XXVII International Conference "Living and Walking in Cities"
SMART MOBILITY AND SHARED URBAN SPACES
Brescia
11-12 September 2025

An assessment tool for the Sustainable Intermodal Walkability Index (SIWI) of railway stations

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[1] Italferr S.p.A.
[2] FS Research Centre

Summary

1. The research group

Ferrovie dello Stato Italiane – Research Centre

The **FS Research Centre** is the FS Group's in-house high-skill centre for advanced studies and research on mobility, focusing on **sustainability** and climate change, green transformation and decarbonisation of transport, digital revolution, Big Data and Internet of Things, **innovative transport systems, governance, ethics and equity in mobility.**

Italferr – Sustainability Unit

Italferr, the engineering firm of the FS Group, plays a key role for the **development of sustainable and inclusive infrastructures.** The **commitment to Sustainability aims to guide the design** towards sustainable development objectives, within the international frameworks, harmonizing the relationships between infrastructure and territory, and thus reconciling engineering know-how with a sensitive approach to environmental, social and economic aspects.

MOST
CENTRO NAZIONALE PER LA MOBILITÀ SOSTENIBILE

Spoke 9 Urban Mobility

Sapienza
UNICA – UNIPR
FS - Italferr

Leader FS Research Centre: Mario Tartaglia

Coord. Spoke FS Research Centre: Stefano Pellecchia

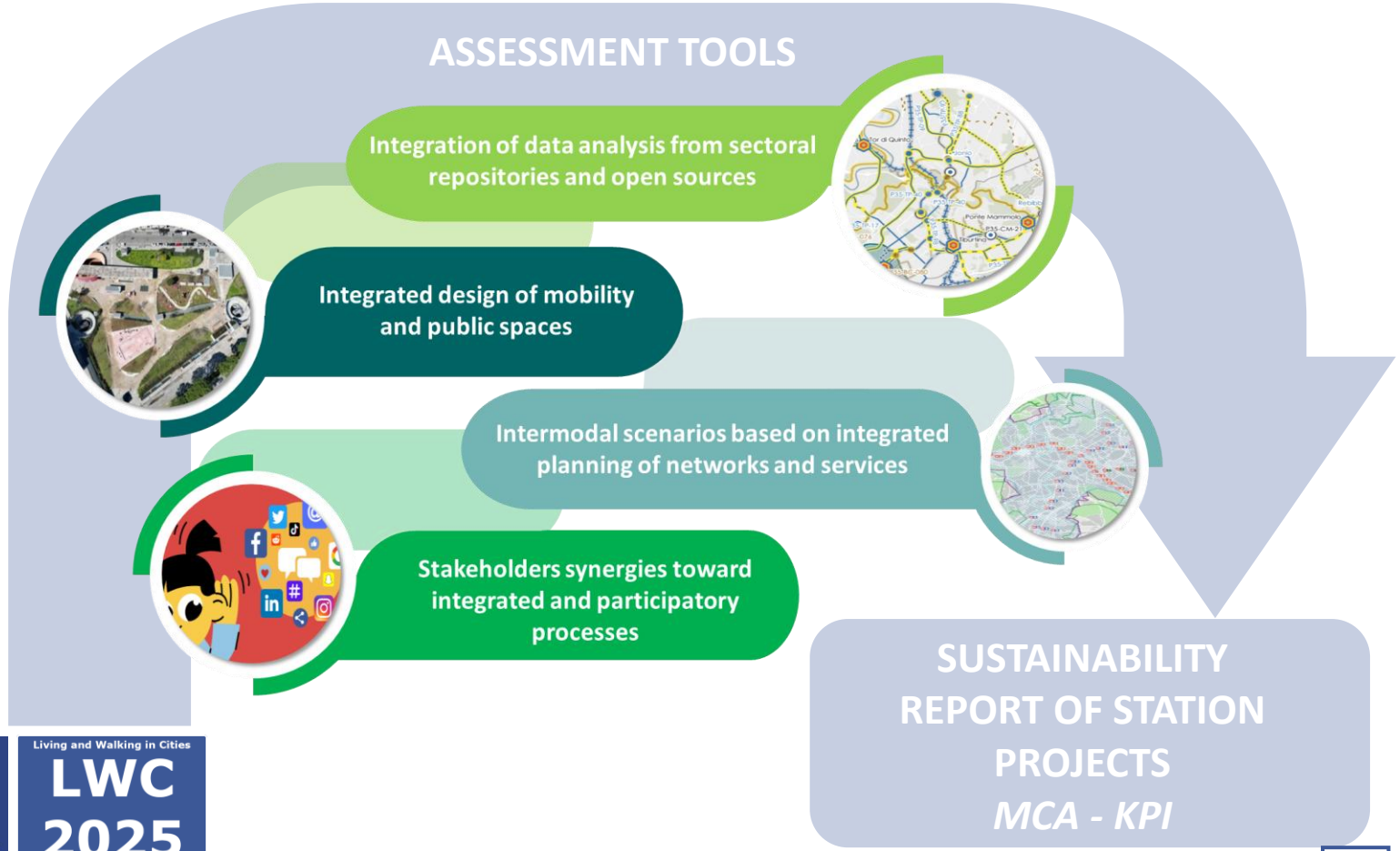
Italferr Sustainability Unit: Serena Martini, Chiara Ravagnan, Assunta Errico, Arturo Becchetti, Almona Tani

