

Caorle, SC 17 September 2026

SUMMA - Municipality of Pescara

WP2| PILOT ACTIONS FOR BETTER MULTIMODAL
CONNECTIVITY

Deliverable 2.2 “Study and legal framework analysis of Single
Ticket System” .

Scope and delivery

WHAT WAS REQUIRED

- Activity 2.2 «Single Ticket System» — Application Form v4.0 of 11 March 2026
- Deliverable D.2.2.1, assigned to the Municipality of Pescara, project partner PP2
- The deliverable states that the system will not be built within the project life cycle: the object is the feasibility of the integrated ticketing component

THE PERIMETER

- Seven pilot territories, two countries: Pescara, Caorle, Comunità Riviera Friulana, Split, Zadar, Poreč, Labin
- 512,292 inhabitants in total
- The sea crossing between the two shores is outside the perimeter: the object is access to the hubs and the urban and interurban travel connected to them

WHAT WAS PRODUCED

- A feasibility study and the calculation models that accompany it
- A demand model, a financial model, a cost-benefit model, a scenario and risk model
- The models are delivered working, with their inputs in the open

Three framing choices, stated as choices

A measurement perimeter

The Pescara node for the cost-benefit analysis: costs and benefits share the same territorial scope and the same demand base. The seven territories are treated separately, as a projection.

A measured demand base

5,700,000 trips a year in the Municipality of Pescara, from the municipal questionnaire of the ISTAT «Environmental data in cities» survey. It is the count of trips the municipality reports in the questionnaire, not a modal share derived from a model.

An explicit criterion of worth

Economic net present value over twenty years at a 3% social discount rate, expressed as a threshold.

How the problem has been solved elsewhere

Eight integrated systems: scale, fare structure, validation technology, governance.

THE SYSTEM - THE SCALE	FARE STRUCTURE	VALIDATION TECHNOLOGY	GOVERNANCE
UnicoCampania - since 2003 551 municipalities, 13 operators, catchment of nearly 8 m	distance bands; time-based tickets and passes integrated across bus, metro, funiculars and rail	contactless smart card (TIC) for pass holders	dedicated consortium handling revenue allocation; institutional agreement between Region, Province, City and operators
BIP Piemonte regional	urban, interurban and regional passes on a single medium; integrated zonal products	account-based: the card is the medium, entitlements verified in the cloud at validation	regional service centre for revenue clearing
AltoAdige / Südtirol Pass provincial	per-kilometre fare that decreases with use; monthly spending caps; €250/year flat option	check-in on card or app; the system charges the best available fare	autonomous province; 1-, 3- and 7-day Mobicard for visitors
Oyster - London, since 2003 metropolitan area	stored value with a daily fare cap; Travelcard on the same card	contactless smart card; since 2014 also bank card or smartphone, open-loop EMV	TfL, single coordinating authority across all modes
Navigo - Île-de-France, since 2001 urban region	concentric zones, now a single fare on monthly passes; Découverte and Easy for non-residents	Calypso RFID/NFC standard; since 2019 dematerialised on smartphone and smartwatch	Île-de-France Mobilités; the card also acts as an ID for adjacent services
SwissPass - since 2015 national	not a ticket: a container onto which national and regional community passes are loaded	RFID chip on a personal photo-bearing medium, read at inspection	Alliance SwissPass: shared back end, regional fare communities kept distinct
HVV Hamburg - since 1965 catchment of ~3.6 m inhabitants	common fare across dozens of operators; bus, harbour ferries, U-Bahn, S-Bahn, A-Bahn and regional rail	—	three tiers: public authorities, HVV GmbH as coordinating company, transport operators
Czech IDS - PID Prague, IDS JMK Brno city and surrounding region	zonal scheme; one ticket valid on every service regardless of operator	—	a public body plans timetables and fares (ROPID in Prague), operators run the service

FOUR RECURRING ELEMENTS

Spatial fare unification — zones or distance bands, not point-to-point fares

Facilitation policies — spending caps, integrated carnets, interchange discounts

Interoperable technologies — smart cards or digital accounts across the whole served area

Stable institutional coordination — a consortium or a dedicated agency

How the border has been crossed: three cases

Integrated travel tickets that cross a state border, and the conditions under which they exist.

