill in* ID *fill in* ***If necessary replicate this spreadsheet per each measure (for example: A1,B1,C1 etc.)***

Eliptic scenario

Evaluation Category	Impact area	KPI #	KPI Name	KPI Definition	Collection methods/sources	Unit of measurement	Reference period	Availability of KPI/data from the demoline/vehicle/fleet during the demonstration	Collection			Data Confidentiality	
									Start	End	Frequency	Yes	No
								tick where appropriate	*fill in (estimated dd/mm/yyyy)*		*D=daily, W=weekly, M=monthly; O=one-off; Ot=Other, specify*	*tick where appropriate*	
	Staff	Ost1	Driving staff	Staff involved in driving activities	counting	man/vehicle	day	X	01/12/2015	31/03/2017			
		Ost2	Drivers workload	Workload required to drive a vehicle	FTE	man-month/vehicle	month	X	01/12/2015	31/03/2017			
		Ost3	Maintenance staff	Amount of personnel with maintenance duties divided by the amount of vehicles composing the fleet	counting	man/vehicle	day	X	01/12/2015	31/03/2017			
		Ost5	Maintenance workload	Workload required to maintenance activity per vehicle	FTE	man-month/vehicle	month	X	01/12/2015	31/03/2017			
		Ost6	Management workload	Workload required to management and planning activities per month	FTE	man-month/vehicle	month	X	01/12/2015	31/03/2017			
		Osu1	Passenger capacity (line)	Passengers volume that can be carried past a single point on a fixed route, in a given period of time	Product of the frequency and the maximum number of persons per vehicle	pass/h	peak time	X	01/12/2015	31/03/2017			
		Osu2	Service coverage	Consistency of the service	Travelled km divided by the number of operational vehicles per line	km/veh	day	X	01/12/2015	31/03/2017			

Operations	Supply	Osu3	Daily supply	Places (seat and standing) volume that can be carried on a fixed route per each vehicle, in a given period of time	Total amount of supplied places per day divided by the amount of daily operating vehicles	places/veh	day	X	01/12/2015	31/03/2017			
		Osu5	Peak vehicles requirement	The maximum number of vehicles required to operate a transport service at peak periods	Total amount of vehicle required to operate in the morning/afternoon peak hours	vehicles/route km	peak time	X	01/12/2015	31/03/2017			
	Service	Ose1	Commercial speed	Speed of operational vehicles	For a given line, the total distance traveled divided by total time taken (including schedule holding)	km/h	peak time in working day	X	01/12/2015	31/03/2017			
		Ose2	Bus frequency	Arrivals recorded at a givn stop	Average amount of bus arrivals at a given stop on a selected route per hour	events/h	peak time in working day	X	01/12/2015	31/03/2017			
		Ose3	Dwell time	Time spent for boarding/alighting passengers at a bus stop	Average of all the time spent at a scheduled stop without moving	minutes	peak time in working day	X	01/12/2015	31/03/2017			
		Ose7	Round trip time	Time between two subsequent passeges of the same vehicle at a given point	Time recorded for a round trip, on a given route	min	peak time in working day	X	01/12/2015	31/03/2017			
	Demand	Ode1	Passenger demand	Amount of passenger-kilometres travelled every month per line	Volume of passengers multiplied by the vehicles mileage per line	passkm	monthly	X	01/12/2015	31/03/2017			

Economy	Costs	Eco1	Operating cost (general)	Monthly expenditure due to staff, energy, maintenance management, to purchase external goods and services, to financial costs, depreciation, and taxes	Sum of all the expenditures for operations recorded in a month	kEURO/vehicle	month		01/02/2015	31/03/2017	X	X	
		Eco2	Investment for the network	Annual expenditure due to investments in infrastructures, vehicles and other items	Sum of expenditure for investements recorded in a year	kEURO/vehicle	year		01/02/2015	31/03/2017	X	X	
		Eco 3	Training operational costs	Monthly expenditure due to staff training and updating	Sum of expenditure for training recorded in a month	kEURO/vehicle	month		01/02/2015	31/03/2017	X	X	
		Eco4	Maintenance operational costs	Monthly expenditure due to maintenace staff	Sum of expenditure for maintenance staff payment recorded in a month	kEURO/vehicle	month		01/02/2015	31/03/2017	X	X	
		Eco5	Drivers operational costs	Monthly expenditure due to drivers	Sum of expenditure for drivers payment recorded in a month	kEURO/vehicle	month		01/02/2015	31/03/2017	X	X	
		Eco6	Vehicle capital costs (for all different vehicles: E-bus / diesel bus, 12m / 18m version etc.)	Capital costs for vehicle owned	Sum of expenditure for each vehicle owned	kEURO/vehicle			01/02/2015	31/03/2017	X	X	
		Eco24	Electricty costs for traction	Total costs for electricity due to traction operations	Sum of expenditure due to traction operations	kEURO/vehicle	month	X	01/12/2015	31/03/2017		X	
	nues	Ere2	Economic efficiency	Monthly capability of operations to generate revenues according to the passenger demand	Amount of ticket revenues divided by the the passenger demand	kEURO/passkm	month	X	01/12/2015	31/03/2017		X	