Digital rail infrastructure design & system Italferr: Marcella Marino

2. The research scope and goals

SUSTAINABILITY OF STATIONS PLANNING AND DESIGN

Italferr's research is guided by an integrated urban planning/infrastructure approach, aiming to innovate station design in synergy with urban design in the surroundings.



3. Methodology and phases

SIWI Sustainable Intermodal Walkability Index

Multimodal accessibility index for the sustainable design of urban mobility spaces

GIS Tool for SIWI

Construction of a GIS Tool capable of computing the SIWI indicator

Cases Study

Experimentation of the assessment methodology to the ongoing station design case study

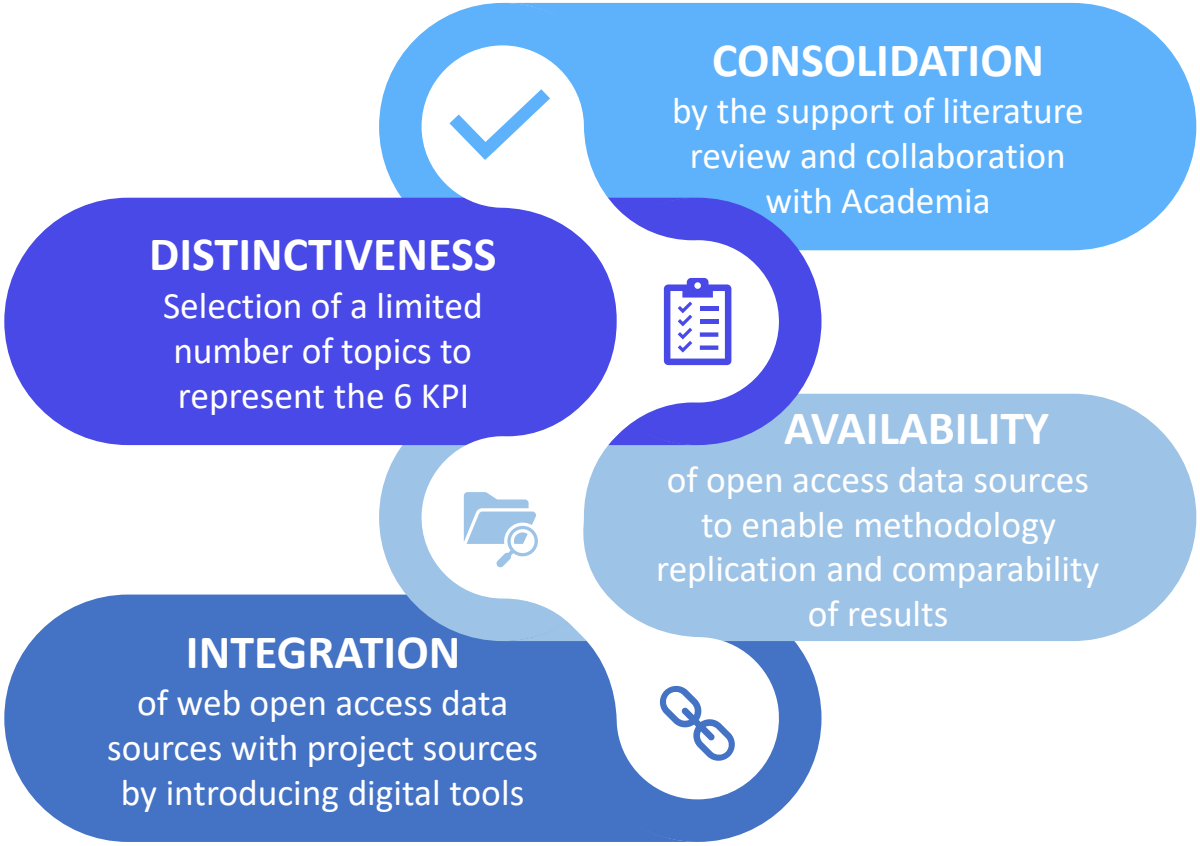
Guidelines

Definition of guidelines for the design of urban mobility spaces using SIWI