Euregio Ticket Maas–Rhein

GERMANY · NETHERLANDS · BELGIUM

- Day pass valid across the whole border area between the three countries
- Unlimited travel on regional bus and rail in all three nations
- Stable institutional agreement between the cross-border transport authorities

flat daily fare of about €19, with group and family options

Euregio Family Pass

TYROL · SOUTH TYROL · TRENTINO

- Land Tirol and the autonomous Provinces of Bolzano and Trento: three regions, two states
- Concessions on local public transport services
- A network of ancillary benefits: museums, attractions, tourist facilities

mobility tied to the territory's tourism policies

E-TRASPORTI

INTERREG ALCOTRA · ITALY–FRANCE

- Shared e-ticketing system between neighbouring regions
- Interoperable technologies and open standards
- Progressive roll-out, from local to cross-border

cooperation between public authorities and operators to overcome regulatory differences

THE THREE CONDITIONS THESE CASES HAVE IN COMMON

Institutional agreements

that assign roles and responsibilities among the authorities involved

Open technology standards

to overcome regulatory and operational differences between systems

Gradual implementation

pilot corridors before extension to the whole area

THE DIFFERENCE

Between the two shores there is the sea

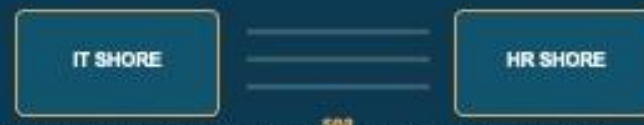
THE DOCUMENTED CROSS-BORDER CASES



The border is crossed by bus or by train: road and rail services on a continuous network.

- 1 The benefit was not estimated on traffic crossing the border: no comparable case exists from which to derive it.

OUR CASE



None of the documented cross-border cases rests on this modal and geographical configuration.

- 2 The benefit was measured where demand exists and is measured: at the node. The quantity chosen — the friction a user bears in planning and buying a journey that involves more than one operator — is the same in all seven territories, is independent of whether the border is crossed by sea or by land, and is the only one the European cases allow us to parameterise.

The calculation does not rest on a cross-border precedent, because no comparable one exists. It rests on a quantity measured at the node, which does not change nature on crossing the border.

The measurement node

The cost-benefit analysis is carried out on the Pescara node. The reason is measurability.

The architecture of the system already exists, at reduced scale

- A 90-minute integrated time ticket at €1.40, since 2024, valid on all urban and suburban services of the Pescara–Chieti area, alongside an integrated day ticket at €3.60
- An integrated urban system across the metropolitan area covering several operators, run by TUA
- The airport connected to the railway station by a dedicated service, with timetables tied to flight times
- MaaS4Abruzzo, of which the Municipality of Pescara is a partner, which puts public transport and sharing services on a single digital booking and payment channel

Where the perimeter stops

- Integration stops at the metropolitan area and one corridor
- There is no cross-border layer
- The sea crossing between the two shores is outside the perimeter of the analysis

On Pescara the numerator and the denominator share the same territorial perimeter and the same recorded demand base.

It is the only one of the seven territories in which the missing piece — fare and information integration — can be isolated from everything else, and therefore measured. In the other six it would have to be measured together with works that happen anyway, and the result would be attributed to a component that did not produce it alone.

