WP 3: Representative models of Built Environment Typologies (BETs) prone to SUOD/SLOD. Case studies selection and data collection

T3.3 - Selection and survey of significant real-World case studies. Scan to BIM and implementation of risk parameters to set scenarios for VR. Case studies VR/AR representation. Users' exposure data collection.

DELIVERABLE ID	D3.3.3
Deliverable Title	Case studies users' exposure report (PM)
Delivery month	22
Revision	1.1
Main partner	UNIVPM
Additional partners	RM (Narni case study), BA (Bari case study), PG (Caldarola case study)
Authors of the contribution	Enrico Quagliarini (UNIPM); Gabriele Bernardini (UNIPM); Guido Romano (UNIPM); Currà Edoardo (UNIRM), Russo Martina (UNIRM), Angelosanti Marco (UNIRM); Fabio Fatiguso (POLIBA), Elena Cantatore (POLIBA), Silvana Bruno (POLIBA); Giovanni Mochi (UNIPG), Letizia Bernabei (UNIPG), Federica Rosso (UNIPG).
Deliverable type	report
Number of pages	10

BE S²ECURe

BE S²ECURE

Built Environment Safer in Slow and Emergency Conditions through behavioUral assessed/designed Resilient solutions

Grant number: 2017LR75XK

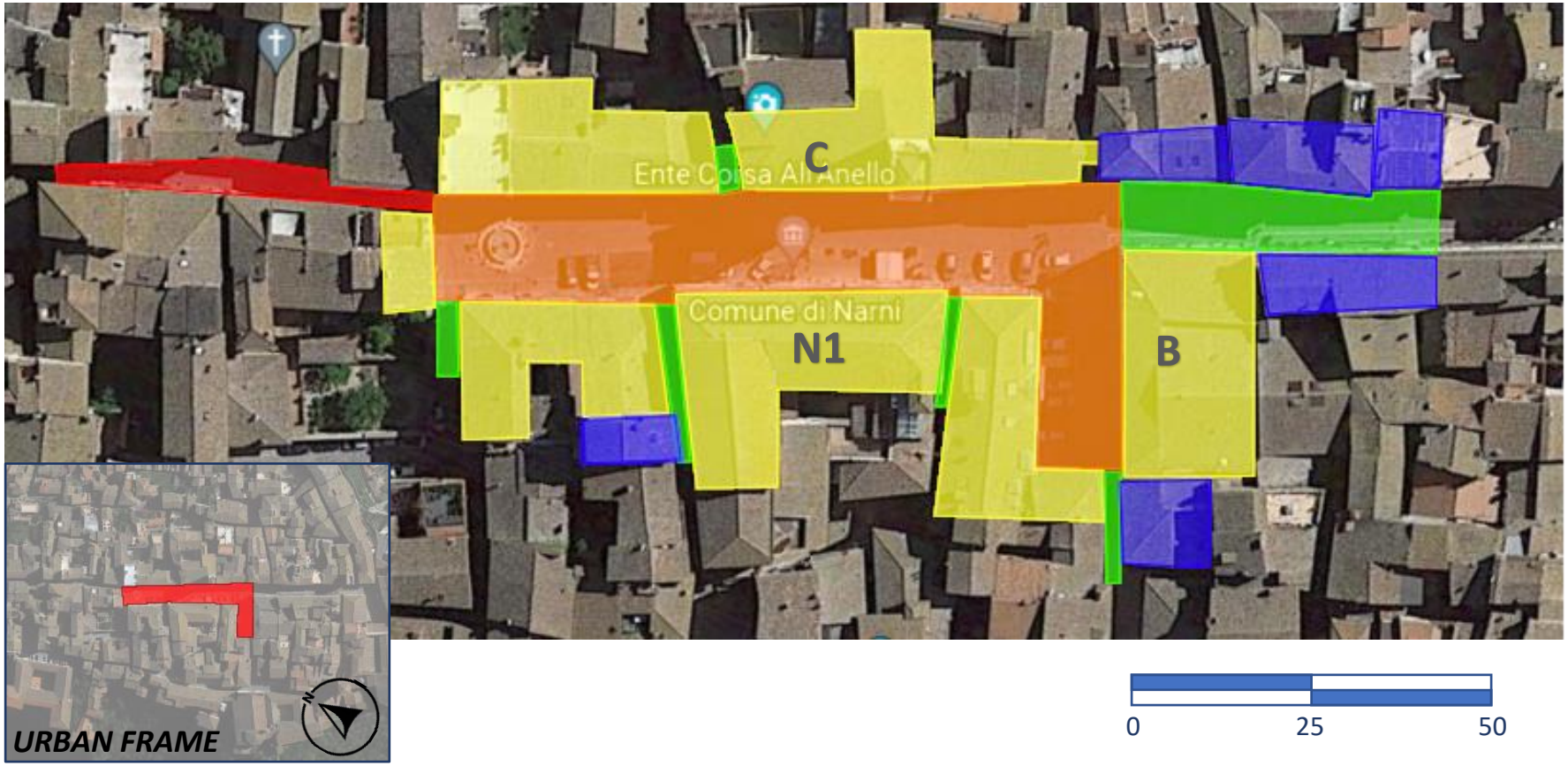
Abstract: **Emergency conditions** provoked by **SUOD and SLOD strictly depend on the Built Environments** (BEs) and users features, and the timetable in which the event itself occurs.
Previous analyses in D3.2.3 provide a methodology basing on a typological approach to quantify the users' exposure according to their (a) motion capabilities, **behavioral issues**, and socioeconomic status, (b) the **BE features** in which they move by taking into account both the square and the spaces directly communicating with it (outdoor and indoor), and (c) the **day time and type considered** (day/night, working days/holidays). Study cases are selected according to previous analyses in D3.3.1 related to the BETs definition and the VR/AR models implementation for multi-hazard scenarios.
Results are organized by descriptors by distinguishing overall and time-dependent outcomes (i.e., daily and hourly) according to the users' vulnerability, familiarity with the BE, and features of the BE itself. Findings will support the next WP6 as they represent a critical step for implementing VR/AR simulations, training strategies and evaluation tools.

