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REGIONE AUTONOMA DELLA SARDEGNA

DESTI-SMART
Interreg Europe



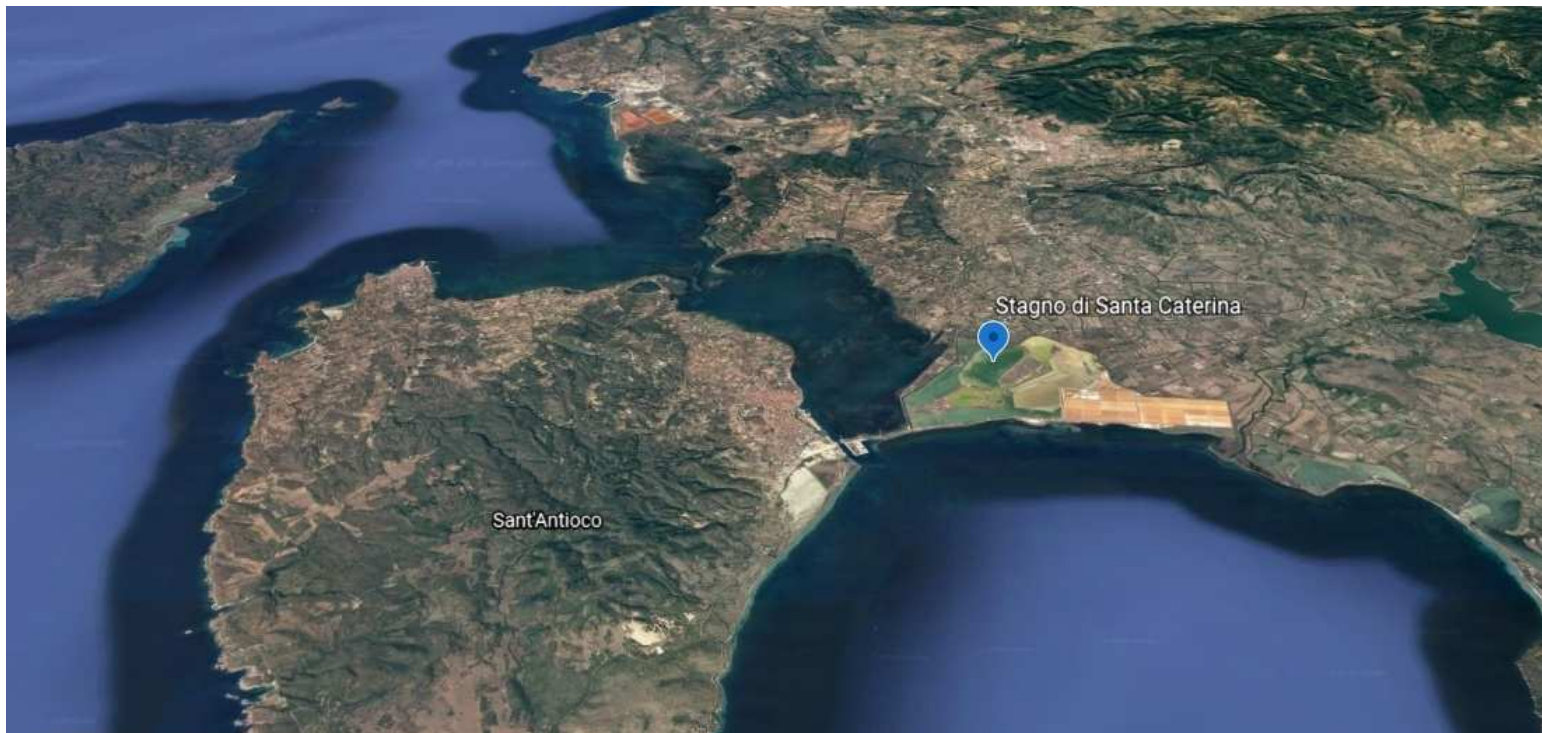
European Union
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Feasibility Study

*Sustainable mobility model towards
naturalistic areas:*

*The case of Santa Caterina—Sant'Antioco
Regione Sardegna*

Annex 1



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DOCUMENT CONTENT AND REFERENCES

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This study was carried out with regard to Activity 8, which requires “Feasibility Studies for Low-Carbon Mobility Options & Transport Systems, Accessibility provision, Intermodality improvements and Cycling/Walking facilities at partner destinations”.

The study was carried out by Andrea Zara, external expert of Autonomous Region of Sardinia in charge to develop the study, in a close collaboration with the project staff of the Region of Sardinia and in the context of DESTI-SMART Project and.

Therefore, all the contents of this document refer exclusively to the objectives and activities of the DESTI-SMART Project. Any different use and the total or partial citation of the contents by third parties must explicitly quote the source and relieve the author and the Region of Sardinia from any possible consequences.



<https://www.interregeurope.eu/desti-smart/>

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1. Zero Scenario

Table 1 - Zero scenario demand distribution

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)				
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL	
1.a Southwest - Calasetta	31.6	0.0%	7.6%	4.6%	18.3%	0.0%	8.9%	6.0%	23.7%	
1.b Southwest - Sant'Antioco	11.6	100.0%	92.4%	22.6%	1.6%	100.0%	91.1%	25.3%	1.8%	
2 North - Carbonia Intermodal Centre	23	0.0%	0.0%	72.8%	80.1%	0.0%	0.0%	68.8%	74.5%	
	0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
	TOTAL DEMAND		48	89	9861	2033	64	120	11719	2460

Table 2 - Zero scenario demand

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	7	449	372	0	11	701	583
1.b Southwest - Sant'Antioco	11.6	48	82	2230	33	64	110	2961	44
2 North - Carbonia Intermodal Centre	23	0	0	7183	1627	0	0	8057	1833
	Total	48	89	9861	2033	64	120	11719	2460

Table 3 - Zero scenario occupancy rate

Bicycle	1
Motorcycles/scooters	1.2
Car	2
TPL	5

Table 4 - Estimated vehicles for Hub zero scenario

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	6	225	74	0	9	350	117
1.b Southwest - Sant'Antioco	11.6	48	69	1115	7	64	92	1481	9
2 North - Carbonia Intermodal Centre	23	0	0	3591	325	0	0	4029	367
	Total vehicles	48	74	4931	407	64	100	5859	492

Table 5 - Total vehicle distance (vei*km) zero scenario

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	180	7,096	2,351	0	281	11,068	3,682
1.b Southwest - Sant'Antioco	11.6	555	797	12,933	77	739	1,062	17,174	103
2 North - Carbonia Intermodal Centre	23	0	0	82,599	7,486	0	0	92,658	8,434
	Total vei*km	555	976	102,628	9,914	739	1,343	120,900	12,219

1.1 EXTERNAL IMPACTS ZERO SCENARIO

ROAD CONGESTION

Table 6 - Marginal cost of road congestion zero scenario

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	not applicable
Car	0.2
TPL	0.5

Data from Table A4_2, by rural area, type 'other roads', V/C (congestion) ratio 0,5 (lowest)

Table 7 - Road congestion zero scenario

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0	1,419	1,175	0	0	2,214	1,841
1.b Southwest - Sant'Antioco	11.6	0	0	2,587	39	0	0	3,435	52
2 North - Carbonia Intermodal Centre	23	0	0	16,520	3,743	0	0	18,532	4,217
	Total €	0	0	20,526	4,957	0	0	24,180	6,109
	Total impact [€]	25,483 €				30,289 €			

INCIDENTALITY

Table 8 - Marginal cost of zero scenario incidents

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0.2
Car	0.2
TPL	not applicable

Data from Table A4_4, for "other non-urban road".

Table 9 - Zero Scenario Incidentalinity

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	36	1419	0	0	56	2214	0
1.b Southwest - Sant'Antioco	11.6	0	159	2587	0	0	212	3435	0
2 North - Carbonia Intermodal Centre	23	0	0	16520	0	0	0	18532	0
	Total €	0	195	20526	0	0	269	24180	0
	Total impact [€]	20,721 €				24,448 €			

POLLUTING EMISSIONS

Table 10 - Marginal cost pollutant emissions zero scenario

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0.003
Car	0.003
TPL	0.055

Data from table A4_6, by rural area. The column with average value has been considered. The marginal cost considered for "euro class" is an average between cars of class 1-4 and class 5-6).motorcycles are considered as passenger cars.

NB.The costs in table A4_6 are in cents, in the analysis they were considered in Euro, dividing the tabulated value by 100.

Table 11 - Zero Scenario Pollutant Emissions

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	ooter	Car	TPL	Bike	ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.5	21	129	0	0.0	33	203
1.b Southwest - Sant'Antioco	11.6	0	2.4	39	4	0	0.0	52	6
2 North - Carbonia Intermodal Centre	23	0	0.0	248	412	0	0.0	278	464
	Total €	0	3	308	545	0	0	363	672
	Total impact [€]	856 €				1.035 €			

ACOUSTIC POLLUTION

Table 12 - Marginal noise pollution cost zero scenario

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0.4
Car	0.2
TPL	0.8

Data from Table A4_10, by rural area, period "day", average traffic density "low".

NB the costs in table A4_6 are in € per 1000 vei*km, so the vehicles per km have been divided by 1000.

Table 13 - Noise pollution scenario zero

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.07	1.42	1.88	0	0.11	2.21	2.95
1.b Southwest - Sant'Antioco	11.6	0	0.32	2.59	0.06	0	0.42	3.43	0.08
2 North - Carbonia Intermodal Centre	23	0	0	16.52	5.99	0	0	18.53	6.75
	Total €	0.0	0.4	20.5	7.9	0.0	0.5	24.2	9.8
	Total impact [€]	28.8 €				34.5 €			

GLOBAL WARMING

Table 14 - Marginal cost Global warming zero scenario

Half	Marginal Cost [€ * vej*km]
Bicycle	not applicable
Motorcycles/scooters	0.0165
Car	0.0165
TPL	0.053

Data from Table A4_13, by rural area. The column with average value has been considered. The marginal cost considered for "euro class" is an average between cars of class 1-4 and class 5-6).motorcycles are considered as passenger cars.