The assumptions the calculation rests on

THE ASSUMPTION	THE VALUE ASSUMED	WHERE IT COMES FROM	WHAT HAPPENS IF IT CHANGES
Adoption curve parameters	$p = 0.03$ - $q = 0.38$ $M = 128,100$ users	Mean values observed across empirical applications of the Bass model in the Sultan, Farley and Lehmann (1990) meta-analysis. The more mature European MaaS cases are a plausibility check and not a source: none of them publishes the two parameters.	Low maturity: 22,500 users by 2030, -47%. High maturity: 59,400, +40%.
Planning time saved	60 seconds per planned trip	Federal Transit Administration, FTA Report No. 0175: over 332 respondents the mean planning time for a bus trip falls from 5 to 4 minutes, significant at 5% with $P = 0.02$. The model adopts 60 seconds: it is the one-minute reduction the source measures.	In the low scenario — 30 seconds of planning and 5 at interchange, with low shares — the net benefit turns negative: -€1,154,985.
The share of planned trips	26% on systematic travel 98% on non-habitual travel	Declared assumption. The weight of the two segments, 60% and 40%, is indeed derived from the mix of tickets sold and not from a direct user survey.	Sets the split of the benefit between the two segments: 21% to systematic commuting, 79% to non-habitual travel.
The value of time	€9.382/h systematic €12.481/h non-habitual	Italian Ministry of Infrastructure and Transport — operational guidelines for mass rapid transit, decree of 21 October 2022, indices V001 and V003: €7.823 and €10.430/h at 2016 prices, restated at constant 2025 prices with the ISTAT FOI(n) coefficient 1.189.	Estates the time benefit linearly: the time benefit is 65,331,488 of the 65,511,544 present value of benefits.
The effect on rail	no reduction attributed to the rail segment	The report's prose says the effect on rail is significant; the table in the same report gives $P = 0.06$. The model follows the table.	Attributing to rail the reduction measured on bus would increase the time benefit.
The carbon price path beyond 2035	extended at +€28/t a year	Table 4 of the 2021-2027 Vademecum for the points at 2028, 2027, 2030 and 2035, at 2016 prices restated to 2025 prices with the coefficient 1.215. Beyond 2035 the source table advances by €27/t and the model by 28.	The gap grows from €18 in 2036 to €106 in 2045: under 0.1% of the present value of benefits.
The discount rate and the horizon	3% real over 20 years, 2026-2045 4% real over 10 years, 2026-2035	The 3% is the social rate of European practice for the socio-economic analysis. The 4% of the financial analysis is declared as a prudential national proxy: the 2021-2027 cycle sets no reference financial discount rate.	The internal rate of return of the financial analysis does not depend on the discount rate.

From eighteen documents to one threshold

18

DOCUMENTS, EACH WITH THE BODY THAT PUBLISHES IT

These are the documents cited as the origin of a value that enters the model.
There are no figures here: the figures begin below.

METHOD AND SHADOW PRICES

Economic Appraisal Vademecum 2021-2027 — DG REGIO
Operational guidelines for mass rapid transit — Italy, Ministry
of Infrastructure and Transport
National set of unit parameters — Italy, Ministry of
Infrastructure and Transport
Autonomous Province of Trento, resolution 1550/2022

TECHNICAL LITERATURE

Federal Transit Administration — FTA Report No. 0175
Yap and Goh (2022)
TRL Report 593
Wardman (2004)
Sellen, Fatoy and Lehmann (1990)

OFFICIAL STATISTICS

ISTAT — «Environmental data in cities»
ISTAT — permanent population census
ISTAT — movements of customers in accommodation
establishments
ISTAT — FDI(yr) index, restatement coefficients
DZS — Popis 2021

THE TERRITORY

Operating data supplied by the project partners
Official TUV fare system
PLMIS of the Municipality of Pescara
Application Form v4.0

THE PARAMETERS — EVERY VALUE CARRIES ITS OWN ORIGIN

trip base: 5,760,000/year

the two populations: 68% · 40%

interchange shares: 25% · 12%

planning shares: 20% · 98%

seconds saved: 5 s · 60 s

values of time: 9.382 · 12.401 €/h

adoption curve: p 0.03 · q 0.38 · M 129,160

carbon price: 182 → 393 €/2016t

unit externalities: car and bus, €/km

costs: CAPEX €524,900 · OPEX €129,408/yr

discount and horizon: 3% real · 25 years

Eighteen values do not come from a document and are declared as assumptions — the main ones are in the register of assumptions. Three of them declare that they have no primary source: the 5 seconds of the second transaction, the operating cost per vehicle-kilometre and the communication campaigns.