Approvals & revisions:

Role	Name	Partner
Coordinator & task leader	Quagliarini Enrico	UNIPM

Revision	Date	Short summary of modifications	Name	Partner
0.1	23.05.2021	check of the general scheme for the form	Bernardini	UNIPM
1.0	22.08.2021	Narni case study inserted	Romano	UNIPM
1.1	15.11.2022	Bari and Caldarola studies inserted	Romano	UNIPM

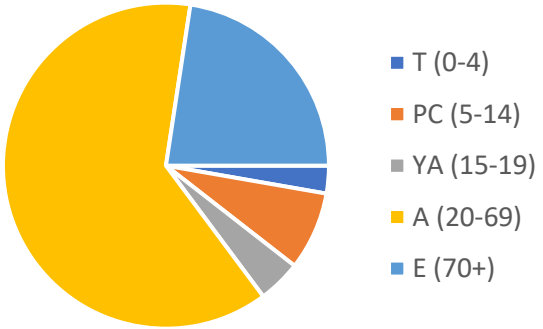
NARNI (PG) | PIAZZA DEI PRIORI | BET 2A | BEC DATA



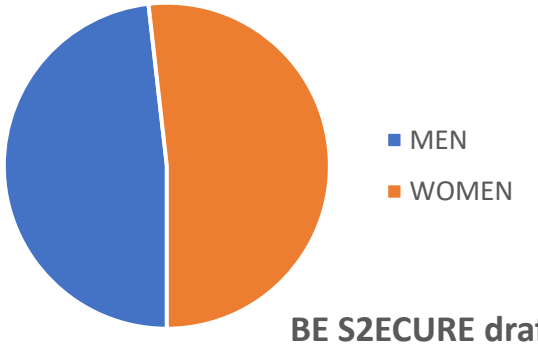
OUTDOOR AREA	AREA [m²]	PCT [%]
Walkable	890	48%
Carrigeable	890	48%
Unwalkable	35	2%
Dehor	30	2%
NET AREA	1810	98%
GROSS AREA	1845	100%
STREETS AREA	**AREA [m²]**	**PCT [%]**
Walkable	265	64%
Carrigeable	120	29%
Unwalkable	0	0%
Dehor	30	7%
INDOOR AREA	**AREA [m²]**	**I/O RATIO [-]**
Accessible	9210	4,99
Total	10010	5,43

SENSITIVE TARGETS	ID	N°
Airport, metro, rail stations	A	0
Theatres, museums, churches	B	1
Hospital, schools, universities	C	1
Government buildings	N1	1