	Reve	Ere3	Revenues per passenger	Monthly capability of operations to generate revenues according to the passenger volume	Amount of ticket revenues divided by the the passenger volume	kEURO/passkm	month	X	01/12/2015	31/03/2017		X	
	Incntives	Ein 2	Incentives for vehicle procuremet	Reduced price for vehicle procuremet granted by external bodies	regulatory reference	Euro/vehicle		X	01/12/2015	31/03/2017		X	
energy	consumption	Ecn 9	Electricty consumption	Total amount of electricty consumed	as reported per vehicle	MJ/vehicle	day	X	01/12/2015	31/03/2017			
Environment	Concentrations	Eco1	CO concentrations	Average hourly (or peak/off-peak) of CO concentrations	data from monitoring station	mg/m^3	peak/off peak hours (average working day)	X	01/12/2015	31/03/2017			
		Eco2	NOx concentrations	Average hourly (or peak/off-peak) of NOx concentrations	data from monitoring station	mg/m^3	peak/off peak hours (average working day)	X	01/12/2015	31/03/2017			
		Eco3	PM_{10} concentrations	Average hourly (or peak/off-peak) of PM_{10} concentrations	data from monitoring station	$\mu g/m^3$	peak/off peak hours (average working day)	X	01/12/2015	31/03/2017			
People	Passengers	Ppa1	Awareness	Assessment of the passengers' awareness of the need to implement a given Eliptic measure	A specific questionnaire to be submitted to passengers	%	Eliptic demo focus groups	X	01/12/2015	31/03/2017			
		Ppa2	Acceptance	Assessment of the passengers' acceptance of a given Eliptic measure	A specific questionnaire to be submitted to passengers	%	Eliptic demo focus groups	X	01/12/2015	31/03/2017			
		Ppa3	Attractiveness	Passengers' perception of attractivenes s of a given Eliptic measure	A specific questionnaire to be submitted to passengers	%	Eliptic demo focus groups	X	01/12/2015	31/03/2017			

5. Risks

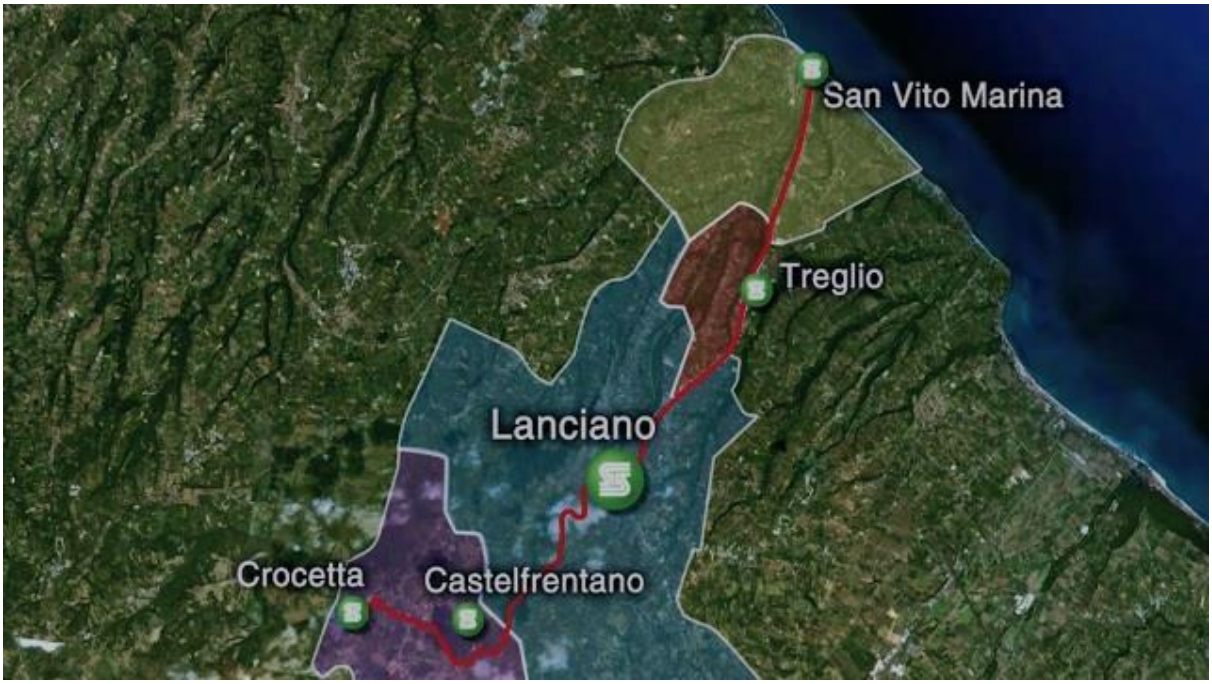
The main internal risks that may impede the achievement of the objectives before mentioned are:

- Lack of data on the population (creating matrices source destination differing from the real situation)
- Discrepancy between real parameters and theoretical parameters of the railway line (realization of unrepresentative operating model)

Other risks may arise instead from the outside:

- Changes in socio-economics that can determine a change in demand for mobility during the study phase
- Changes in the political vision of the system and poor incentives to use the rail

6. Detailed description of the Use Case



The assessment of the demand for mobility will be carried on starting from of real data after processing in statistical mode in order to determine the number of persons, split up into time slots, which will have the need to travel.

The data will be tabulated, the type shown in the figure below, one for each center concerned on the line

Units	Age range
125	0-10
245	10-20
263	20-30
341	30-40
320	40-50
425	50-60
415	60-70
394	70-80
112	80-90
21	90-100
0	oltre

According to the different age classes specific coefficients of mobility (characteristic of each time slot) shall be postulated in order to come to define multiple matrices “origin and destination” represented as a function of the of the hourly demand variability during the reference day.

The following figure shows an example of a matrix “origin and destination” that will be used to classificate and represent the data obtained.

Time slot 8/9	S. Vito Chietino	Treglio	Lanciano	Castel Frentano	Crocetta
S. Vito Chietino	0	3	79	16	29
Treglio	35	0	15	7	12
Lanciano	111	26	0	85	57
Castel Frentano	19	0	27	0	11
Crocetta	8	12	12	12	0

The data collected and split as described shall be held as the benchmark for planning the service to offer.

The performance of the service shall be assessed through the application of mathematical functions able to predetermine the operating characteristics in function of layout and altimetry of the track and in function of the exact location of the stops.

First will be calculated ordinary resistances that oppose the motion of the vehicle to be then compared with the performance of the vehicle itself in order to determine the potential of the entire system. Below is a brief description.

R= Rv+Ra+Rl+Rm+Rc (kg/tonn) where:

Rv = rolling friction, generally equal to 2.5 kg / ton for speed and characteristics of the vehicle type in this study