NB the costs in table A4_6 are in cents, in the analysis they were considered in Euro, dividing the tabulated value by 100.

Table 15 - Global warming zero scenario

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	2.96	3.71	19.71	0	4.64	5.78	30.88
1.b Southwest - Sant'Antioco	11.6	0	13.14	18.40	1.77	0	17.52	24.43	2.35
2 North - Carbonia Intermodal Centre	23	0	0.00	59.26	86.25	0	0.00	66.47	97.17
	Total €	0.0	16.1	81.4	107.7	0.0	22.2	96.7	130.4
	Total impact [€]	205 €				249 €			

1.2 OPERATING COSTS ZERO SCENARIO

Table 16 - Cost of operation for half a zero scenario

Half	Operating cost [€ * veI*km]
Bicycle	not applicable
Motorcycles/scooters	0.1759
Car	0.47
TPL	3

Motorbike/scooter car mileage costs, from ministerial tables and ACI tables. Vehicles-type used : Two hatchback classic and scooter type Scarabeo or similar

LPT cost - standard mileage cost per km per urban/extraurban bus

Table 17 - Operating cost zero scenario

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motor scooter	Car	TPL	Bike	Motor scooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	31.58	3,335.35	7,052.33	0	49.43	5,202.07	11,046.81
1.b Southwest - Sant'Antioco	11.6	0	140.11	6,078.32	231.79	0	186.73	8,071.73	309.13
2 North - Carbonia Intermodal Centre	23	0	0.00	38,821.72	22,457.27	0	0.00	43,549.13	25,300.61
	Total €	0.0	171.7	48235.4	29741.4	0.0	236.2	56822.9	36656.6
	Total impact [€]				78,148 €				93,716 €

1.3 CO2 PRODUCTION ON ROAD ZERO SCENARIO

Table 18 CO2 production by half zero scenario

Half	KG CO2 *km
Bicycle	not applicable
Motorcycles/scooters	0.073
Car	0.119
TPL	0.069

Type of emission per vehicle - Panda and scooter type utility vehicle

Table 19 - CO2 production zero scenario

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoscooter	Car	TPL	Bike	Motoscooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	13.10	844.48	162.20	0	20.51	1,317.12	254.08
1.b Southwest - Sant'Antioco	11.6	0	58.15	1,538.98	5.33	0	77.49	2,043.69	7.11
2 North - Carbonia Intermodal Centre	23	0	0,00	9,829.33	516.52	0	0,00	11,026.27	581.91
	Total CO2	0.0	71.3	12212.8	684.1	0.0	98.0	14387.1	843.1
	Total impact [kg CO2]	12,968.09				15,328.19			

1.4 ZERO SCENARIO SUMMARY

Table 20 - Zero scenario summary

	Prudential user estimate	Optimistic user estimate
EXTERNAL IMPACTS	Cost [€]	
Road congestion	€ 25,483	€ 30,289
Incidentality	€ 20,721	€ 24,448
Polluting emissions	€ 856	1,035 €
Acoustic pollution	29 €	34 €
Global warming	€ 205	€ 249
	47.294 €	56.056 €
Operating costs	€ 78.148	93.716 €
		149.772
IMPACTS + OPERATING COSTS	125.442 € €	
	Kg CO2	
CO2 production	12.968,09	15.328,19

2. Zero Scenario - 60% demand reduction

Table 21 - Distribution of demand zero scenario - demand 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc scooter	Car	TPL	Bike	Motoc scooter	Car	TPL
1.a Southwest - Calasetta	31.6	0.0%	7.6%	4.6%	18.3%	0.0%	8.9%	6.0%	23.7%
1.b Southwest - Sant'Antioco	11.6	100.0%	92.4%	22.6%	1.6%	100.0%	91.1%	25.3%	1.8%
2 North - Carbonia Intermodal Centre	23	0.0%	0.0%	72.8%	80.1%	0.0%	0.0%	68.8%	74.5%
	0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	TOTAL DEMAND	29	54	5917	1220	38	72	7031	1476

Table 22 - Zero scenario demand - 60% demand

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc scooter	Car	TPL	Bike	Motoc scooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	7	449	372	0	11	701	583
1.b Southwest - Sant'Antioco	11.6	48	82	2230	33	64	110	2961	44
2 North - Carbonia Intermodal Centre	23	0	0	7183	1627	0	0	8057	1833
	Total	48	89	9861	2033	64	120	11719	2460

Table 23 - Employment rates zero scenario - demand 60%.

Bicycle	1
Motorcycles/scooters	1.2
Car	2
TPL	5

Table 24 - Estimated vehicles per Hub zero-demand scenario 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	3	135	45	0	5	210	70
1.b Southwest - Sant'Antioco	11.6	29	41	669	4	38	55	888	5
2 North - Carbonia Intermodal Centre	23	0	0	2155	195	0	0	2417	220
	Total vehicles	29	45	2958	244	38	60	3516	295

Table 25 - Total vehicle distance (vei*km) zero-demand scenario 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	108	4,258	1,410	0	169	6,641	2,209
1.b Southwest - Sant'Antioco	11.6	333	478	7,760	46	443	637	10,304	62
2 North - Carbonia Intermodal Centre	23	0	0	49,560	4,491	0	0	55,595	5,060
	Total vei*km	333	586	61,577	5,948	443	806	72,540	7,331

2.1 EXTERNAL IMPACTS ZERO SCENARIO - DEMAND 60%

ROAD CONGESTION

Table 26 - Marginal cost of road congestion zero scenario - demand 60%.

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	not applicable
Car	0.2
TPL	0.5

Data from Table A4_2, by rural area, type 'other roads', V/C (congestion) ratio 0,5 (lowest)

Table 27 - Road congestion zero scenario - demand 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motorc ooter	Car	TPL	Bike	Motorc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0	852	705	0	0	1,328	1,105
1.b Southwest - Sant'Antioco	11.6	0	0	1,552	23	0	0	2,061	31
2 North - Carbonia Intermodal Centre	23	0	0	9,912	2,246	0	0	11,119	2,530
	Total €	0	0	12,315	2,974	0	0	14,508	3,666
	Total impact [€]	15.290 €				18.174 €			

INCIDENTALITY

Table 28 - Marginal cost of incident zero scenario - demand 60%.

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0.2
Car	0.2
TPL	not applicable

Data from Table A4_4, for "other non-urban road".

Table 29 - Zero Scenario Incidentalinity - demand 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motorc ooter	Car	TPL	Bike	Motorc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	22	852	0	0	34	1328	0
1.b Southwest - Sant'Antioco	11.6	0	96	1552	0	0	127	2061	0
2 North - Carbonia Intermodal Centre	23	0	0	9912	0	0	0	11119	0
	Total €	0	117	12315	0	0	161	14508	0
	Total impact [€]	12.433 €				14.669 €			

POLLUTING EMISSIONS

Table 30 - Marginal cost of pollutant emissions zero scenario - demand 60%.

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0.003
Car	0.003
TPL	0.055

Data from table A4_6, by rural area. The column with average value has been considered. The marginal cost considered for "euro class" is an average between cars of class 1-4 and class 5-6).motorcycles are considered as passenger cars.

NB.The costs in table A4_6 are in cents, in the analysis they were considered in Euro, dividing the tabulated value by 100.

Table 31 - Pollutant emissions zero scenario - demand 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	ooter	Car	TPL	Bike	ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.3	13	78	0	0.0	20	122
1.b Southwest - Sant'Antioco	11.6	0	1.4	23	3	0	0.0	31	3
2 North - Carbonia Intermodal Centre	23	0	0.0	149	247	0	0.0	167	278
	Total €	0	2	185	327	0	0	218	403
	Total impact [€]	514 €				621 €			

ACOUSTIC POLLUTION

Table 32 - Marginal cost noise pollution scenario zero - demand 60%.

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0.4
Car	0.2
TPL	0.8

Data from Table A4_10, by rural area, period "day", average traffic density "low".

NB the costs in table A4_6 are in € per 1000 vei*km, so the vehicles per km have been divided by 1000.

Table 33 - Noise pollution zero scenario - demand 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.04	0.85	1.13	0	0.07	1.33	1.77
1.b Southwest - Sant'Antioco	11.6	0	0.19	1.55	0.04	0	0.25	2.06	0.05
2 North - Carbonia Intermodal Centre	23	0	0	9.91	3.59	0	0	11.12	4.05
	Total €	0.0	0.2	12.3	4.8	0.0	0.3	14.5	5.9
	Total impact [€]	17.3 €				20.7 €			

GLOBAL WARMING

Table 34 - Marginal cost Global warming zero scenario - demand 60%.

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0.0165
Car	0.0165
TPL	0.053

Data from Table A4_13, by rural area. The column with average value has been considered. The marginal cost considered for "euro class" is an average between cars of class 1-4 and class 5-6).motorcycles are considered as passenger cars.

NB the costs in table A4_6 are in cents, in the analysis they were considered in Euro, dividing the tabulated value by 100.