Users' age distribution



Users' gender distribution



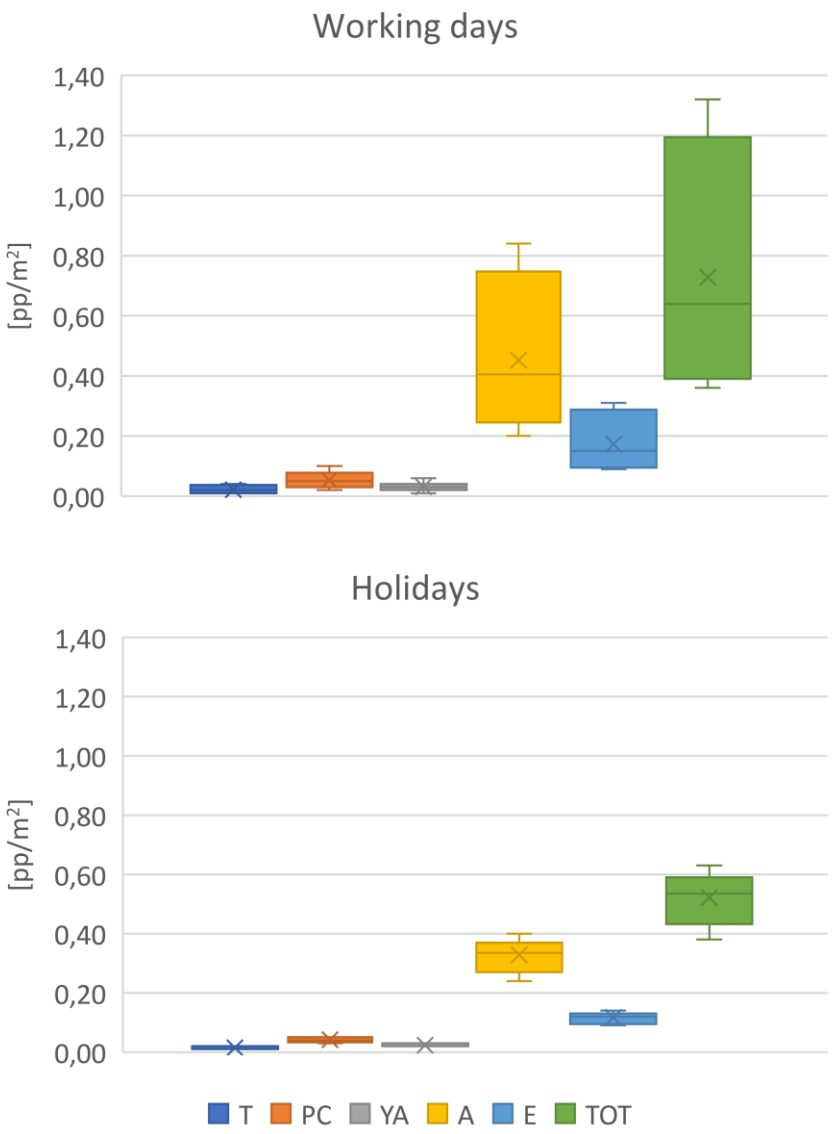
B.E. AREAS

- OUTDOOR AREA
- STREETS AREA
- INDOOR AREA
- EXCLUDED STREETS AREA
- SECONDARY INDOOR AREA

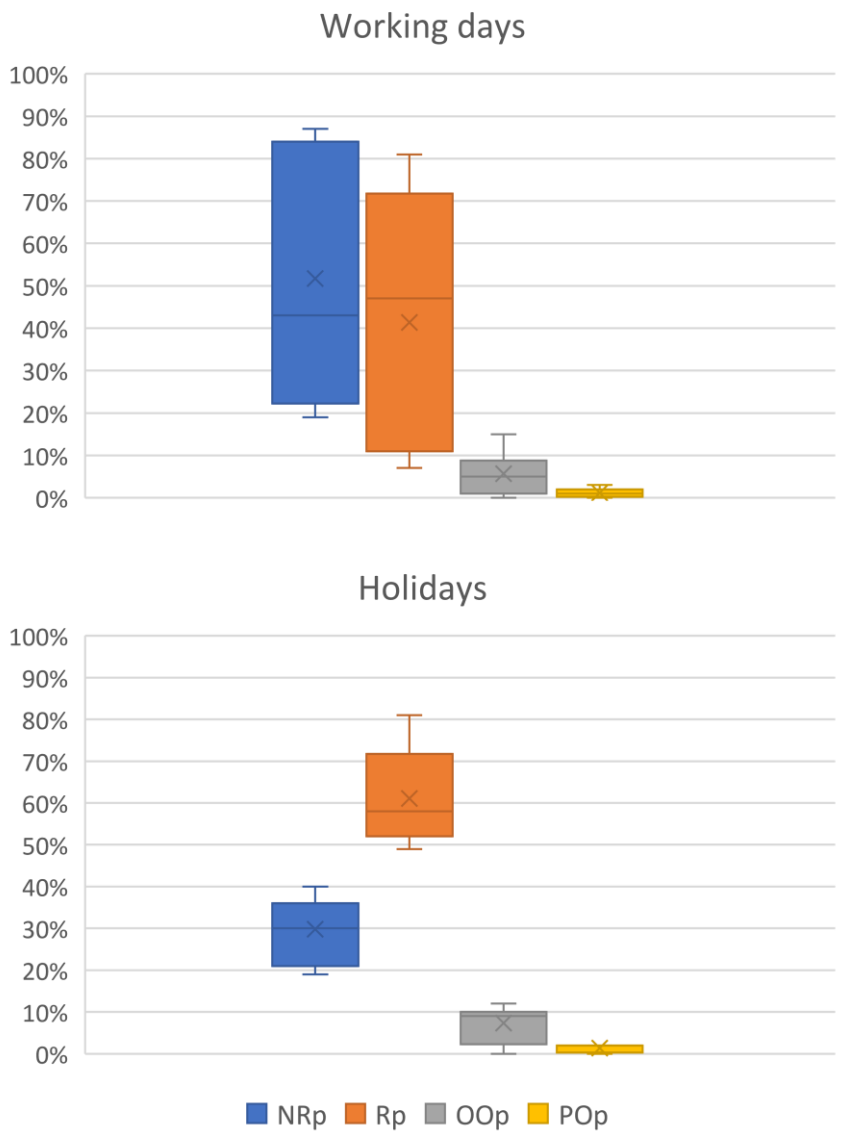
BE S2ECURE draft

NARNI (PG)	PIAZZA DEI PRIORI	BET 2A	OUC DATA

DAILY DENSITY DISTRIBUTION IN OUTDOOR ORGANIZED PER USERS' AGE RANGE