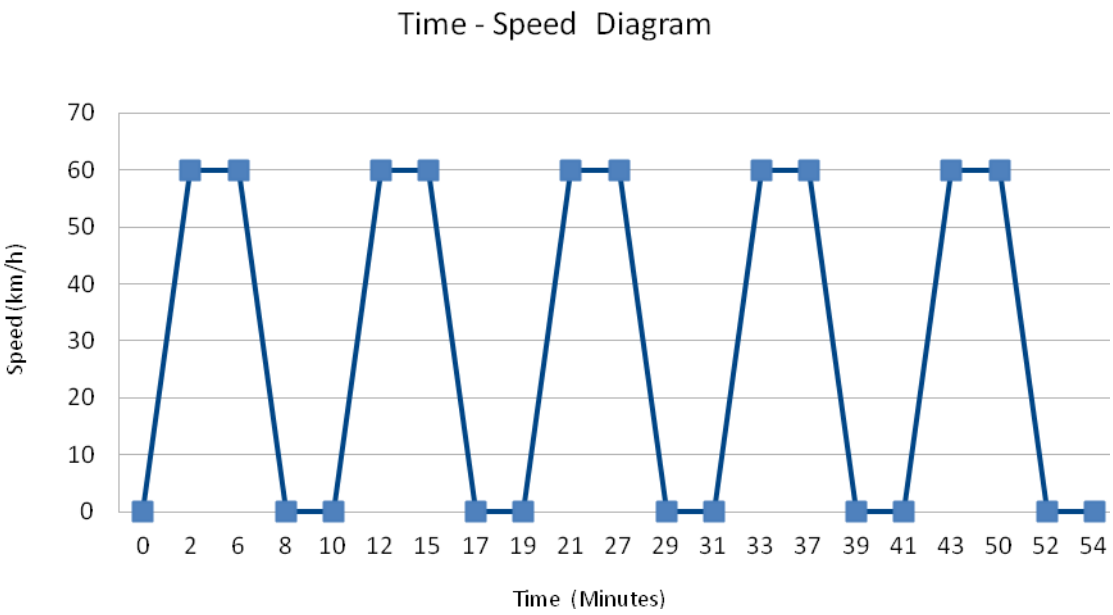
Ra = aerodynamic resistance, dependent on numerous factors (such as the speed, the main section of reference, aerodynamic permeability etc.). Generally it affects not so significantly the calculation of global resistances.

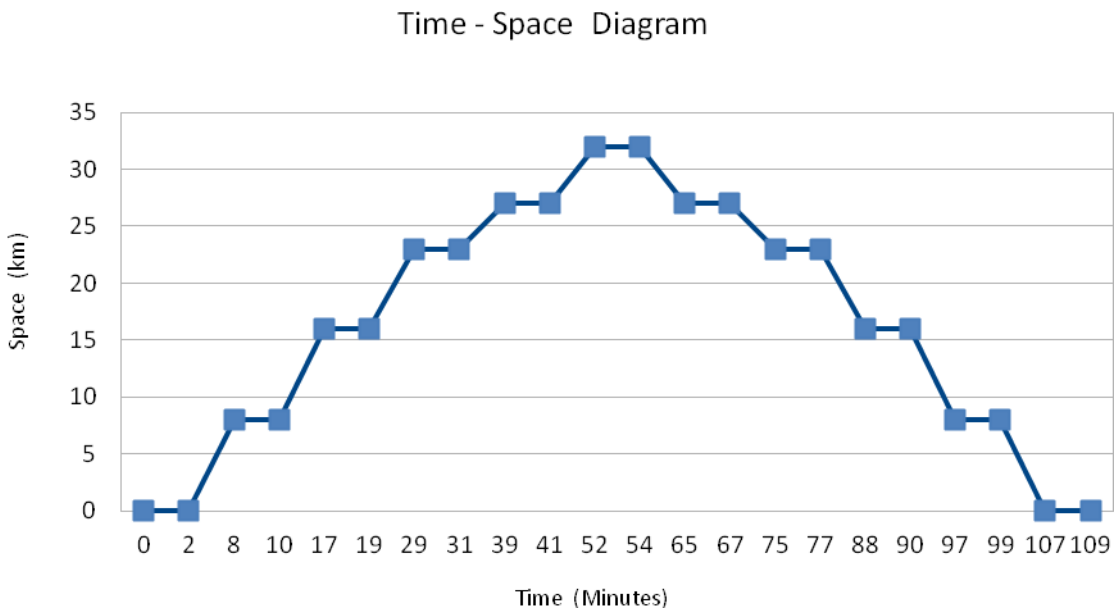
Rl = incline resistance, it is expressed in ‰ and is the dimensionless value reported to the slope of the line; it is used in calculation considering it in the typical units of measure for resistances (kg / ton).

Rm = resistance of the rotating masses, it is a characteristic resistance of the considered vehicle and take into account the losses due to the kinetic characteristic of the various mechanical parts.

Rc = resistance in the curve, it is a characteristic parameter of the route. In function of the average radius of each curve the specific resistance to the motion is determined and the related maximum speed too.

After comparison between the global resistances, thus obtained, and the performance characteristics of the studied vehicle, it is possible to define diagrams of motion, needed for assessments of the state of performance of the system as a whole (including maximum capacity, hourly capacity and travel times).
The following shows two examples.