Table 35 - Global warming zero scenario - demand 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	1.78	2.22	11.83	0	2.78	3.47	18.53
1.b Southwest - Sant'Antioco	11.6	0	7.89	11.04	1.06	0	10.51	14.66	1.41
2 North - Carbonia Intermodal Centre	23	0	0.00	35.55	51.75	0	0.00	39.88	58.30
	Total €	0.0	9.7	48.8	64.6	0.0	13.3	58.0	78.2
	Total impact [€]	123 €				150 €			

2.2 OPERATING COSTS ZERO SCENARIO - DEMAND 60%

Table 36 - Operating cost per half zero scenario - demand 60%.

Half	Operating cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0.1759
Car	0.47
TPL	3

Motorbike/scooter car mileage costs, from ministerial tables and ACI tables. Vehicles-type used : Two hatchback classic and scooter type Scarabeo or similar
LPT cost - standard mileage cost per km per urban/extraurban bus

Table 37 - Operating cost zero scenario - demand 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motor scooter	Car	TPL	Bike	Motor scooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	18.95	2,001.21	4,231.40	0	29.66	3,121.24	6,628.09
1.b Southwest - Sant'Antioco	11.6	0	84.07	3,646.99	139.07	0	112.04	4,843.04	185.48
2 North - Carbonia Intermodal Centre	23	0	0.00	23,293.03	13,474.36	0	0.00	26,129.48	15,180.37
	Total €	0,0	103.0	28941.2	17844.8	0.0	141.7	34093.8	21993.9
	Total impact [€]	46.889 €				56.229 €			

2.3 CO2 PRODUCTION ON ROAD ZERO SCENARIO - DEMAND 60%.

Table 38 CO2 production by half a zero scenario - demand 60%.

Half	KG CO2 *km
Bicycle	not applicable
Motorcycles/scooters	0.073
Car	0.119
TPL	0.069

Type of emission per vehicle - Panda and scooter type utility vehicle

Table 39 - CO2 production zero scenario - demand 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoscooter	Car	TPL	Bike	Motoscooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	7.86	506.69	97.32	0	12.31	790.27	152.45
1.b Southwest - Sant'Antioco	11.6	0	34.89	923.39	3.20	0	46.50	1,226.22	4.27
2 North - Carbonia Intermodal Centre	23	0	0.00	5,897.60	309.91	0	0.00	6,615.76	349.15
	Total CO2	0.0	42.8	7327.7	410.4	0.0	58.8	8632.2	505.9
	Total impact [kg CO2]	7.780,86				9.196,91			

2.4 SUMMARY ZERO-DEMAND SCENARIO 60%

Table 40 - Zero Scenario Summary - 60% demand

	Prudential user estimate	Optimistic user estimate
EXTERNAL IMPACTS	Cost [€]	
Road congestion	15,290 €	18,174 €
Incidentalities	12,433 €	14,669 €
Polluting emissions	514 €	621 €
Acoustic pollution	17 €	21 €
Global warming	123 €	150 €
	28,376 €	33,634 €
Operating costs	46,889 €	
IMPACTS + OPERATING COSTS	75,265 €	89,863 €
	Kg CO2	
CO2 production	7,780.86	9,196.91

3. Scenario 1

Table 41 - Distribution of demand scenario 1

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motocooter	Car	TPL	Bike	Motocooter	Car	TPL
1.a Southwest - Calasetta	31.6	0.0%	7.6%	4.6%	18.3%	0.0%	8.9%	6.0%	23.7%
1.b Southwest - Sant'Antioco	11.6	100.0%	92.4%	22.6%	1.6%	100.0%	91.1%	25.3%	1.8%
2 North - Carbonia Intermodal Centre	23	0.0%	0.0%	72.8%	80.1%	0.0%	0.0%	68.8%	74.5%
	0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	TOTAL DEMAND	48	89	9861	2033	64	120	11719	2460

Table 42 - Demand scenario 1

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motocooter	Car	TPL	Bike	Motocooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	7	449	372	0	11	701	583
1.b Southwest - Sant'Antioco	11.6	48	82	2230	33	64	110	2961	44
2 North - Carbonia Intermodal Centre	23	0	0	7183	1627	0	0	8057	1833
	Total	48	89	9861	2033	64	120	11719	2460

Table 43 - Employment rates scenario 1

Bicycle	1
Motorcycles/scooters	1.2
Car	2
TPL	5

Table 44 - Estimated vehicles for Hub scenario 1

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	6	225	74	0	9	350	117
1.b Southwest - Sant'Antioco	11.6	48	69	1115	7	64	92	1481	9
2 North - Carbonia Intermodal Centre	23	0	0	3591	325	0	0	4029	367
	Total vehicles	48	74	4931	407	64	100	5859	492

Table 45 - Total vehicle distance (vei*km) scenario 1

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	180	7,096	2,351	0	281	11,068	3,682
1.b Southwest - Sant'Antioco	11.6	555	797	12,933	77	739	1,062	17,174	103
2 North - Carbonia Intermodal Centre	23	0	0	82,599	7,486	0	0	92,658	8,434
	Total vei*km	555	976	102,628	9,914	739	1,343	120,900	12,219

3.1 EXTERNAL IMPACTS SCENARIO 1

ROAD CONGESTION

Table 46 - Marginal cost of road congestion scenario 1

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	not applicable
Car	0.2
TPL	0.5

Data from Table A4_2, by rural area, type 'other roads', V/C (congestion) ratio 0,5 (lowest)

Table 47 - Road congestion scenario 1

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0	1,419	1,175	0	0	2,214	1,841
1.b Southwest - Sant'Antioco	11.6	0	0	2,587	39	0	0	3,435	52
2 North - Carbonia Intermodal Centre	23	0	0	16,520	3,743	0	0	18,532	4,217
	Total €	0	0	20,526	4,957	0	0	24,180	6,109
	Total impact [€]	25.483 €				30.289 €			

INCIDENTALITY

Table 48 - Marginal accident cost scenario 1

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0.2
Car	0.2
TPL	not applicable

Data from Table A4_4, for "other non-urban road".

Table 49 - Incidentalality scenario 1

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	36	1419	0	0	56	2214	0
1.b Southwest - Sant'Antioco	11.6	0	159	2587	0	0	212	3435	0
2 North - Carbonia Intermodal Centre	23	0	0	16520	0	0	0	18532	0
	Total €	0	195	20526	0	0	269	24180	0
	Total impact [€]	20.721 €				24.448 €			

POLLUTING EMISSIONS

Table 50 - Marginal cost pollutant emissions scenario 1

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0
Car	0
TPL	0.055

Data from table A4_6, by rural area. The column with average value has been considered. The marginal cost considered for "euro class" is an average between cars of class 1-4 and class 5-6).motorcycles are considered as passenger cars.

NB.The costs in table A4_6 are in cents, in the analysis they were considered in Euro, dividing the tabulated value by 100.

Table 51 - Pollutant emissions scenario 1

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motosc ooter	Car	TPL	Bike	Motosc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.0	0	129	0	0.0	0	203
1.b Southwest - Sant'Antioco	11.6	0	0.0	0	4	0	0.0	0	6
2 North - Carbonia Intermodal Centre	23	0	0.0	0	412	0	0.0	0	464
	Total €	0	0	0	545	0	0	0	672
	Total impact [€]	545 €				672 €			

ACOUSTIC POLLUTION

Table 52 - Marginal cost noise pollution scenario 1

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0.2
Car	0.1
TPL	0.8

Data from Table A4_10, by rural area, period "day", average traffic density "low".

NB the costs in table A4_6 are in € per 1000 vei*km, so the vehicles per km have been divided by 1000.

Electric vehicles by law must emit a background noise to be heard. Prudentially, it can be said that the coefficients are reduced by half compared to petrol cars.

Table 53 - Noise pollution scenario 1

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.04	0.71	1.88	0	0.06	1.11	2.95
1.b Southwest - Sant'Antioco	11.6	0	0.16	1.29	0.06	0	0.21	1.72	0.08
2 North - Carbonia Intermodal Centre	23	0	0	8.26	5.99	0	0	9.27	6.75
	Total €	0.0	0.2	10,3	7,9	0,0	0,3	12,1	9,8
	Total impact [€]	18.4 €				22.1 €			

GLOBAL WARMING

Table 54 - Marginal cost Global warming scenario 1

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0
Car	0
TPL	0.053

Data from Table A4_13, by rural area. The column with average value has been considered. The marginal cost considered for "euro class" is an average between cars of class 1-4 and class 5-6).motorcycles are considered as passenger cars.

NB the costs in table A4_6 are in cents, in the analysis they were considered in Euro, dividing the tabulated value by 100.

Table 55 - Global warming scenario 1

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.00	0.00	19.71	0	0.00	0.00	30.88
1.b Southwest - Sant'Antioco	11.6	0	0.00	0.00	1.77	0	0.00	0.00	2.35
2 North - Carbonia Intermodal Centre	23	0	0.00	0.00	86.25	0	0.00	0.00	97.17
	Total €	0.0	0.0	0.0	107.7	0.0	0.0	0.0	130.4
	Total impact [€]	108 €				130 €			

3.2 OPERATING COSTS SCENARIO 1

Table 56 - Operating cost per half scenario 1

Half	Operating cost [€ * vei*km]
Bicycle	0.03
Motorcycles/scooters	0.1268
Car	0.3583
TPL	3

Motorbike/scooter car mileage costs, from ministerial tables and ACI tables. Vehicles-type used : Electric Smart . The only electric scooter listed

Renault Twizy life, which has a list price of about 7,000. It is estimated that the operating cost of the Niu electric scooter can be about half.