3. Methodology and phases

3.1 SIWI: goals and assessment framework

The methodology follows **criteria** of



3. Methodology and phases

3.1 SIWI: goals and assessment framework

DEFINITION OF ONE OR MORE **METRICS**
to evaluate and monitor the performance of the related topic

EVALUATION CRITERION DEFINITION
to evaluate the indicator, detailing the measurement related to the metric

ASSIGNMENT OF THE INDICATORS WEIGHTS
defined on the basis of surveys submitted to experts of the project consortium (UNIPR, UNICA, FS, Italferr, RFI)

IDENTIFICATION OF TOPICS
representing the 6 KPIs and characterized by strong "distinctiveness"

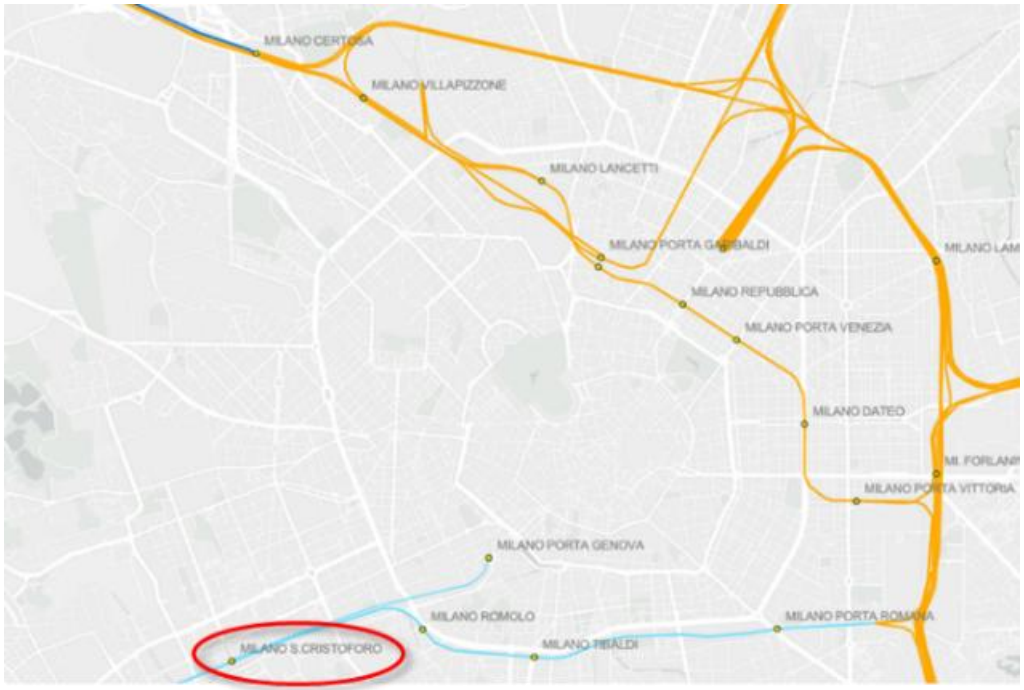
DATA COLLECTION
("as is" and "to be" scenario), favoring open access web data, and **LAYERS** GIS **DEFINITION**
in which to store the collected data