Time - Speed Diagram
Speed (km/h)
70
60
50
40
30
20
10
0
0 2 6 8 10 12 15 17 19 21 27 29 31 33 37 39 41 43 50 52 54
Time (Minutes)


Time - Space Diagram
Space (km)
35
30
25
20
15
10
5
0
0 2 8 10 17 19 29 31 39 41 52 54 65 67 75 77 88 90 97 99 107 109
Time (Minutes)

Using the first chart we can determine the main characteristics of the system, ad shall therefore calculate: the maximum capacity per hour, maximum capacity per day, roundtrip time, acceleration, speed etc..

The main parameter to be taken into account is the capacity of the system. Right this element shall be the input data for the analysis of costs and benefits

An initial estimate of the costs related to maintenance of the infrastructure was done in advance. To those parameters it will be necessary to add the costs related to purchase of vehicles and those arising from the management and supply of the services (electric power, operators, system management, etc.).

Once established an appropriate amortization period (also depending on the regional political vision in matter of public mobility) it shall be assumed a cost of access to the service to be charged to the users.
Within the feasibility study it will be also discussed the issue concerning the collective benefits arising from the realization of this project. A calculation shall in fact be carried on for emission reductions of pollutants (NOx, CO2, MP10, etc.) if part of the population would abandon the use of private cars to benefit of the Tram Train to make some moves.
The results will be obtained through an average rating of vehicles fleet, number of passengers, speed etc.
More benefits could arise from upgrading of some urban areas. Since it is impossible, or at least unlikely, to quantify these effects through standardized benchmarks, within the feasibility study a section shall be dedicated to the improvements that will come from the use-case project.
An economic quantification of the costs for the dismantling of the existing rail network shall also be implemented. This parameter, quantified in euro, will enter into the calculations for evaluation of cost effectiveness as an essential element, according to the need to use the areas of the railway path, when the use-case project is not carried out, for urban regeneration

6.1 Description of expected use case features, establishing the link among use case conditions, objectives and background

In order to realize the Tram Train project and to offer a new PT service it is necessary to carry out two separate analyzes within the same feasibility study. The first shall attain an evaluation of the potential of the system by estimating time and cost for the activation of the line San Vito – Lanciano, while the study of the entire San Vito - Crocetta line shall highlight issues to consider from the beginning for possible further developments.
Lanciano is a magnet for the surrounding municipalities, through its schools, the hospital, the station connected to the national Adriatic railway route, and other points of interest. To date, however, an ecological public transport service linking the points of interest mentioned above is missing.
The main reason that drives to perform a feasibility study for a first activation of the line San Vito - Lanciano comes from the high tourist interest related to the two poles. Since the Abruzzo is one of the most environmentally-conscious regions in Italy, we considered

necessary to transmit this propensity to tourists by providing them more sustainable means for displacements.
Moreover, despite Lanciano can not be considered certainly a nerve center of traffic, right the road between Lanciano and San Vito is affected by the highest number of events of congestion of vehicular traffic.
The realization of the use-case project is perfectly in line with other interventions that Sangritana is implementing in its own district, such as the reactivation of the historic railway line from Fossacesia to Castel di Sangro, enabling the gradual establishment of a network of rail transport to be made available to tourists and residents.
The main target of the feasibility study is to demonstrate the excellence of the investment and lay the foundation for planning a service that stands out for reliability and quality.

6.2 Use Case constraints

Since this is a recovery and upgrade of a railway line and wanting to perform a service that uses an existing infrastructure the main constraints are arising from the state of the network.
Another decisive factor for the outcome of the feasibility study are the features of the vehicles and the availability of staff. It will not in fact be possible to predict the trend from the other activities of the company providing the service, and for this reason a perfect coincidence between the theoretical model and real service cannot be assured.