DAILY PERCENTAGE DISTRIBUTION OF USERS PER FAMILIARITY WITH THE B.E.



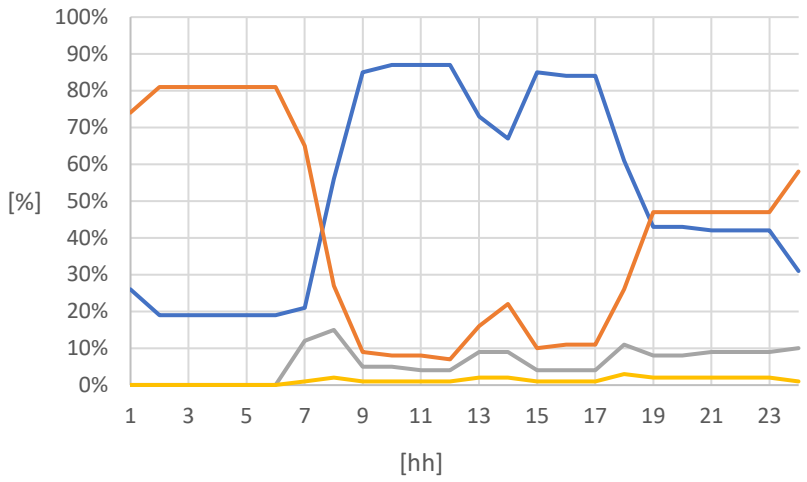
USERS OVERALL NUMBER IN THE B.E.: MAXIMUM AND MEDIAN VALUES

	MAX	50 pctl
WD	2368	1155
H	1144	968

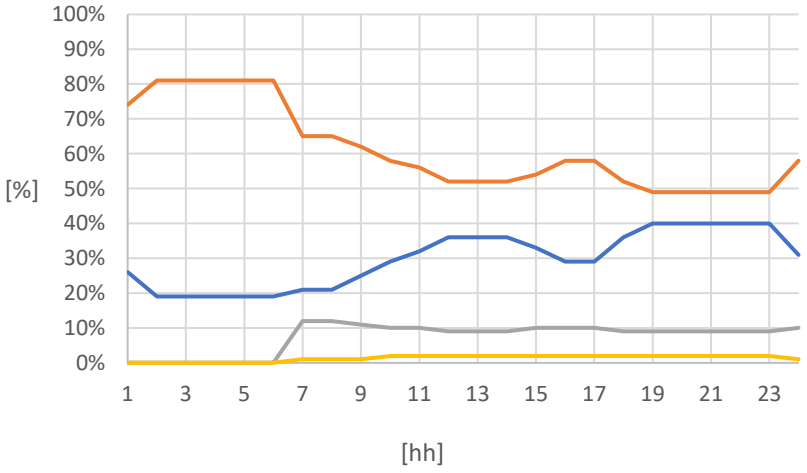
NARNI (PG)	PIAZZA DEI PRIORI	BET 2A	TDC DATA

PERCENTAGE OF USERS ACCORDING TO THEIR FAMILIARITY WITH THE B.E.