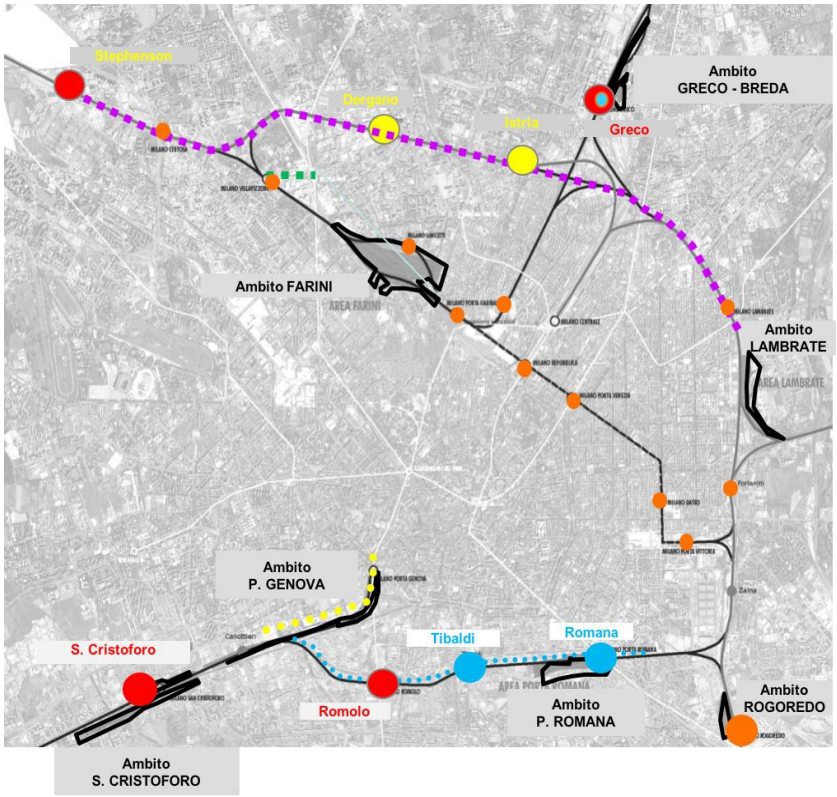
KPI EVALUATION RANGE DEFINITION
to provide a quantitative or qualitative measure to evaluate the level of criterion satisfaction

These ranges were defined according to the six categories outlined by RFI in the new station classification: **Main Hub**, **Hub**, **Major**, **Plus**, **Local Plus** and **Local**.

3. Methodology and phases

3.2 Case study: Milano San Cristoforo





3. Methodology and phases

3.2 Case study: Milano San Cristoforo

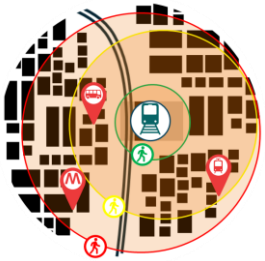
NODE ACCESSIBILITY	PLACE ACCESSIBILITY	SOCIAL SECURITY	ROAD SAFETY	INCLUSIVE DESIGN	ENJOYMENT & ENVIRONMENTAL COMFORT
• Intermodality of Rail with LPT • Intermodality of Rail with car services • Intermodality of Rail with sharing • Intermodality of Rail with private bikes	• Population density • Activity density • Density of services	• Station security • Access security	• Crossing safety • Paths safety	• Stations inclusive usability • Stations inclusive accessibility	• Shading for climate comfort