LPT cost - standard mileage cost per km per urban/extraurban bus

Table 57 - Operating cost scenario 1

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motor scooter	Car	TPL	Bike	Motor scooter	Car	TPL
1.a Southwest - Calasetta	31,6	0	22.76	2,542.67	7,052.33	0	35.63	3,965.75	11,046.81
1.b Southwest - Sant'Antioco	11,6	17	101.00	4,633.75	231.79	22	134.60	6,153.41	309.13
2 North - Carbonia Intermodal Centre	23	0	0.00	29,595.37	22,457.27	0	0.00	33,199.26	25,300.61
	Total €	16.7	123.8	36771.8	29741.4	22.2	170.2	43318.4	36656.6
	Total impact [€]				66,654 €				80,167 €

3.3 CO2 PRODUCTION ON ROAD SCENARIO 1

Table 58 CO2 production by half scenario 1

Half	KG CO2 *km
Bicycle	0
Motorcycles/scooters	0
Car	0
TPL	0.069

Table 59 - CO2 production scenario 1

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motosc cooter	Car	TPL	Bike	Motosc cooter	Car	TPL
1.a Southwest - Calasetta	31,6	0	0.00	0.00	162.20	0	0.00	0.00	254.08
1.b Southwest - Sant'Antioco	11,6	0	0.00	0.00	5.33	0	0.00	0.00	7.11
2 North - Carbonia Intermodal Centre	23	0	0.00	0.00	516.52	0	0.00	0.00	581.91
	Total CO2	0.0	0.0	0.0	684.1	0.0	0.0	0.0	843.1
	Total impact [kg CO2]	684.05				843.10			

3.4 SUMMARY SCENARIO 1

Table 60 - Summary scenario 1

	Prudential user estimate	Optimistic user estimate
EXTERNAL IMPACTS	Cost [€]	
Road congestion	€ 25,483	€ 30,289
Incidentalities	€ 20,721	€ 24,448
Polluting emissions	€ 545	€ 672
Acoustic pollution	18 €	22 €
Global warming	€ 108	€ 130
	46,875 €	55,562 €
Operating costs	66,654 €	80,167 €
		135,730
IMPACTS + OPERATING COSTS	113,528 €	€
	Kg CO2	
CO2 production	684.05	843.10

4. Scenario 1 - 60% demand reduction

Table 61 - Distribution of demand scenario 1 - demand 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motosc ooter	Car	TPL	Bike	Motosc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0.0%	7.6%	4.6%	18.3%	0.0%	8.9%	6.0%	23.7%
1.b Southwest - Sant'Antioco	11.6	100.0%	92.4%	22.6%	1.6%	100.0%	91.1%	25.3%	1.8%
2 North - Carbonia Intermodal Centre	23	0.0%	0.0%	72.8%	80.1%	0.0%	0.0%	68.8%	74.5%
	0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	TOTAL DEMAND	29	54	5917	1220	38	72	7031	1476

Table 62 - Demand scenario 1- demand 60%

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motosc ooter	Car	TPL	Bike	Motosc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	4	269	223	0	6	420	350
1.b Southwest - Sant'Antioco	11.6	29	49	1338	20	38	66	1777	27
2 North - Carbonia Intermodal Centre	23	0	0	4310	976	0	0	4834	1100
	Total	29	54	5917	1220	38	72	7031	1476

Table 63 - Employment ratios scenario 1- demand 60%

Bicycle	1
Motorcycles/scooters	1.2
Car	2
TPL	5

Table 64 - Estimated vehicles for Hub scenario 1- demand 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	3	135	45	0	5	210	70
1.b Southwest - Sant'Antioco	11.6	29	41	669	4	38	55	888	5
2 North - Carbonia Intermodal Centre	23	0	0	2155	195	0	0	2417	220
	Total vehicles	29	45	2958	244	38	60	3516	295

Table 65 - Total vehicle distance (vei*km) scenario 1- demand 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	108	4,258	1,410	0	169	6,641	2,209
1.b Southwest - Sant'Antioco	11.6	333	478	7,760	46	443	637	10,304	62
2 North - Carbonia Intermodal Centre	23	0	0	49,560	4,491	0	0	55,595	5,060
	Total vei*km	333	586	61,577	5,948	443	806	72,540	7,331

4.1 EXTERNAL IMPACTS SCENARIO 1 - DEMAND 60%

ROAD CONGESTION

Table 66 - Marginal cost of road congestion scenario 1- demand 60%.

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	not applicable
Car	0.2
TPL	0.5

Data from Table A4_2, by rural area, type 'other roads', V/C (congestion) ratio 0,5 (lowest)

Table 67 - Road congestion scenario 1- demand 60%

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0	852	705	0	0	1,328	1,105
1.b Southwest - Sant'Antioco	11.6	0	0	1,552	23	0	0	2,061	31
2 North - Carbonia Intermodal Centre	23	0	0	9,912	2,246	0	0	11,119	2,530
	Total €	0	0	12,315	2,974	0	0	14,508	3,666
	Total impact [€]	15,290 €				18,174 €			

INCIDENTALITY

Table 68 - Marginal cost of accidents scenario 1- demand 60%.

Half	Marginal Cost [€ * vej*km]
Bicycle	not applicable
Motorcycles/scooters	0.2
Car	0.2
TPL	not applicable

Data from Table A4_4, for "other non-urban road".

Table 69 - Incidentalities scenario 1- demand 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	22	852	0	0	34	1328	0
1.b Southwest - Sant'Antioco	11.6	0	96	1552	0	0	127	2061	0
2 North - Carbonia Intermodal Centre	23	0	0	9912	0	0	0	11119	0
	Total €	0	117	12315	0	0	161	14508	0
	Total impact [€]	12.433 €				14.669 €			

POLLUTING EMISSIONS

Table 70 - Marginal cost pollutant emissions scenario 1- demand 60%.

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0
Car	0
TPL	0.055

Data from table A4_6, by rural area. The column with average value has been considered. The marginal cost considered for "euro class" is an average between cars of class 1-4 and class 5-6).motorcycles are considered as passenger cars.

NB.The costs in table A4_6 are in cents, in the analysis they were considered in Euro, dividing the tabulated value by 100.

Table 71 - Pollutant emissions scenario 1- demand 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	ooter	Car	TPL	Bike	ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0,0	0	78	0	0,0	0	122
1.b Southwest - Sant'Antioco	11.6	0	0,0	0	3	0	0,0	0	3
2 North - Carbonia Intermodal Centre	23	0	0,0	0	247	0	0,0	0	278
	Total €	0	0	0	327	0	0	0	403
	Total impact [€]	327 €				403 €			

ACOUSTIC POLLUTION

Table 72 - Marginal cost of noise pollution scenario 1- demand 60%.

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0.2
Car	0.1
TPL	0.8

Data from Table A4_10, by rural area, period "day", average traffic density "low".

NB the costs in table A4_6 are in € per 1000 vei*km, so the vehicles per km have been divided by 1000.

Electric vehicles by law must emit a background noise to be heard. Prudentially, it can be said that the coefficients are reduced by half compared to petrol cars.

Table 73 - Noise pollution scenario 1 - 60% demand

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motorc ooter	Car	TPL	Bike	Motorc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.02	0.43	1.13	0	0.03	0.66	1.77
1.b Southwest - Sant'Antioco	11.6	0	0.10	0.78	0.04	0	0.13	1.03	0.05
2 North - Carbonia Intermodal Centre	23	0	0	4.96	3.59	0	0	5.56	4.05
	Total €	0.0	0.1	6.2	4.8	0.0	0.2	7.3	5.9
	Total impact [€]	11.0 €				13.3 €			

GLOBAL WARMING

Table 74 - Marginal cost Global warming scenario 1- demand 60%

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0
Car	0
TPL	0.053

Data from Table A4_13, by rural area. The column with average value has been considered. The marginal cost considered for "euro class" is an average between cars of class 1-4 and class 5-6).motorcycles are considered as passenger cars.

NB the costs in table A4_6 are in cents, in the analysis they were considered in Euro, dividing the tabulated value by 100.

Table 75 - Global warming scenario 1- demand 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motorc ooter	Car	TPL	Bike	Motorc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.00	0.00	11.83	0	0.00	0.00	18.53
1.b Southwest - Sant'Antioco	11.6	0	0.00	0.00	1.06	0	0.00	0.00	1.41
2 North - Carbonia Intermodal Centre	23	0	0.00	0.00	51.75	0	0.00	0.00	58.30
	Total €	0.0	0.0	0.0	64.6	0.0	0.0	0.0	78.2
	Total impact [€]	65 €				78 €			

4.2 OPERATING COSTS SCENARIO 1 - DEMAND 60%

Table 76 - Operating cost per half scenario 1- demand 60%.

Half	Operating cost [€ * vei*km]
Bicycle	0.03
Motorcycles/scooters	0.1268
Car	0.3583
TPL	3

Motorbike/scooter car mileage costs, from ministerial tables and ACI tables. Vehicles-type used : Electric Smart . The only electric scooter listed

Renault Twizy life, which has a list price of about 7,000. It is estimated that the operating cost of the Niu electric scooter can be about half.

LPT cost - standard mileage cost per km per urban/extraurban bus

Table 77 - Cost of operation scenario 1- demand 60%

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motor scooter	Car	TPL	Bike	Motor scooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	13.66	1,525.60	4,231.40	0	21.38	2,379.45	6,628.09
1.b Southwest - Sant'Antioco	11.6	10	60.60	2,780.25	139.07	13	80.76	3,692.04	185.48
2 North - Carbonia Intermodal Centre	23	0	0.00	17,757.22	13,474.36	0	0.00	19,919.56	15,180.37
	Total €	10.0	74.3	22063.1	17844.8	13.3	102.1	25991.0	21993.9
	Total impact [€]				39,992 €				48,100 €

4.3 CO2 PRODUCTION ON ROAD SCENARIO 1 - DEMAND 60%.

Table 78 CO2 production by vehicles of scenario 1- demand 60%.