34.41

seconds

of planning per planned trip, below which
the net benefit falls to zero. The model
adopts 60.

economic net present value

+2,118,743 €

Eighteen documents at the top. Eleven parameters in the middle. One threshold at the bottom. Every parameter points back to the line of the document it comes from, or to the entry in the register of assumptions.

Demand: the curve and its parameters

The Bass diffusion model describes adoption through two channels: independent adoption and social imitation.

$$F(t) = (1 - e^{-(p+q) \cdot t}) / (1 + (q/p) \cdot e^{-(p+q) \cdot t})$$

$$N(t) = M \cdot F(t)$$

p coefficient of innovation · q coefficient of imitation · M potential market · t years from 2025

$M = 128,100$ users, 25% of the 512,292 inhabitants of the seven territories — the product gives 128,073, rounded to the nearest hundred. The share incorporates digital penetration and propensity to adopt, and is not applied to a separately estimated sub-population.

The calculation, done once — at 2030, $t = 5$

$$p + q = 0.41 \quad q/p = 12.6667$$

$$e^{-0.41 \cdot 5} = e^{-2.05} = 0.128735$$

$$F(5) = (1 - 0.128735) / (1 + 12.6667 \times 0.128735) = 0.331200$$

$$N(5) = 128,100 \times 0.331200 = 42,427 \text{ users}$$

Where the parameters come from

$p = 0.03$ and $q = 0.38$ are the mean values observed across empirical applications of the Bass model in the Sultan, Farley and Lehmann (1990) meta-analysis. Calibrating on the Adriatic case would require an adoption time series that does not exist, because the service does not exist.

The more mature European MaaS cases — Whim Helsinki, UbiGo Göteborg, MaaS4Italy — are cited as a plausibility check and not as a source: none of them publishes the two parameters.

Parameter sensitivity · users by 2030

low maturity	$p = 0.02 \cdot q = 0.25$	~22,500	-47%
case adopted	$p = 0.03 \cdot q = 0.38$	42,427	8.3% of the population
high maturity	$p = 0.04 \cdot q = 0.45$	~59,400	+40%

The benefit: the two populations and the formula

The time saving is made of two items — the second transaction at interchange and journey planning — across two populations that behave differently.

The form of the calculation is not proper to this study: it is the time benefit of transport cost-benefit analysis — trip volume times time saved per trip — applied under the incremental with-vs-without principle of the Economic Appraisal Vademecum 2021-2027. What falls is generalised travel time, and the reduction is multiplied by the number of trips.

Systematic trips

60% of trips

3,420,000 trips/year

$$0.25 \times 5 \text{ s} + 0.20 \times 60 \text{ s}$$

$$= 13.25 \text{ s}$$

saved per trip

value of time

9.302 €/h

€0.0342 per trip

Non-habitual and tourist trips

40% of trips

2,280,000 trips/year

$$0.12 \times 5 \text{ s} + 0.90 \times 60 \text{ s}$$

$$= 54.6 \text{ s}$$

saved per trip

value of time

12.401 €/h

€0.1881 per trip

ANNUAL TIME BENEFIT AT STEADY STATE

545,919 €

Weighted mean: 29.79 seconds per trip, that is 0.4965 minutes.

This is the quantity that transfers to the other territories.

Where the benefit concentrates

The unit benefit of the occasional and tourist segment is 5.5 times that of the commuter: 79% of the time benefit, measured in value, concentrates on non-habitual travel, against 21% for systematic commuting. In seconds saved the split is 73 to 27: the distance between the two readings is the different value of time of the two segments.

Operational consequence. The design priority for the service is the experience of those travelling without a settled routine, not the commuter's season ticket.

From the annual benefit to the result

The time benefit of €545,919 is an annual flow at steady state. The result is a present value over twenty years. Between the two there are five items and two discountings.