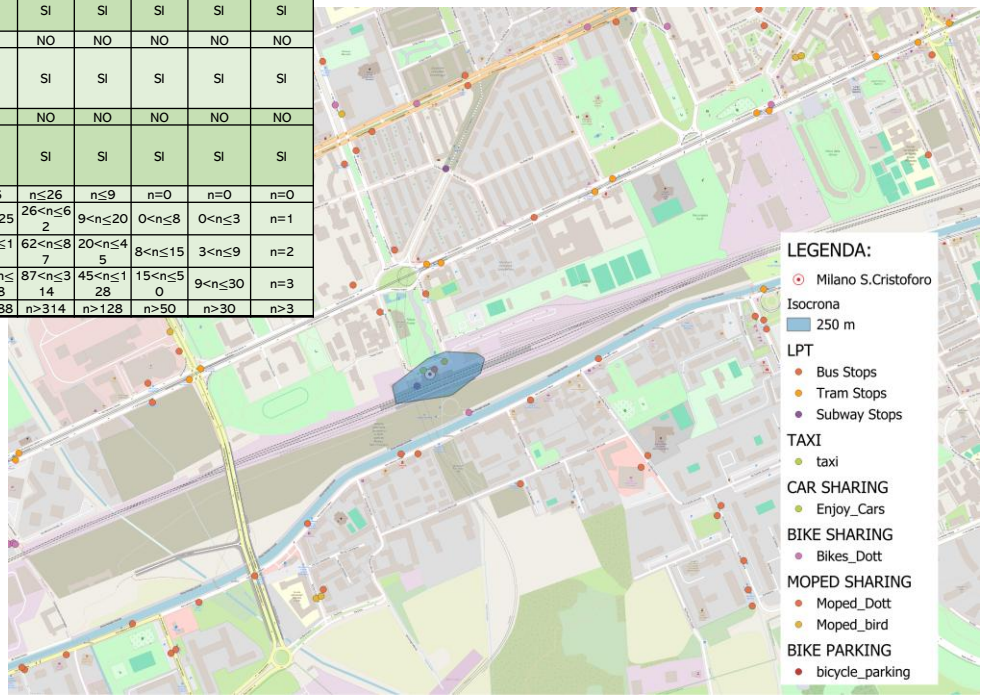
3. Methodology and phases

3.2 Case study: Milano San Cristoforo

NODE ACCESSIBILITY | PLACE ACCESSIBILITY | SOCIAL SECURITY | ROAD SAFETY | INCLUSIVE DESIGN | ENJOYMENT & ENVIRONMENTAL COMFORT