Working days



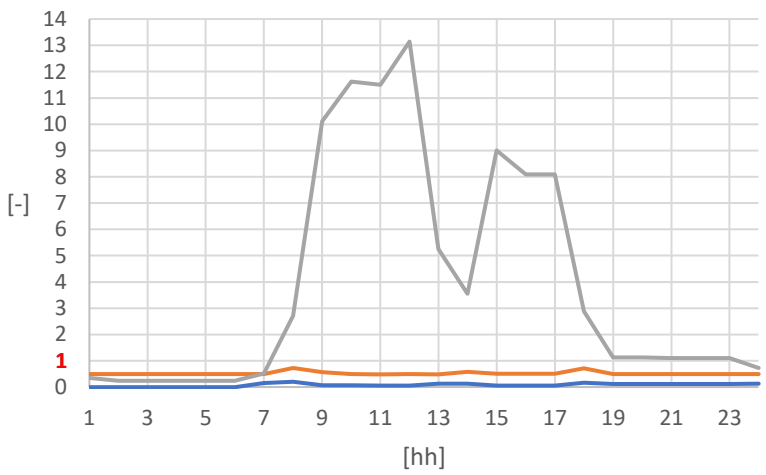
Holidays



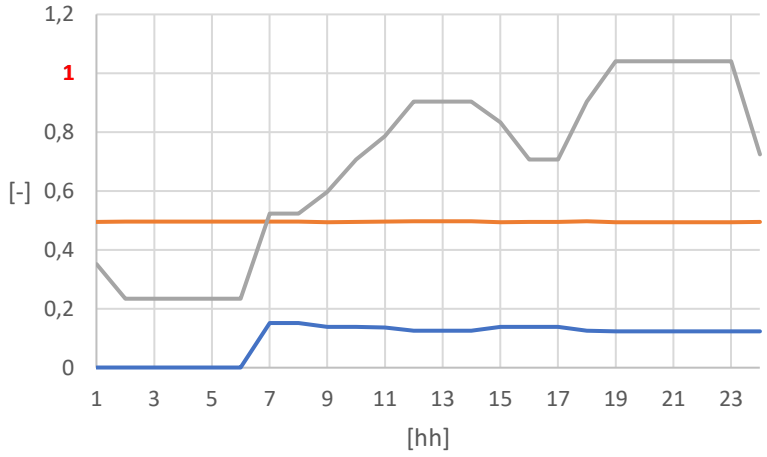
NRp — Rp — OOp — POp

RATIOS BETWEEN SPECIFIC CATEGORIES

Working days



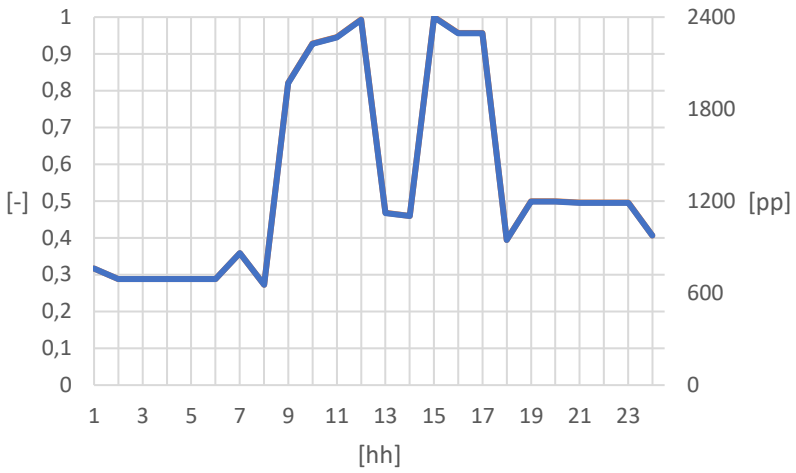
Holidays



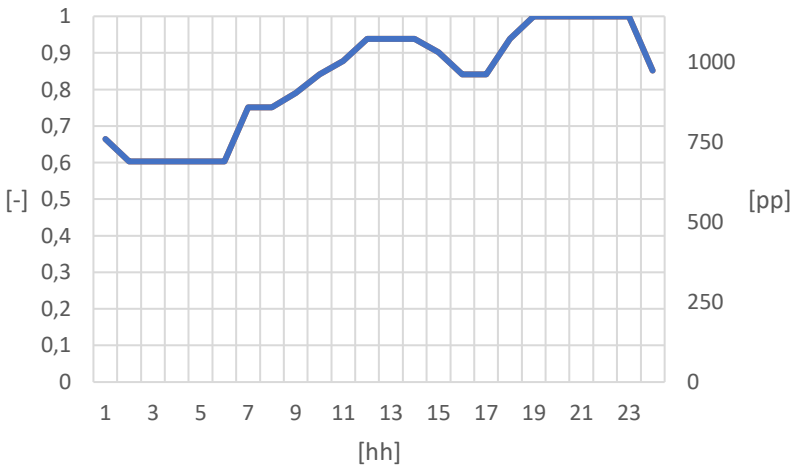
(OO+PO)/(NR+R) — (T+PC+E)/(YA+A) — (NR+OO+PO)/R