6.3 Use Case monitoring criteria

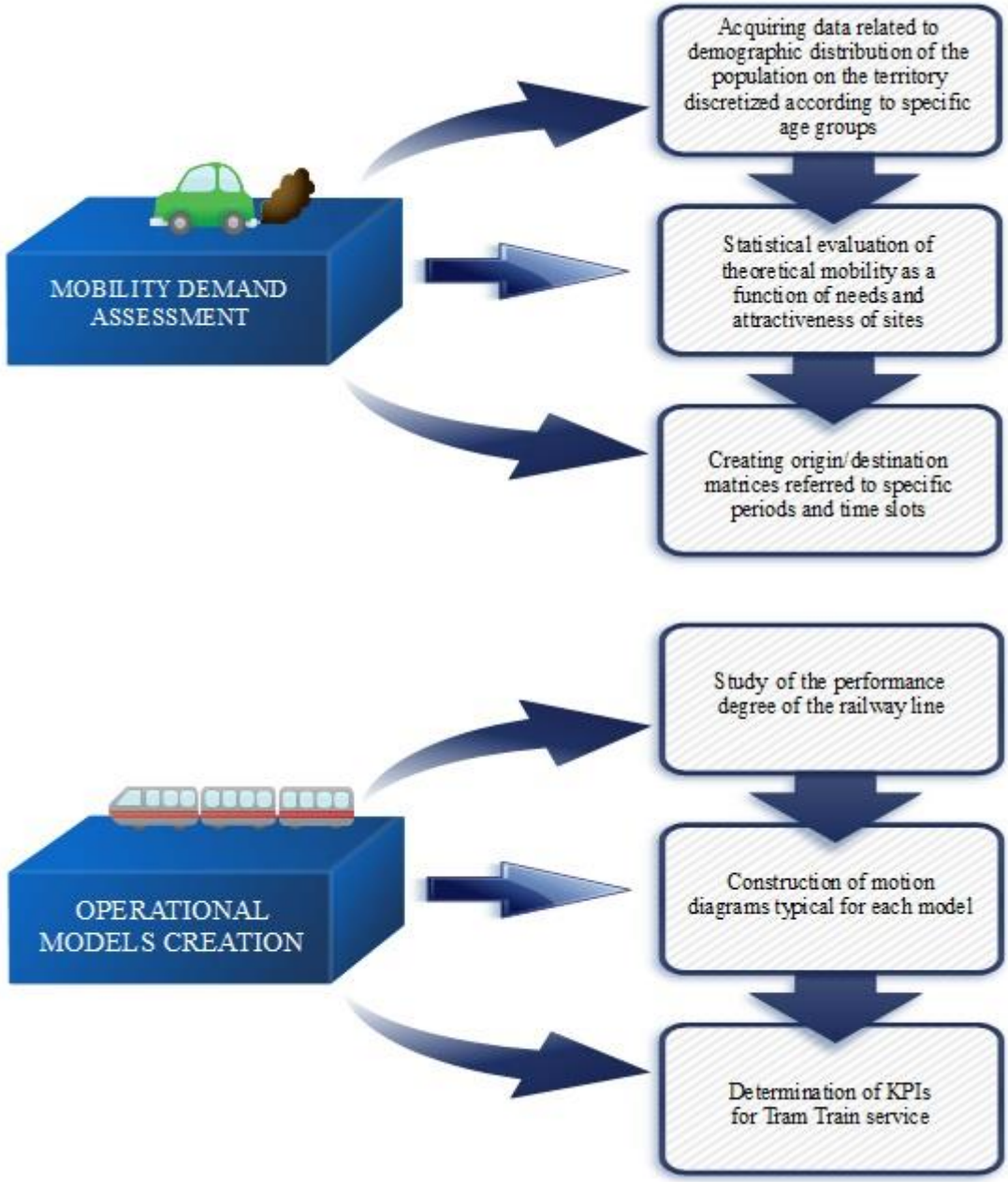
The development of the Use-case study shall be monitored according to the critieria expressed in the following check-list, showing also the up to date situation