Half	KG CO2 *km
Bicycle	0
Motorcycles/scooters	0
Car	0
TPL	0.069

Table 79 - CO2 production scenario 1- demand 60%.

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc cooter	Car	TPL	Bike	Motos cooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.00	0.00	97.32	0	0.00	0.00	152.45
1.b Southwest - Sant'Antioco	11.6	0	0.00	0.00	3.20	0	0.00	0.00	4.27
2 North - Carbonia Intermodal Centre	23	0	0.00	0.00	309.91	0	0.00	0.00	349.15
	Total CO2	0.0	0.0	0.0	410.4	0.0	0.0	0.0	505.9
	Total impact [kg CO2]	410.43				505.86			

4.4 SUMMARY SCENARIO 1 - DEMAND 60%

Table 80 - Summary scenario 1 - 60% demand

	Prudential user estimate	Optimistic user estimate
EXTERNAL IMPACTS	Cost [€]	
Road congestion	15,290 €	18,174 €
Incidentalities	12,433 €	14,669 €
Polluting emissions	327 €	403 €
Acoustic pollution	11 €	13 €
Global warming	65 €	78 €
	28,125 €	33,337 €
Operating costs	39,992 €	48,100 €
IMPACTS + OPERATING COSTS	68,117 €	81,438 €
	Kg CO2	
CO2 production	410.43	505.86

5. Scenario 2

Table 81 - Distribution of demand scenario 2

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motocooter	Car	TPL	Bike	Motocooter	Car	TPL
1.a Southwest - Calasetta	31.6	20.0%	33.0%	20.0%	18.3%	20.0%	33.0%	20.0%	23.7%
1.b Southwest - Sant'Antioco	11.6	60.0%	34.0%	30.0%	1.6%	60.0%	34.0%	30.0%	1.8%
2 North - Carbonia Intermodal Centre	23	20.0%	33.0%	50.0%	80.1%	20.0%	33.0%	50.0%	74.5%
	0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	TOTAL DEMAND	1923	420	8875	813	2315	518	10547	984

Table 82 - Demand scenario 2

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motocooter	Car	TPL	Bike	Motocooter	Car	TPL
1.a Southwest - Calasetta	31.6	231	83	1065	89	278	103	1266	140
1.b Southwest - Sant'Antioco	11.6	692	86	1598	8	833	106	1898	11
2 North - Carbonia Intermodal Centre	23	231	83	2663	391	278	103	3164	440
	Total	1154	252	5325	488	1389	311	6328	591

Table 83 - Employment rates scenario 2

Bicycle	1
Motorcycles/scooters	1.2
Car	2
TPL	5

Table 84 - Estimated vehicles for Hub scenario 2

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	231	69	533	18	278	85	633	28
1.b Southwest - Sant'Antioco	11.6	692	71	799	2	833	88	949	2
2 North - Carbonia Intermodal Centre	23	231	69	1331	78	278	85	1582	88
	Total vehicles	1154	210	2663	98	1389	259	3164	118

Table 85 - Total vehicle distance (vei*km) scenario 2

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	7,291	2,190	16,828	564	8,777	2,699	19,997	884
1.b Southwest - Sant'Antioco	11.6	8,029	828	9,266	19	9,666	1,021	11,011	25
2 North - Carbonia Intermodal Centre	23	5,307	1,594	30,620	1,797	6,388	1,965	36,387	2,024
	Total vei*km	20,627	4,613	56,713	2,379	24,831	5,685	67,394	2,933

5.1 EXTERNAL IMPACTS SCENARIO 2

ROAD CONGESTION

Table 86 - Marginal cost of road congestion scenario 2

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	not applicable
Car	0.2
TPL	0.5

Data from Table A4_2, by rural area, type 'other roads', V/C (congestion) ratio 0,5 (lowest)

Table 87 - Road congestion scenario 2

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0	3,366	282	0	0	3,999	442
1.b Southwest - Sant'Antioco	11.6	0	0	1,853	9	0	0	2,202	12
2 North - Carbonia Intermodal Centre	23	0	0	6,124	898	0	0	7,277	1,012
	Total €	0	0	11,343	1,190	0	0	13,479	1,466
	Total impact [€]	12,532 €				14,945 €			

INCIDENTALITY

Table 88 - Marginal accident cost scenario 2

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0.2
Car	0.2
TPL	not applicable

Data from Table A4_4, for "other non-urban road".

Table 89 - Incidentalality scenario 2

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	438	3366	0	0	540	3999	0
1.b Southwest - Sant'Antioco	11.6	0	166	1853	0	0	204	2202	0
2 North - Carbonia Intermodal Centre	23	0	319	6124	0	0	393	7277	0
	Total €	0	923	11343	0	0	1137	13479	0
	Total impact [€]	12,265 €				14,616 €			

POLLUTING EMISSIONS

Table 90 - Marginal cost pollutant emissions scenario 2

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0
Car	0
TPL	0.055

Data from table A4_6, by rural area. The column with average value has been considered. The marginal cost considered for "euro class" is an average between cars of class 1-4 and class 5-6).motorcycles are considered as passenger cars.

NB.The costs in table A4_6 are in cents, in the analysis they were considered in Euro, dividing the tabulated value by 100.

Table 91 - Pollutant emissions scenario 2

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motosc ooter	Car	TPL	Bike	Motosc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.0	0	31	0	0.0	0	49
1.b Southwest - Sant'Antioco	11.6	0	0.0	0	1	0	0.0	0	1
2 North - Carbonia Intermodal Centre	23	0	0.0	0	99	0	0.0	0	111
	Total €	0	0	0	131	0	0	0	161
	Total impact [€]	131 €				161 €			

ACOUSTIC POLLUTION

Table 92 - Marginal cost noise pollution scenario 2

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0.2
Car	0.1
TPL	0.8

Data from Table A4_10, by rural area, period "day", average traffic density "low".

NB the costs in table A4_6 are in € per 1000 vei*km, so the vehicles per km have been divided by 1000.

Electric vehicles by law must emit a background noise to be heard. Prudentially, it can be said that the coefficients are reduced by half compared to petrol cars.

Table 93 - Noise pollution scenario 2

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motor	Car	TPL	Bike	Motor	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.44	1.68	0.45	0	0.54	2.00	0.71
1.b Southwest - Sant'Antioco	11.6	0	0.17	0.93	0.01	0	0.20	1.10	0.02
2 North - Carbonia Intermodal Centre	23	0	0	3.06	1.44	0	0	3.64	1.62
	Total €	0.0	0.6	5.7	1.9	0.0	0.7	6.7	2.3
	Total impact [€]	8.2 €				9.8 €			

GLOBAL WARMING

Table 94 - Marginal cost Global warming scenario 2

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0
Car	0
TPL	0.053

Data from Table A4_13, by rural area. The column with average value has been considered. The marginal cost considered for "euro class" is an average between cars of class 1-4 and class 5-6).motorcycles are considered as passenger cars.

NB the costs in table A4_6 are in cents, in the analysis they were considered in Euro, dividing the tabulated value by 100.

Table 95 - Global warming scenario 2

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motor	Car	TPL	Bike	Motor	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.00	0.00	4.73	0	0.00	0.00	7.41
1.b Southwest - Sant'Antioco	11.6	0	0.00	0.00	0.42	0	0.00	0.00	0.56
2 North - Carbonia Intermodal Centre	23	0	0.00	0.00	20.70	0	0.00	0.00	23.32
	Total €	0.0	0.0	0.0	25.9	0.0	0.0	0.0	31.3
	Total impact [€]	26 €				31 €			

5.2 OPERATING COSTS SCENARIO 2

Table 96 - Operating cost per half scenario 2

Half	Operating cost [€ * vei*km]
Bicycle	0.03
Motorcycles/scooters	0.1268
Car	0.3583
TPL	3

Motorbike/scooter car mileage costs, from ministerial tables and ACI tables. Vehicles-type used : Electric Smart . The only electric scooter listed

Renault Twizy life, which has a list price of about 7,000. It is estimated that the operating cost of the Niu electric scooter can be about half.

LPT cost - standard mileage cost per km per urban/extraurban bus

Table 97 - Operating cost scenario 2

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motor scooter	Car	TPL	Bike	Motor scooter	Car	TPL
1.a Southwest - Calasetta	31,6	219	277.72	6,029.33	1,692.56	263	342.27	7,164.87	2,651.23
1.b Southwest - Sant'Antioco	11,6	241	105.04	3,319.95	55.63	290	129.45	3,945.21	74.19
2 North - Carbonia Intermodal Centre	23	159	202.14	10,971.09	5,389.74	192	249.12	13,037.34	6,072.15
	Total €	618.8	584.9	20320.4	7137.9	744.9	720.8	24147.4	8797.6
	Total impact [€]	28,662 €				34,411 €			

5.3 CO2 PRODUCTION ON ROAD SCENARIO 2

Table 98 CO2 production by half scenario 2

Half	KG CO2 *km
Bicycle	0
Motorcycles/scooters	0
Car	0
TPL	0.069

Table 99 - CO2 production scenario 2

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motosc cooter	Car	TPL	Bike	Motosc cooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.00	0.00	38.93	0	0.00	0.00	60.98
1.b Southwest - Sant'Antioco	11.6	0	0.00	0.00	1.28	0	0.00	0.00	1.71
2 North - Carbonia Intermodal Centre	23	0	0.00	0.00	123.96	0	0.00	0.00	139.66
	Total CO2	0.0	0.0	0.0	164.2	0.0	0.0	0.0	202.3
	Total impact [kg CO2]	164.17				202.34			