USERS OVERALL NORMALIZED NUMBER

Working day



Holidays



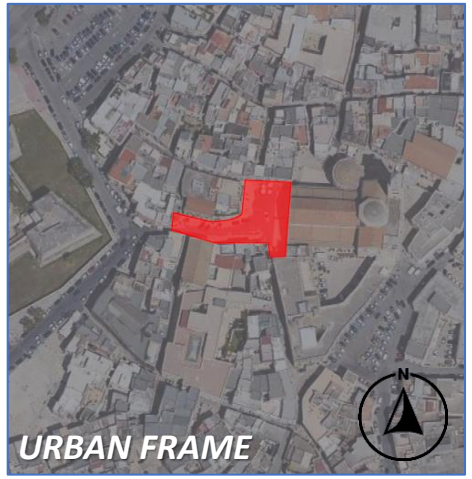
BE S2ECURE draft

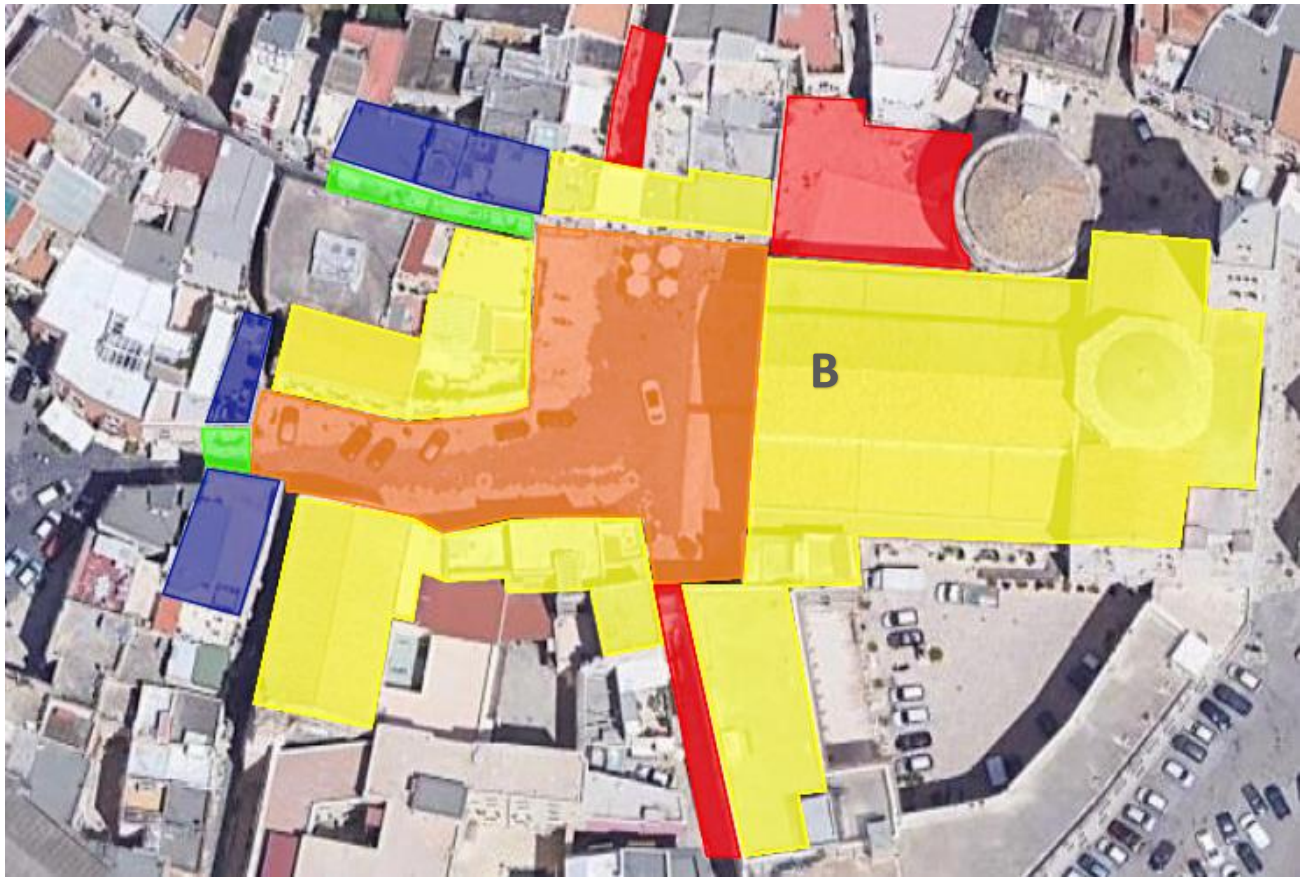
BARI

PIAZZA DELL'ODEGITRIA

BET 4B

BEC DATA



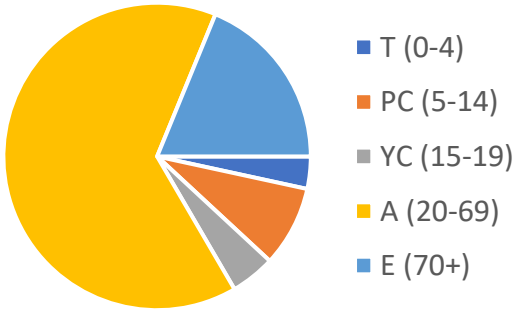


0 25 50

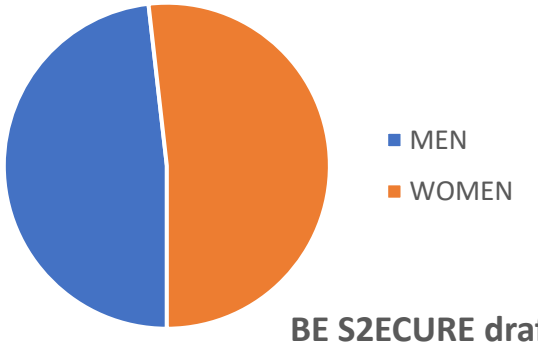
OUTDOOR AREA	AREA [m²]	PCT [%]
Walkable	850	76%
Carrigeable	250	22%
Unwalkable	0	0%
Dehor	25	2%
NET AREA	1125	100%
GROSS AREA	1125	100%
STREETS AREA	**AREA [m²]**	**PCT [%]**
Walkable	50	56%
Carrigeable	40	44%
Unwalkable	0	0%
Dehor	0	0%
INDOOR AREA	**AREA [m²]**	**I/O RATIO [-]**
Accessible	3300	2,93
Total	3325	2,95

SENSITIVE TARGETS	ID	N°
Airport, metro, rail stations	A	0
Theatres, museums, churches	B	1
Hospital, schools, universities	C	0
Government buildings	N1	0