TOPIC	EVALUATION CRITERIA	DATA COLLECTION SOURCE		METRIC	SCORE ATTRIBUTION	RANGE ATTRIBUTION IN RELATION TO STATIONS CLASSIFFICATION					
		AS IS	TO BE			Main Hub	Hub	Major	Plus	Local Plus	Local
Intermodality of Rail with LPT	Quantity and proximity of bus/tram/subway stop (somma pesata)	MobilityDatabase.org (.gtfs)	Project/Masterplan	Number (n) of bus/tram/subway stops reacheable in less than 250 m walking	0,00	n≤8	n≤2	n=0	n=0	n=0	n=0
					0,25	8<n≤15	2<n≤4	0<n≤2	n=1	n=1	n=1
					0,50	15<n≤18	4<n≤7	2<n≤3	n=2	n=2	n=2
					0,75	18<n≤23	7<n≤10	3<n≤6	n=3	n=3	n=3
					1,00	n>23	n>10	n>6	n>3	n>3	n>3
Intermodality of Rail with car services	Proximity of taxi rank	OpenStreetMap	Project/Masterplan	Presence of taxi ranks reacheable in less than 250 m walking	0,00	NO	NO	NO	NO	NO	NO
					1,00	SI	SI	SI	SI	SI	SI
Intermodality of Rail with sharing	Proximity of car sharing services	MobilityDatabase.org (.gbfs)	Project/Masterplan	Presence of car sharing services reacheable in less than 250 m walking	0,00	NO	NO	NO	NO	NO	NO
					1,00	SI	SI	SI	SI	SI	SI
	Proximity of bike sharing services	MobilityDatabase.org (.gbfs)	Project/Masterplan	Presence of bike sharing services reacheable in less than 250 m walking	0,00	NO	NO	NO	NO	NO	NO
					1,00	SI	SI	SI	SI	SI	SI
	Proximity of moped sharing services	MobilityDatabase.org (.gbfs)	Project/Masterplan	Presence of moped sharing services reacheable in less than 250 m walking	0,00	NO	NO	NO	NO	NO	NO
					1,00	SI	SI	SI	SI	SI	SI
	Proximity of scooter sharing services	MobilityDatabase.org (.gbfs)	Project/Masterplan	Presence of scooter sharing services reacheable in less than 250 m walking	0,00	NO	NO	NO	NO	NO	NO
					1,00	SI	SI	SI	SI	SI	SI
Intermodality of Rail with private bikes	Quantity and proximity of bike boxes and racks	OpenStreetMap	Project/Masterplan	Number (n) of bike boxes/racks reacheable in less than 250 m walking	0,00	n≤6	n≤26	n≤9	n=0	n=0	n=0
					0,25	6<n≤25	26<n≤62	9<n≤20	0<n≤8	0<n≤3	n=1
					0,50	25<n≤148	62<n≤87	20<n≤45	8<n≤15	3<n≤9	n=2
					0,75	148<n≤1088	87<n≤314	45<n≤128	15<n≤50	9<n≤30	n=3
					1,00	n>1088	n>314	n>128	n>50	n>30	n>3



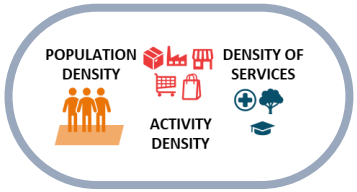


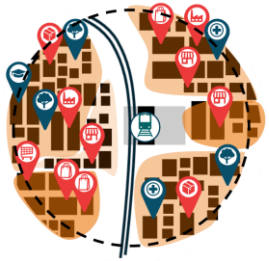
3. Methodology and phases

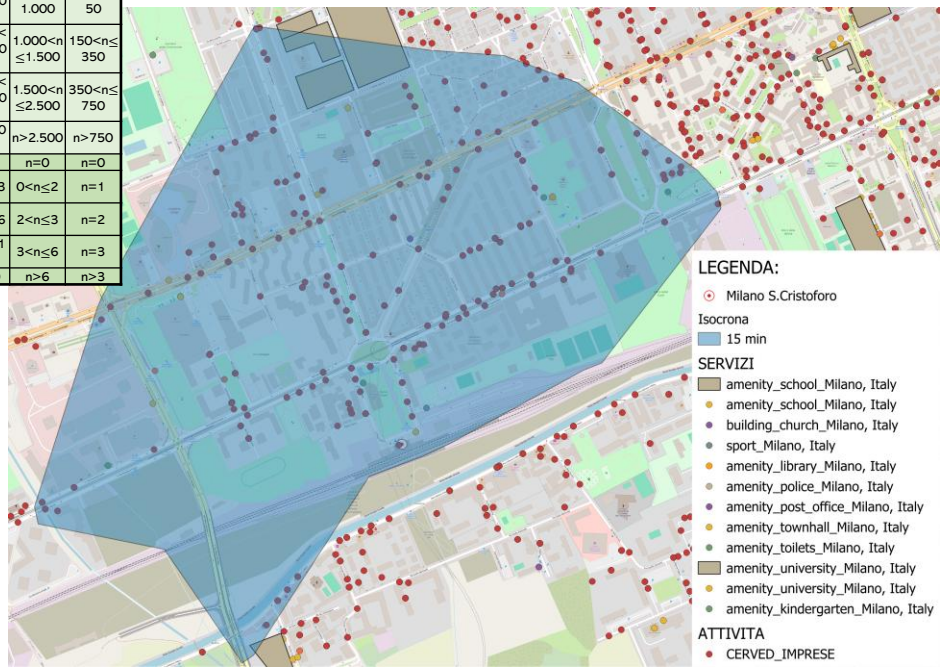
3.2 Case study: Milano San Cristoforo

NODE ACCESSIBILITY | PLACE ACCESSIBILITY | SOCIAL SECURITY | ROAD SAFETY | INCLUSIVE DESIGN | ENJOYMENT & ENVIRONMENTAL COMFORT