5.4 SUMMARY SCENARIO 2

Table 100 - Overview scenario 2

	Prudential user estimate	Optimistic user estimate
EXTERNAL IMPACTS	Cost [€]	
Road congestion	12,532 €	14,945 €
Incidentality	12,265 €	14,616 €
Polluting emissions	131 €	161 €
Acoustic pollution	8 €	10 €
Global warming	26 €	31 €
	24,962 €	29,763 €
Operating costs	28,662 €	34,411 €
IMPACTS + OPERATING COSTS	53,624 €	64,174 €
		Kg CO2
CO2 production	164.17	202.34

6. Scenario 3

Table 101 - Distribution of demand scenario 3

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	20.0%	33.0%	20.0%	18.3%	20.0%	33.0%	20.0%	23.7%
1.b Southwest - Sant'Antioco	11.6	60.0%	34.0%	30.0%	1.6%	60.0%	34.0%	30.0%	1.8%
2 North - Carbonia Intermodal Centre	23	20.0%	33.0%	50.0%	80.1%	20.0%	33.0%	50.0%	74.5%
	0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	TOTAL DEMAND	1923	420	8875	813	2315	518	10547	984

Table 102 - Demand scenario 3

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	231	83	1065	89	278	103	1266	140
1.b Southwest - Sant'Antioco	11.6	692	86	1598	8	833	106	1898	11
2 North - Carbonia Intermodal Centre	23	231	83	2663	391	278	103	3164	440
	Total	1154	252	5325	488	1389	311	6328	591

Table 103 - Employment rates scenario 3

Bicycle	1
Motorcycles/scooters	1.2
Car	2
TPL	3.5

Table 104 - Estimated vehicles for Hub scenario 3

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	231	69	533	26	278	85	633	40
1.b Southwest - Sant'Antioco	11.6	692	71	799	2	833	88	949	3
2 North - Carbonia Intermodal Centre	23	231	69	1331	112	278	85	1582	126
	Total vehicles	1154	210	2663	139	1389	259	3164	169

Table 105 - Total vehicle distance (vei*km) scenario 3

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	7,291	2,190	16,828	806	8,777	2,699	19,997	1,262
1.b Southwest - Sant'Antioco	11.6	8,029	828	9,266	26	9,666	1,021	11,011	35
2 North - Carbonia Intermodal Centre	23	5,307	1,594	30,620	2,567	6,388	1,965	36,387	2,891
	Total vei*km	20,627	4,613	56,713	3,399	24,831	5,685	67,394	4,189

6.1 EXTERNAL IMPACTS SCENARIO 3

ROAD CONGESTION

Table 106 - Marginal cost of road congestion scenario 3

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	not applicable
Car	0.2
TPL	0.5

Data from Table A4_2, by rural area, type 'other roads', V/C (congestion) ratio 0,5 (lowest)

Table 107 - Road congestion scenario 3

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0	3,366	403	0	0	3,999	631
1.b Southwest - Sant'Antioco	11.6	0	0	1,853	13	0	0	2,202	18
2 North - Carbonia Intermodal Centre	23	0	0	6,124	1,283	0	0	7,277	1,446
	Total €	0	0	11,343	1,700	0	0	13,479	2,095
	Total impact [€]	13,042 €				15,574 €			

INCIDENTALITY

Table 108 - Marginal accident cost scenario 3

Half	Marginal Cost [€ * vej*km]
Bicycle	not applicable
Motorcycles/scooters	0.2
Car	0.2
TPL	not applicable

Data from Table A4_4, for "other non-urban road".

Table 109 - Incidentalility scenario 3

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	438	3366	0	0	540	3999	0
1.b Southwest - Sant'Antioco	11.6	0	166	1853	0	0	204	2202	0
2 North - Carbonia Intermodal Centre	23	0	319	6124	0	0	393	7277	0
	Total €	0	923	11343	0	0	1137	13479	0
	Total impact [€]	12,265 €				14,616 €			

POLLUTING EMISSIONS

Table 110 - Marginal cost pollutant emissions scenario 3

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0
Car	0
TPL	0.055

Data from table A4_6, by rural area. The column with average value has been considered. The marginal cost considered for "euro class" is an average between cars of class 1-4 and class 5-6).motorcycles are considered as passenger cars.

NB.The costs in table A4_6 are in cents, in the analysis they were considered in Euro, dividing the tabulated value by 100.

Half bus emissions (1 electric bus)

Table 111 - Pollutant emissions scenario 3

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motosc ooter	Car	TPL	Bike	Motosc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.0	0	22	0	0.0	0	35
1.b Southwest - Sant'Antioco	11.6	0	0.0	0	1	0	0.0	0	1
2 North - Carbonia Intermodal Centre	23	0	0.0	0	71	0	0.0	0	80
	Total €	0	0	0	93	0	0	0	115
	Total impact [€]				93 €				115 €

ACOUSTIC POLLUTION

Table 112 - Marginal cost of noise pollution scenario 3

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0.2
Car	0.1
TPL	0.45

Data from Table A4_10, by rural area, period "day", average traffic density "low".

NB the costs in table A4_6 are in € per 1000 vei*km, so the vehicles per km have been divided by 1000.

Electric vehicles by law must emit a background noise to be heard. Prudentially, it can be said that the coefficients are reduced by half compared to petrol cars.

Inq. Acoustic electric bus equivalent to electric vehicle (0.1). The marginal cost is an average between 0.1 and 0.8.

Table 113 - Noise pollution scenario 3

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.44	1.68	0.36	0	0.54	2.00	0.57
1.b Southwest - Sant'Antioco	11.6	0	0.17	0.93	0.01	0	0.20	1.10	0.02
2 North - Carbonia Intermodal Centre	23	0	0	3.06	1.15	0	0	3.64	1.30
	Total €	0.0	0.6	5.7	1.5	0.0	0.7	6.7	1.9
	Total impact [€]	7.8 €				9.4 €			

GLOBAL WARMING

Table 114 - Marginal cost Global warming scenario 3

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0
Car	0
TPL	0.053

Data from Table A4_13, by rural area. The column with average value has been considered. The marginal cost considered for "euro class" is an average between cars of class 1-4 and class 5-6).motorcycles are considered as passenger cars.

NB the costs in table A4_6 are in cents, in the analysis they were considered in Euro, dividing the tabulated value by 100.

Half of the total amount (1 electric bus).

Table 115 - Global warming scenario 3

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.00	0.00	2.37	0	0.00	0.00	3.71
1.b Southwest - Sant'Antioco	11.6	0	0.00	0.00	0.21	0	0.00	0.00	0.28
2 North - Carbonia Intermodal Centre	23	0	0.00	0.00	10.35	0	0.00	0.00	11.66
	Total €	0.0	0.0	0.0	12.9	0.0	0.0	0.0	15.6
	Total impact [€]	13 €				16 €			

6.2 OPERATING COSTS SCENARIO 3

Table 116 - Operating cost per half scenario 3

Half	Operating cost [€ * vei*km]
Bicycle	0.03
Motorcycles/scooters	0.1268
Car	0.3583
TPL	2

Motorbike/scooter car mileage costs, from ministerial tables and ACI tables. Vehicles-type used : Electric Smart . The only electric scooter listed

Renault Twizy life, which has a list price of about 7,000. It is estimated that the operating cost of the Niu electric scooter can be about half.

LPT cost - standard cost per km per urban/extrurban bus . 3€. Electric minibus cost: 1€. The average value between the two is used, as there are buses in circulation.

Table 117 - Operating cost scenario 3

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motor scooter	Car	TPL	Bike	Motor scooter	Car	TPL
1.a Southwest - Calasetta	31.6	219	277.72	6,029.33	1,611.96	263	342.27	7,164.87	2,524.98
1.b Southwest - Sant'Antioco	11.6	241	105.04	3,319.95	52.98	290	129.45	3,945.21	70.66
2 North - Carbonia Intermodal Centre	23	159	202.14	10,971.09	5,133.09	192	249.12	13,037.34	5,783.00
	Total €	219	277.72	6,029.33	1,611.96	263	342.27	7,164.87	2,524.98
	Total impact [€]	28,322 €				33,992 €			

6.3 CO2 PRODUCTION ON ROAD SCENARIO 3

Table 118 CO2 production by half scenario 3

Half	KG CO2 *km
Bicycle	0
Motorcycles/scooters	0
Car	0
TPL	0.069

Half CO2 production (1 electric bus)

Table 119 - CO2 production scenario 3

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motosc cooter	Car	TPL	Bike	Motosc cooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.00	0.00	27.81	0	0.00	0.00	43.56
1.b Southwest - Sant'Antioco	11.6	0	0.00	0.00	0.91	0	0.00	0.00	1.22
2 North - Carbonia Intermodal Centre	23	0	0.00	0.00	88.55	0	0.00	0.00	99.76
	Total CO2	0.0	0.0	0.0	117.3	0.0	0.0	0.0	144.5
	Total impact [kg CO2]	117.27				144.53			

6.4 SUMMARY SCENARIO 3

Table 120 - Summary of scenario 3

	Prudential user estimate	Optimistic user estimate
EXTERNAL IMPACTS	Cost [€]	
Road congestion	13,042 €	15,574 €
Incidentalities	12,265 €	14,616 €
Polluting emissions	93 €	115 €
Acoustic pollution	8 €	9 €
Global warming	13 €	16 €
	25,422 €	30,330 €
Operating costs	28,322 €	33,992 €
IMPACTS + OPERATING COSTS	53,744 €	64,321 €
	Kg CO2	
CO2 production	117.27	144.53