+	Time saved by public transport users	5,238,495 €	over 20 years at 3%, with the adoption ramp: the benefit is not full from the first year
+	Surplus of generated demand	92,992 €	rule of half, on monetisable minutes only
+	CO ₂ emissions avoided from private traffic	225,213 €	shadow price of carbon
+	Air pollution, noise and accidents avoided	69,080 €	per vehicle-kilometre avoided
-	Dis-benefits of the additional service	114,236 €	emissions of the extra runs required by the new demand
=	PRESENT VALUE OF BENEFITS	5,511,544 €	of which 96.7% time and 3.3% not externalities
-	Present value of costs	3,392,802 €	investment and operation, with activation ramp
=	ECONOMIC NET PRESENT VALUE	+2,118,743 €	2025-2045, 3% real, constant 2025 prices

The threshold. The net benefit falls to zero if the planning saving drops to 34.41 seconds per planned trip. The model adopts 60. The distance between the two is the margin.

The five items sum to €5,511,544; the difference between the two present values gives €2,118,742 against the €2,118,743 adopted, and it is the rounding to the euro. The time saved by users already present (€5,238,495) and the surplus of generated demand (€92,992) are the two components that elsewhere appear aggregated in a single value.

Result and sensitivity

The result in its native form is a threshold. Beside it, the range within which it holds.

THE RESULT, IN THE FORM IN WHICH IT IS CALCULATED

34.41

seconds of planning
per planned trip

It is the saving at which the intervention breaks even economically, on a base of 48.00% of trips — 2,736,000 trips a year out of 5,700,000. The value adopted in the model is 60 seconds.

Present value of benefits

5,511,544 €

Present value of costs

3,392,802 €

Economic net present value

+2,118,743 €

Margins of tolerance. The economic net present value falls to zero if costs rise by 62.45%, or if benefits fall by 38.44%. The ratio of present value of benefits to present value of costs is 1.62, and it is calculated on the Pescara node alone: widening the perimeter of endogenous items — clearing and fees on the whole digital revenue rather than on interchange trips only — it falls to 0.94.

Sensitivity analysis, in economic net present value

Base	3% real over 20 years; 5 s at interchange and 60 s of planning	+2,118,743 €
Time — low case	3 s and 30 s; low interchange and planning shares	-1,154,988 €
Time — high case	15 s and 180 s; high shares	+16,967,940 €
Total costs	-20% / +60% on the present value of costs	+2,797,303 € / +422,342 €
Additional supply required	30% / 0% of induced demand	+604,874 € / +2,875,677 €
Extended perimeter of endogenous items	clearing and fees on the whole digital revenue	-363,854 €
Combined pessimistic / optimistic	all adverse assumptions / all favourable ones	-1,841,769 € / +20,178,717 €

Incremental with/without socio-economic analysis, horizon 2025–2045, social discount rate of 3% real, constant 2025 prices, perimeter of the Pescara node. The values of the financial analysis — horizon 2025–2035 at 4% real — constitute, for the risk analysis, the optimistic scenario, and appear beside that scenario.

How this calculation is reproduced

The unit effect transfers; the monetary value does not.

The transfer, step by step

unit effect at steady state 8.4965 minutes per trip
base of the measured areas ~26.4 million trips/year
Pescara 5,788,888 • Split 16,881,815 • Zadar 4,644,000
hours saved ~218,788 hours/year
Italian component 47,168 • Croatian component 171,586
transferability factor 0.83 $47,168 + 171,586 \times 0.83$
total ~189,508 hours/year

The two transfer rules

- The 0.83 factor applies to the foreign component alone. The Italian component enters in full.
- For the foreign territories the quantity is expressed in hours and not in euro, because the value of time is not transferable.

The lever is seasonally, and it runs opposite ways between the territories: Croatia concentrates 56.2% of its overnight stays in July and August, Pescara 26.8%. The same ticket performs differently in two different places.

THE SEVEN TERRITORIES — WHERE THE CALCULATION IS DONE, AND WHERE THE BASE MUST BE ENTERED

ITALIAN SHORE

Comunità Riviera Friulana

Caorle

Greater Pescara

CROATIAN SHORE

Poreč

Labin

Zadar

Split

SEA

base recorded — the calculation is done (3)

base to be entered (4)

For Caorle, Comunità Riviera Friulana, Poreč and Labin no series of passengers carried is available. The sheets for these four do not show a result: they show what is needed to obtain one.