TOPIC	EVALUATION CRITERIA	DATA COLLECTION SOURCE		METRIC	SCORE ATTRIBUTION	RANGE ATTRIBUTION IN RELATION TO STATIONS CLASSIFFICATION					
		AS IS	TO BE			Main Hub	Hub	Major	Plus	Local Plus	Local
Population density	Inhabitants living within 15 minutes	ORS Tools	ORS Tools	Number of inhabitants (n) living within 15 minutes walk from the station	0,00	n≤14.500	n≤12.000	n≤8.000	n≤3.500	n≤1.000	n≤250
					0,25	14.500<n≤22.500	12.000<n≤14.000	8.000<n≤11.000	3.500<n≤5.500	1.000<n≤3.000	250<n≤700
					0,50	22.500<n≤30.500	14.000<n≤18.000	11.000<n≤14.000	5.500<n≤8.000	3.000<n≤4.500	700<n≤1.500
					0,75	30.500<n≤35.000	18.000<n≤26.000	14.000<n≤18.500	8.000<n≤12.000	4.500<n≤7.000	1.500<n≤2.500
					1,00	n>35.000	n>26.000	n>18.500	n>12.000	n>7.000	n>2.500
Activity density	Workers within 15 minutes	Cerved	Cerved	Number of workers (n) within 15 minutes walk from the station	0,00	n≤10.500	n≤6.000	n≤3.000	n≤1.000	n≤500	n≤50
					0,25	10.500<n≤18.000	6.000<n≤9.500	3.000<n≤4.500	1.000<n≤2.000	500<n≤1.000	50<n≤150
					0,50	18.000<n≤27.000	9.500<n≤12.000	4.500<n≤7.000	2.000<n≤3.000	1.000<n≤1.500	150<n≤350
					0,75	27.000<n≤40.000	12.000<n≤16.000	7.000<n≤9.000	3.000<n≤4.500	1.500<n≤2.500	350<n≤750
					1,00	n>40.000	n>16.000	n>9.000	n>4.500	n>2.500	n>750
Density of services	Urban and local public services within 15-minutes	OpenStreetMap	OpenStreetMap	Number of urban and local public services (s) (Universities, High Schools, Hospitals, Cultural sites, Wide commercial areas) within 15-minute walk from the station	0,00	n≤10	n≤7	n≤6	n≤2	n=0	n=0
					0,25	10<n≤23	7<n≤12	6<n≤8	2<n≤3	0<n≤2	n=1
					0,50	23<n≤25	12<n≤18	8<n≤12	3<n≤6	2<n≤3	n=2
					0,75	25<n≤32	18<n≤23	12<n≤17	6<n≤10	3<n≤6	n=3
					1,00	n>32	n>23	n>17	n>10	n>6	n>3