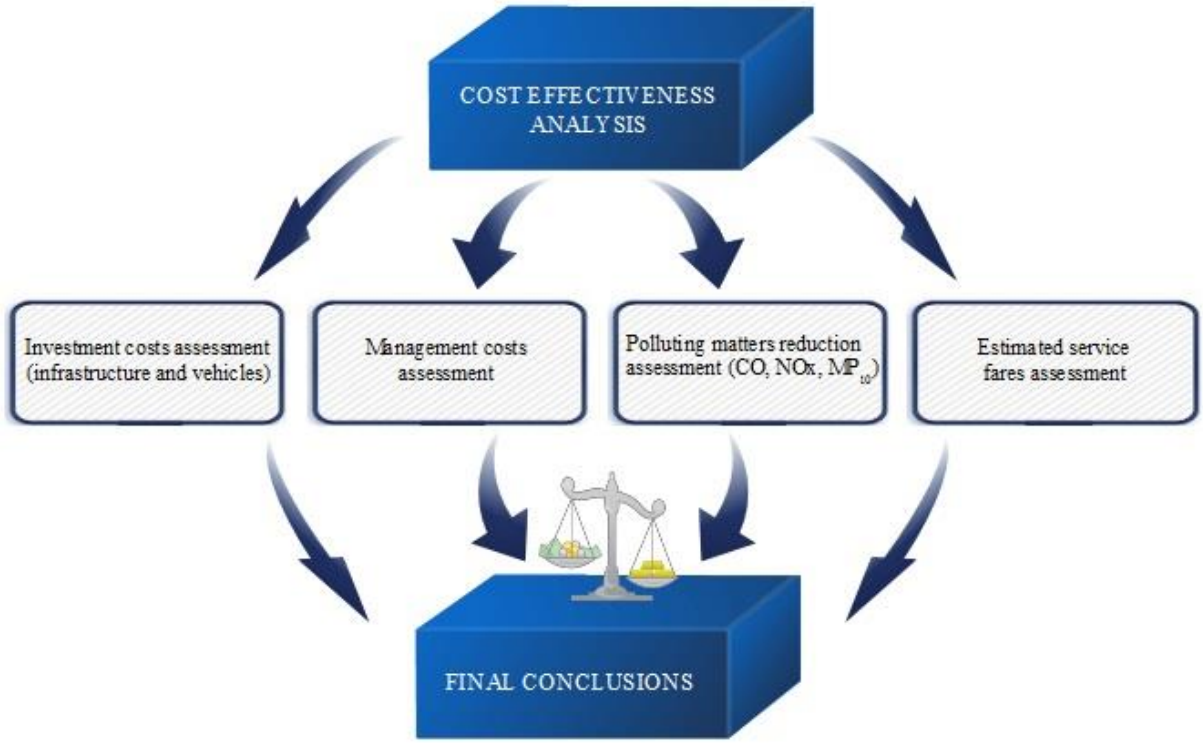
n.	Activity	If the activity is **COMPLETED**, indicate:		If the activity is **NOT YET COMPLETED**, indicate:		
		starting month	closing month	not yet started (X)	still in progress: indicate expected closing month	remarks: explain why the activity is still to start or still in progress and propose solutions
1	Needs analysis			X		according to work plan
2	Technological parameters determination			X		according to work plan
3	Mapping/GIS					not appliable
4	Modelling			X		according to work plan
5	Legal feasibility					not appliable
6	Financial feasibility			X		according to work plan
7	Procurement strategy (please describe if public tender or other)					not appliable
8	Infrastructure design and installation planning	Jun 2015	Oct 2015			
9	Infrastructure delivery			X		after feasibility study
10	Infrastructure installation			X		after feasibility study
11	Infrastructure testing			X		after feasibility study
12	(Reversible) sub-station design and planning				Mar 2017	according to work plan
13	Flywheel energy storage system procurment					not appliable
14	Installation of data recorder					not appliable
15	Data collection according to the selected KPIs			X		according to work plan
16	Selection of evaluation process					not appliable
17	Status of Delivery: Use case set up report	Set 2015	Nov 2015			
18	Other : Final report construction			X		according to work plan

7. Use case work plan

This chapter provides a complete overview of the use case work plan.