QR
to be added

replicability
page

A schematic, not a map: the territories are ordered north to south on the two shores; distance on the figure is not a real distance.

WHAT A PARTNER NEEDS IN ORDER TO REPRODUCE THE CALCULATION

- passengers carried per year, or population and tourist overnight stays in accommodation establishments
- the split of trips between systematic and non-habitual, from the mix of tickets sold
- the share of trips involving an interchange

Overnight stays: TITAT survey on movements of customers in accommodation establishments, all establishments, by municipality of residence, 2004

- the national value of time, for anyone expressing the result in euro
- incremental platform and operating costs
- the discount rate and horizon of their own national framework

D.2.2.1 · DELIVERY

What remains with the partners

The feasibility study

The complete document, with sources cited by body, title and date, and the assumptions declared item by item.

The calculation models

The demand model, the financial model, the cost-benefit model and the scenario and risk model, delivered working and with their inputs in the open.

The tool for redoing the calculation

The two-panel simulator: change the seconds saved, the share of planned trips and the demand base, and read the threshold.

The register of sources

The index of primary sources, with the originating document for every quantity adopted.

Three of the seven territories have a recorded demand base and the calculation is done. For the other four the calculation is set up and awaits the passengers-carried figure.



Study and analysis of the legal framework for creating a Single Ticket system

1. Review and analysis of supranational, national and regional legislation on intermodal passenger mobility
2. Review and analysis of administrative measures and other relevant comparable experiences in the area
3. Identification of the main legal issues raised by introducing a Single Ticket system
4. Preparation of non-binding recommendations, where appropriate, in light of the relevant local context



Città di Pescara
Medaglia d'oro al Merito Civile



Fabriano d'Annunzio



Evolution of the EU legal framework

The evolution of EU legislation strengthens the role of integrated ticketing.

Key developments include:

- proposed Regulation on passenger rights in multimodal journeys;
- development of Mobility as a Service (MaaS) platforms;
- interoperability of digital systems;
- consistent passenger protection;
- cross-border integration of fare systems.

The SUMMA project anticipates several directions currently pursued by the European Union.



National framework

In Italy, the system is supported by an already favourable regulatory framework.

Main references:

- Legislative Decree No. 201/2022 on local public services;
- Ministerial Decree No. 255/2016 on interoperable electronic ticketing;
- national technical standards;
- integration of transport systems and electronic validation of travel tickets.

Regional framework (Abruzzo)

Regional legislation has long promoted modal and fare integration.

In particular:

- Regional Law No. 152/1998;
- Integrated Regional Transport Plan (PRIT 2035);
- Three-Year Services Programme;
- development of intermodality;
- deployment of interoperable electronic ticketing.

The regional MaaS4Abruzzo project provides an important point of reference.



Municipal framework (Pescara)

The Municipality of Pescara is a strategic hub for Adriatic mobility.

Key elements:

- Sustainable Urban Mobility Plan (PUMS);
- General Urban Traffic Plan;
- TUA system;
- port, airport and rail network;
- development of interchange hubs.

The Single Ticket provides a means of integrating these infrastructures.



Main legal issues raised by introducing a Single Ticket system

Legal issues raised by the Single Ticket:

- obligations and responsibilities of service providers
- protection of user rights
- accessibility
- Governance
 - consortium of local public transport operators;
 - public coordinating agency;
 - appointment of an operator;
- revenue allocation (clearing)
- data protection
- technological interoperability
- competition protection



Recommendations

The study recommends, among other measures:

- classifying the Single Ticket as a public service instrument;
- strengthening cooperation between public bodies and private operators;
- integrating the project into PUMS and PRIT;
- developing unified governance;
- establishing a regional clearing centre;
- making effective use of digital tools.



Interreg



Co-funded by
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Italy – Croatia



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