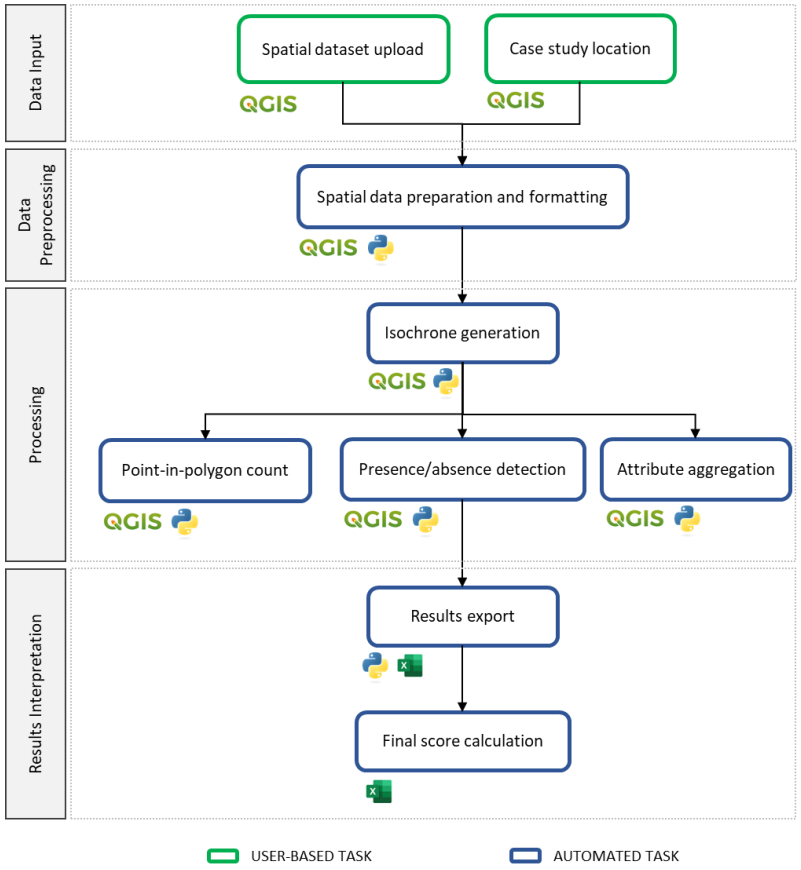






3. Methodology and phases

3.3 Automatization process



KEY PERFORMANCE INDICATORS	TOPIC	EVALUATION CRITERIA	METRIC	SCORE
NODE ACCESSIBILITY	Intermodality of Rail with LPT	Quantity and proximity of bus/tram/subway stop (somma pesata)	Number (n) of bus/tram/subway stops reacheable in less than 250 m walking	0,25
	Intermodality of Rail with car services	Proximity of taxi rank	Presence of taxi ranks reacheable in less than 250 m walking	1
	Intermodality of Rail with sharing	Proximity of car sharing services	Presence of car sharing services reacheable in less than 250 m walking	0
		Proximity of bike sharing services	Presence of bike sharing services reacheable in less than 250 m walking	0
		Proximity of moped sharing services	Presence of moped sharing services reacheable in less than 250 m walking	1
		Proximity of scooter sharing services	Presence of scooter sharing services reacheable in less than 250 m walking	0
	Intermodality of Rail with private bikes	Quantity and proximity of bike boxes and racks	Number (n) of bike boxes/racks reacheable in less than 250 m walking	0
PLACE ACCESSIBILITY	Population density	Inhabitants living within 15 minutes	Number of inhabitants (n) living within 15 minutes walk from the station	0,5
	Activity density	Workers within 15 minutes	Number of workers (n) within 15 minutes walk from the station	0
	Density of services	Urban and local public services within 15-minutes	Number of urban and local public services (s) (Universities, High Schools, Hospitals, Cultural sites, Wide commercial areas) within 15-minute walk from the station	0,5

4. Conclusions and next steps

NODE ACCESSIBILITY

SOCIAL SECURITY

INCLUSIVE DESIGN

ROAD SAFETY

ENJOYMENT & ENVIRONMENTAL COMFORT

PLACE ACCESSIBILTY

DEFINE THE SET OF METHODOLOGICAL AND DIGITAL TOOLS FOR THE EVALUATION OF SUSTAINABLE INTERMODAL WALKABILITY OF STATIONS

SUGGEST THE USE OF THE TOOLS IN THE DIFFERENT PHASES OF THE DESIGN PROCESS

MAP THE POTENTIAL INSTITUTIONAL TOOLS FOR THE COLLABORATION BETWEEN INFRASTRUCTURE MANAGERS AND MUNICIPALITIES.

UNIVERSITY OF BRESCIA

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