Users' age distribution



Users' gender distribution



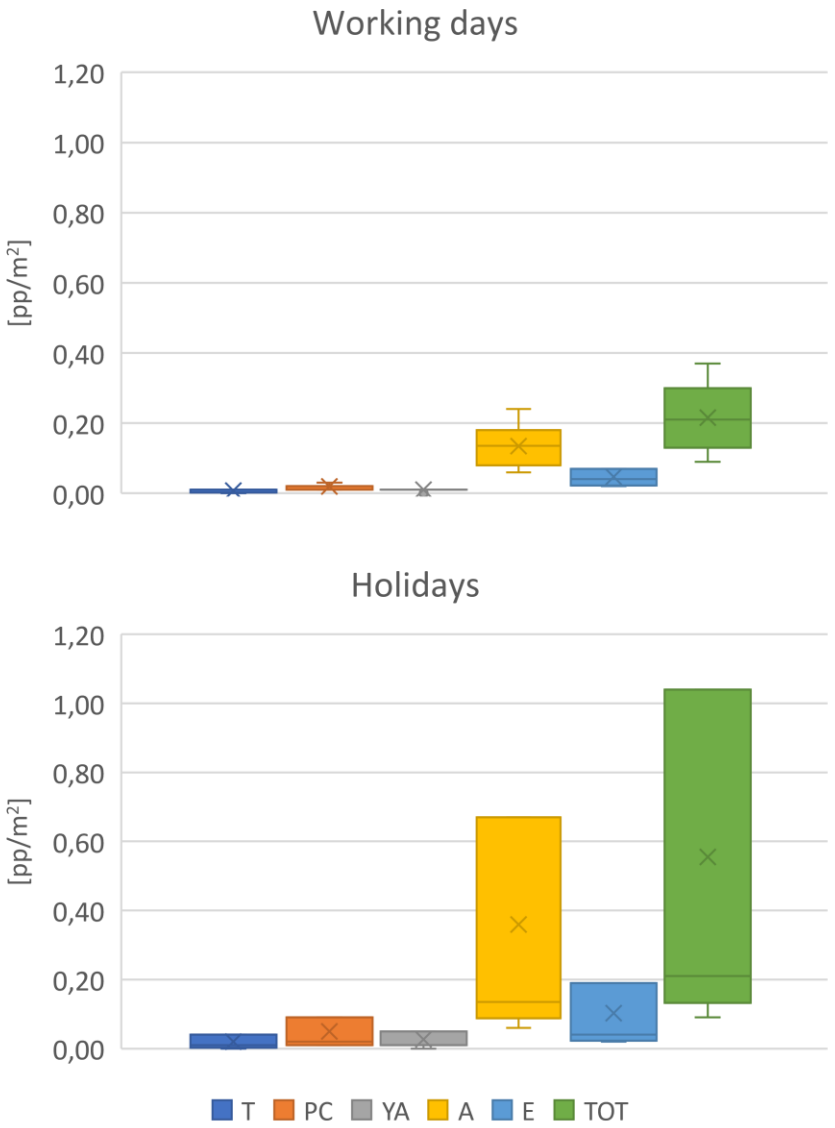
B.E. AREAS

- OUTDOOR AREA
- STREETS AREA
- INDOOR AREA
- EXCLUDED STREETS AREA
- SECONDARY INDOOR AREA

BE S2ECURE draft

BARI	PIAZZA DELL'ODEGITRIA	BET 4B	OUC DATA