7. Scenario 4

Table 121 - Distribution of demand scenario 4

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	20.0%	33.0%	20.0%	18.3%	20.0%	33.0%	20.0%	23.7%
1.b Southwest - Sant'Antioco	11.6	60.0%	34.0%	30.0%	1.6%	60.0%	34.0%	30.0%	1.8%
2 North - Carbonia Intermodal Centre	23	20.0%	33.0%	50.0%	80.1%	20.0%	33.0%	50.0%	74.5%
	0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	TOTAL DEMAND	1923	420	8875	813	2315	518	10547	984

Table 122 - Demand scenario 4

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	231	83	1065	89	278	103	1266	140
1.b Southwest - Sant'Antioco	11.6	692	86	1598	8	833	106	1898	11
2 North - Carbonia Intermodal Centre	23	231	83	2663	391	278	103	3164	440
	Total	1154	252	5325	488	1389	311	6328	591

Table 123 - Employment rates scenario 4

Bicycle	1
Motorcycles/scooters	1.2
Car	2
TPL	3.5

Table 124 - Estimated vehicles for Hub scenario 4

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	231	69	533	26	278	85	633	40
1.b Southwest - Sant'Antioco	11.6	692	71	799	2	833	88	949	3
2 North - Carbonia Intermodal Centre	23	231	69	1331	112	278	85	1582	126
	Total vehicles	1154	210	2663	139	1389	259	3164	169

Table 125 - Total vehicle distance (vei*km) scenario 4

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	7,291	2,190	16,828	806	8,777	2,699	19,997	1,262
1.b Southwest - Sant'Antioco	11.6	8,029	828	9,266	26	9,666	1,021	11,011	35
2 North - Carbonia Intermodal Centre	23	5,307	1,594	30,620	2,567	6,388	1,965	36,387	2,891
	Total vei*km	20,627	4,613	56,713	3,399	24,831	5,685	67,394	4,189

7.1 EXTERNAL IMPACTS SCENARIO 4

ROAD CONGESTION

Table 126 - Marginal cost of road congestion scenario 4

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	not applicable
Car	0.2
TPL	0.5

Data from Table A4_2, by rural area, type 'other roads', V/C (congestion) ratio 0,5 (lowest)

Table 127 - Road congestion scenario 4

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31,6	0	0	3,366	403	0	0	3,999	631
1.b Southwest - Sant'Antioco	11,6	0	0	1,853	13	0	0	2,202	18
2 North - Carbonia Intermodal Centre	23	0	0	6,124	1,283	0	0	7,277	1,446
	Total €	0	0	11,343	1,700	0	0	13,479	2,095
	Total impact [€]	13,042 €				15,574 €			

INCIDENTALITY

Table 128 - Marginal accident cost scenario 4

Half	Marginal Cost [€ * vej*km]
Bicycle	not applicable
Motorcycles/scooters	0.2
Car	0.2
TPL	not applicable

Data from Table A4_4, for "other non-urban road".

Table 129 - Incidentalities scenario 4

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoc ooter	Car	TPL	Bike	Motoc ooter	Car	TPL
1.a Southwest - Calasetta	31,6	0	438	3366	0	0	540	3999	0
1.b Southwest - Sant'Antioco	11,6	0	166	1853	0	0	204	2202	0
2 North - Carbonia Intermodal Centre	23	0	319	6124	0	0	393	7277	0
	Total €	0	923	11343	0	0	1137	13479	0
	Total impact [€]	12,265 €				14,616 €			

POLLUTING EMISSIONS

Table 130 - Marginal cost of pollutant emissions scenario 4

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0
Car	0
TPL	0

Data from table A4_6, by rural area. The column with average value has been considered. The marginal cost considered for "euro class" is an average between cars of class 1-4 and class 5-6).motorcycles are considered as passenger cars.

NB.The costs in table A4_6 are in cents, in the analysis they were considered in Euro, dividing the tabulated value by 100.

Zero bus emissions (2 electric buses)

Table 131 - Pollutant emissions scenario 4

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motosc ooter	Car	TPL	Bike	Motosc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.0	0	0	0	0.0	0	0
1.b Southwest - Sant'Antioco	11.6	0	0.0	0	0	0	0.0	0	0
2 North - Carbonia Intermodal Centre	23	0	0.0	0	0	0	0.0	0	0
	Total €	0	0	0	0	0	0	0	0
	Total impact [€]	0 €				0 €			

ACOUSTIC POLLUTION

Table 132 - Marginal cost noise pollution scenario 4

Half	Marginal Cost [€ * vei*km]
Bicycle	not applicable
Motorcycles/scooters	0.2
Car	0.1
TPL	1

Data from Table A4_10, by rural area, period "day", average traffic density "low".

NB the costs in table A4_6 are in € per 1000 vei*km, so the vehicles per km have been divided by 1000.

Electric vehicles by law must emit a background noise to be heard. Prudentially, it can be said that the coefficients are reduced by half compared to petrol cars.

Inq. Acoustic electric bus equivalent to electric vehicle (0.1).

Table 133 - Noise pollution scenario 4

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motorc ooter	Car	TPL	Bike	Motorc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	Bicycl e	Motorc ycles/sc ooters	Car	TPL	Bicycle	Motorc ycles/sc ooters	Car	TPL
1.b Southwest - Sant'Antioco	11,6	0	0.44	1.68	0.08	0	0.54	2.00	0.13
2 North - Carbonia Intermodal Centre	23	0	0.17	0.93	0.00	0	0.20	1.10	0.00
	Total €	0	0	3.06	0.26	0	0	3.64	0.29
	Total impact [€]	6.6 €				7.9 €			

GLOBAL WARMING

Table 134 - Marginal cost Global warming scenario 4

Half	Marginal Cost [€ * vej*km]
Bicycle	not applicable
Motorcycles/scooters	0
Car	0
TPL	0

Data from Table A4_13, by rural area. The column with average value has been considered. The marginal cost considered for "euro class" is an average between cars of class 1-4 and class 5-6).motorcycles are considered as passenger cars.

NB the costs in table A4_6 are in cents, in the analysis they were considered in Euro, dividing the tabulated value by 100.

Global zero charge(2 electric buses).

Table 135 - Global warming scenario 4

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motorc ooter	Car	TPL	Bike	Motorc ooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.00	0.00	0	0	0.00	0.00	0
1.b Southwest - Sant'Antioco	11.6	0	0.00	0.00	0	0	0.00	0.00	0
2 North - Carbonia Intermodal Centre	23	0	0.00	0.00	0	0	0.00	0.00	0
	Total €	0.0	0.0	0.0	0	0.0	0.0	0.0	0
	Total impact [€]	0 €				0 €			

7.2 OPERATING COSTS SCENARIO 4

Table 136 - Operating cost (in euros) by half scenario 4

Half	Operating cost [€ * vel*km]
Bicycle	0.03
Motorcycles/scooters	0.1268
Car	0.3583
TPL	1

Motorbike/scooter car mileage costs, from ministerial tables and ACI tables. Vehicles-type used : Electric Smart . The only electric scooter listed

Renault Twizy life, which has a list price of about 7,000. It is estimated that the operating cost of the Niu electric scooter can be about half.

TPL cost - electric minibus (1 €).

Table 137 - Operating costs (in euros) scenario 4

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motor scooter	Car	TPL	Bike	Motor scooter	Car	TPL
1.a Southwest - Calasetta	31,6	219	277.72	6,029.33	805.98	263	342.27	7,164.87	1,262.49
1.b Southwest - Sant'Antioco	11,6	241	105.04	3,319.95	26.49	290	129.45	3,945.21	35.33
2 North - Carbonia Intermodal Centre	23	159	202.14	10,971.09	2.566.55	192	249.12	13,037.34	2,891.50
	Total €	618,8	584.9	20320.4	3399.0	744.9	720.8	24147.4	4189.3
	Total impact [€]	24,923 €				29,803 €			

7.3 CO2 PRODUCTION ON ROAD SCENARIO 4

Table 138 CO2 production by half scenario 4

Half	KG CO2 *km
Bicycle	0
Motorcycles/scooters	0
Car	0
TPL	0

Table 139 - CO2 production scenario 4

Hub/Municipalities	Distance Km	Total demand (prudential)				Total demand (optimistic)			
		Bike	Motoscooter	Car	TPL	Bike	Motoscooter	Car	TPL
1.a Southwest - Calasetta	31.6	0	0.00	0.00	0	0	0.00	0.00	0
1.b Southwest - Sant'Antioco	11.6	0	0.00	0.00	0	0	0.00	0.00	0
2 North - Carbonia Intermodal Centre	23	0	0.00	0.00	0	0	0.00	0.00	0
	Total CO2	0.0	0.0	0.0	0	0.0	0.0	0.0	0
	Total impact [kg CO2]	0				0			

7.4 SUMMARY SCENARIO 4

Table 140 - Summary scenario 4

	Prudential user estimate	Optimistic user estimate
EXTERNAL IMPACTS	Cost [€]	
Road congestion	13,042 €	15,574 €
Incidentalities	12,265 €	14,616 €
Polluting emissions	0 €	0 €
Acoustic pollution	7 €	8 €
Global warming	0 €	16 €
	25,314 €	30,197 €
Operating costs	24,923 €	29,803 €
IMPACTS + OPERATING COSTS	50,237 €	60,000 €
	Kg CO2	
CO2 production	0	0

8. Impact Comparison - All Scenarios

Table 141 - Prudential demand estimate, Scenarios 0 and 1 with 100% demand (costs in euros)