7.1 Use Case development logic





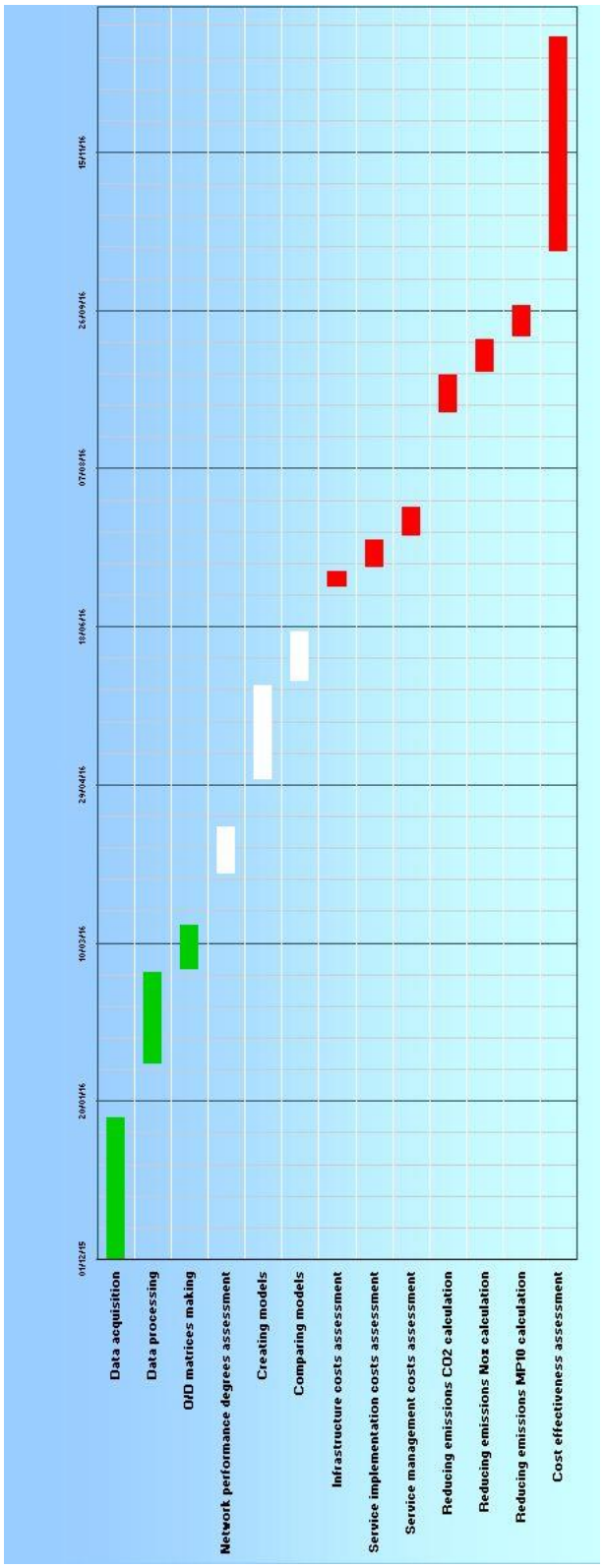
7.2. Work plan

The following table presents the expected action plan with related timing

Phase	Action	Start	End	Days
Mobility demand	Data acquisition	01/12/2015	15/01/2016	45
	Data processing	01/02/2016	01/03/2016	29
	O/D matrices making	02/03/2016	16/03/2016	14
Modelling	Network performance degrees assessment	01/04/2016	16/04/2016	15
	Creating models	01/05/2016	31/05/2016	30
	Comparing models	01/06/2016	17/06/2016	16
Cost effectiveness	Infrastructure costs assessment	01/07/2016	06/07/2016	5
	Service implementation costs assessment	07/07/2016	16/07/2016	9
	Service management costs assessment	17/07/2016	26/07/2016	9
	Reducing emissions CO2 calculation	25/08/2016	06/09/2016	12
	Reducing emissions Nox calculation	07/09/2016	17/09/2016	10
	Reducing emissions MP10 calculation	18/09/2016	28/09/2016	10
	Cost effectiveness assessment	15/10/2016	22/12/2016	68
Conclusions	Final report construction	16/01/2017	31/03/2017	74

7.3. Detailed timeline

The following Gantt chart shows the work plan presented in the previous section



8. Expected results

Service features:

- Capacity per hour and per direction at least 130 pax / h
- Capacity per day and per direction at least 1.950 pax/day
- Rush hour capacity in at least one of two directions: 260 pax/h
- Travel time not exceeding 60 min
- Roundrip time not exceeding 120 min
- Frequency not less than one transit per hour and per direction.

Polluting matters:

- Reduction CO_2
  - 5,4 kg less per hour
  - 64,8 kg less per day
  - 22 ton less per year
- Reduction NOx
  - 180 g less per hour
  - 2,1 kg less per day
  - 720 kg less per year

- Riduzione MP_{10}
  - 9,5 g less per hour
  - 115 g less per day
  - 40 kg less per year

General features

- Get a payback period of less than or equal to 50 years
- To propose the creation of a better service than currently offered by the road