		Scenario				
		0	1	2	3	4
External impacts	Road congestion	25,483 €	25,483 €	12,532 €	13,042 €	13,042 €
	Incidentality	20,721 €	20,721 €	12,265 €	12,265 €	12,265 €
	Polluting emissions	856 €	545 €	131 €	93 €	0 €
	Acoustic pollution	29 €	18 €	8 €	8 €	7 €
	Global warming	205 €	108 €	26 €	13 €	0 €
	Total Impacts	47,294 €	46,875 €	24,962 €	25,422 €	25,314 €
	Operating costs	78,148 €	66,654 €	28,662 €	28,322 €	24,923 €
	TOTAL COSTS	125,442 €	113,528 €	53,624 €	53,744 €	50,237 €
	Production kg CO2	12.968	684	164	117	0

Table 142 Optimistic demand estimate, Scenarios 0 and 1 with 100% demand (costs in euros)

		Scenario				
		0	1	2	3	4
External impacts	Road congestion	30,289 €	30,289 €	14,945 €	15,574 €	15,574 €
	Incidentality	24,448 €	24,448 €	14,616 €	14,616 €	14,616 €
	Polluting emissions	1,035 €	672 €	161 €	115 €	0 €
	Acoustic pollution	34 €	22 €	10 €	9 €	8 €
	Global warming	249 €	130 €	31 €	16 €	0 €
	Total Impacts	56,056 €	55,562 €	29,763 €	30,330 €	30,197 €
	Operating costs	93,716 €	80,167 €	34,411 €	33,992 €	29,803 €
	TOTAL COSTS	149,772 €	135,730 €	64,174 €	64,321 €	60,000 €
	Production kg CO2	15,328	843	202	145	0

Table 143 - Prudential demand estimate, all scenarios with 60% demand (costs in euros)

		Scenario				
		0	1	2	3	4
External impacts	Road congestion	15,290 €	15,290 €	12,532 €	13,042 €	13,042 €
	Incidentality	12,433 €	12,433 €	12,265 €	12,265 €	12,265 €
	Polluting emissions	514 €	327 €	131 €	93 €	0 €
	Acoustic pollution	17 €	11 €	8 €	8 €	7 €
	Global warming	123 €	65 €	26 €	13 €	0 €
	Total Impacts	28,376 €	28,125 €	24,962 €	25,422 €	25,314 €
	Operating costs	46,889 €	39,992 €	28,662 €	28,322 €	24,923 €
	TOTAL COSTS	75,265 €	68,117 €	53,624 €	53,744 €	50,237 €
	Production kg CO2	7,781	410	164	117	0

Table 144 Optimistic demand estimate, all scenarios with 60 % demand (costs in euros)

		Scenario				
		0	1	2	3	4
External impacts	Road congestion	18,174 €	18,174 €	14,945 €	15,574 €	15,574 €
	Incidentality	14,669 €	14,669 €	14,616 €	14,616 €	14,616 €
	Polluting emissions	621 €	403 €	161 €	115 €	0 €
	Acoustic pollution	21 €	13 €	10 €	9 €	8 €
	Global warming	150 €	78 €	31 €	16 €	0 €
	Total Impacts	33,634 €	33,337 €	29,763 €	30,330 €	30,197 €
	Operating costs	56,229 €	48,100 €	34,411 €	33,992 €	29,803 €
	TOTAL COSTS	89,863 €	81,438 €	64,174 €	64,321 €	60,000 €
	Production kg CO2	9,197	506	164	117	0

9. Cost of fleet management scenario 2

Table 145 - Average annual distance per vehicle and energy cost (in euros) scenario 2

	total km		number of vehicles	prudential [km]	optimistic [km]	Energy cost per km [€]	prudential	Optimistic
	prudential	Optimistic						
Vehicles	56,713	67,394	14	4051	4814	0.05	203 €	241 €
Scooter	4,613	5,685	6	769	947		38 €	47 €
Bicycles	20,627	24,831	34	573	690		0 €	0 €

Table 146 - Fixed costs (in euros) per vehicle - year scenario 2

	Insurance Cost	Battery rental	Maintenance cost	Total
Smart	300 €	1,000 €	160 €	1,460 €
Microcar	200 €	800 €	100 €	1,100 €
Scooter	150 €	0	50 €	200 €
Bicycles	60 €	0	30 €	90 €

Table 147 - Overview of costs (in euros) vehicle fleet scenario 2

Type	Nr vehicles	Insurance	Battery rental	Maintenance	Energy		Staff	General costs
					Prudent	Optimistic		
Smart	6	1,800 €	6,000 €	960 €	1,215 €	1,444 €	50,000 €	20,000 €
Microcar	8	1,600 €	6,400 €	800 €	1,620 €	1,926 €		
Scooter	6	900 €	0 €	300 €	231 €	284 €		
Bike	34	2,040 €	0 €	1,020 €	0 €	0 €		
Total		6,340 €	12,400 €	3,080 €	3,066 €	3,654 €	50,000 €	20,000 €

Annual costs	prudential estimate	94,886 €
	optimistic estimate	95,474 €

10. Cost of fleet management scenario 3

Table 148 - Average annual distance per vehicle and energy cost (in euros) scenario 3

	total km		number of vehicles	prudential [km]	optimistic [km]	Energy cost per km [€]	prudential	Optimistic
	prudential	Optimistic						
Vehicles	56,713	67,394	11	5156	6127	0.05	258 €	306 €
Scooter	4,613	5,685	6	769	947		38 €	47 €
Minibus	1,190	1,466	1	1190	1466		59 €	73 €
Bicycles	20,627	24,831	34	573	690		0 €	0 €

Table 149 - Fixed costs (in euros) per vehicle - year scenario 3

	Insurance Cost	Battery rental	Maintenance cost	Total
Smart	300 €	1,000 €	160 €	1,460 €
Microcar	200 €	800 €	100 €	1,100 €
Minibus	600	1200 €	200 €	2,000 €
Scooter	150 €	0	50 €	200 €
Bicycles	60 €	0	30 €	90 €

Table 150 - Overview of costs (in euros) vehicle fleet scenario 3

Type	Nr vehicles	Insurance	Battery rental	Maintenance	Energy		Staff	General costs
					Prudent	Optimistic		
Smart	5	1,500 €	5,000 €	800 €	1,289 €	1,532 €	50,000 €	20,000 €
Microcar	6	1,200 €	4,800 €	600 €	1,547 €	1,838 €		
Minibus	1	600 €	1,200 €	200 €	59 €	73 €		
Scooter	6	900 €	0 €	300 €	231 €	284 €		
Bike	34	2,040 €	0 €	1,020 €	0 €	0 €		
Total		6,240 €	11,000 €	2,920 €	3,126 €	3,727 €	50,000 €	20,000 €

Annual costs	prudential estimate	93,286 €
	optimistic estimate	93,887 €

11. Cost of fleet management scenario 4

Table 151 - Average annual distance per vehicle and cost (in euros) energy scenario 4

	total km		number of vehicles	prudenti al [km]	optimistic [km]	Energy cost per km [€]	prudenti al	Optimistic
	prudenti al	Optimistic						
Vehicles	56,713	67,394	8	7089	8424	0.05	354 €	421 €
Scooter	4,613	5,685	6	769	947		38 €	47 €
Minibus	2,379	2,933	2	1190	1466		59 €	73 €
Bicycles	20,627	24,831	36	573	690		0 €	0 €

Table 152 - Fixed costs (in euros) per vehicle - year scenario 4

	Insurance Cost	Battery rental	Maintenance cost	Total
Smart	300 €	1,000 €	160 €	1,460 €
Microcar	200 €	800 €	100 €	1,100 €
Minibus	600 €	1200 €	200 €	2,000 €
Scooter	150 €	0	50 €	200 €
Bicycles	60 €	0	30 €	90 €

Table 153 - Summary of costs (in euros) fleet scenario 4

Type	Nr vehicles	Insurance	Battery rental	Maintenance	Energy		Staff	General costs
					Prudent	Optimistic		
Smart	4	1,200 €	4,000 €	640 €	1,418 €	1,685 €	50,000 €	20,000 €
Microcar	4	800 €	3,200 €	400 €	1,418 €	1,685 €		
Minibus	2	1,200 €	2,400 €	400 €	119 €	147 €		
Scooter	6	900 €	0 €	300 €	231 €	284 €		
Bike	34	2,040 €	0 €	1,020 €	0 €	0 €		
Total		6,140 €	9,600 €	2,760 €	3,185 €	3,801 €	50,000 €	20,000 €

Annual costs	prudenti al estimate	91,685 €
	optimistic estimate	92,301 €

12. Comparison of fleet management costs scenarios 2, 3, 4

Table 154 - Comparison of costs (in euros) fleet management, prudential demand

	Scenario		
	2	3	4
Insurance	6,340 €	6,240 €	6,140 €
Battery rental	12,400 €	11,000 €	9,600 €
Maintenance	3,080 €	2,920 €	2,760 €
Energy	3,066 €	3,126 €	3,185 €
Total variable costs	24,886 €	23,286 €	21,685 €
Staff	50,000 €	50,000 €	50,000 €
General costs	20,000 €	20,000 €	20,000 €
Total fixed costs	70,000 €	70,000 €	70,000 €
Total	94,886 €	93,286 €	91,685 €

Table 155 - Comparison of costs (in euros) fleet management, optimistic demand

	Scenario		
	2	3	4
Insurance	6,340 €	6,240 €	6,140 €
Battery rental	12,400 €	11,000 €	9,600 €
Maintenance	3,080 €	2,920 €	2,760 €
Energy	3,654 €	3,727 €	3,801 €
Total variable costs	25,474 €	23,887 €	22,301 €
Staff	50,000 €	50,000 €	50,000 €
General costs	20,000 €	20,000 €	20,000 €
Total fixed costs	70,000 €	70,000 €	70,000 €
Total	95,474 €	93,887 €	92,301 €

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