DAILY DENSITY DISTRIBUTION IN OUTDOOR ORGANIZED PER USERS' AGE RANGE



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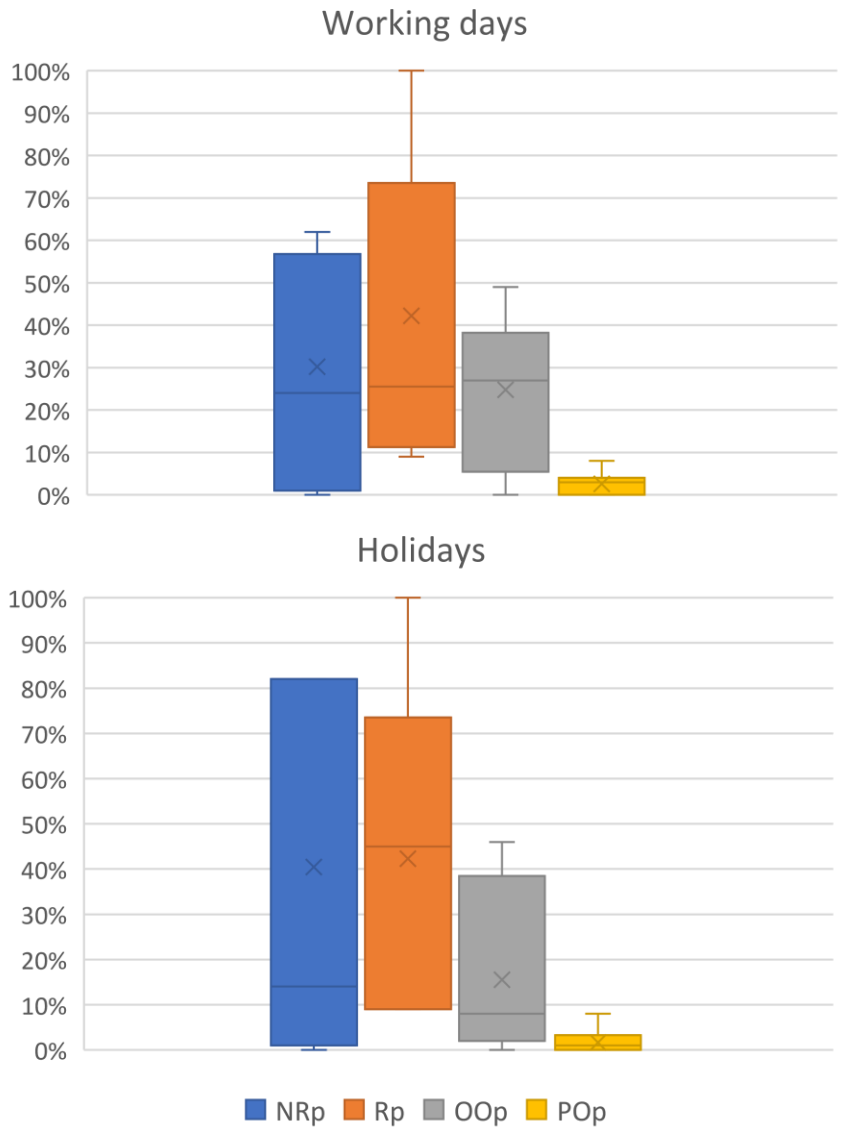


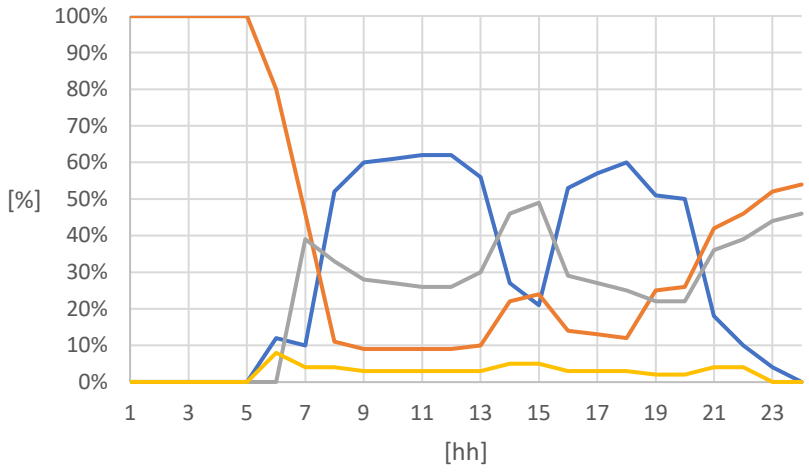
USERS OVERALL NUMBER IN THE B.E.: MAXIMUM AND MEDIAN VALUES

	MAX	50 pctl
WD	418	241
H	1169	238

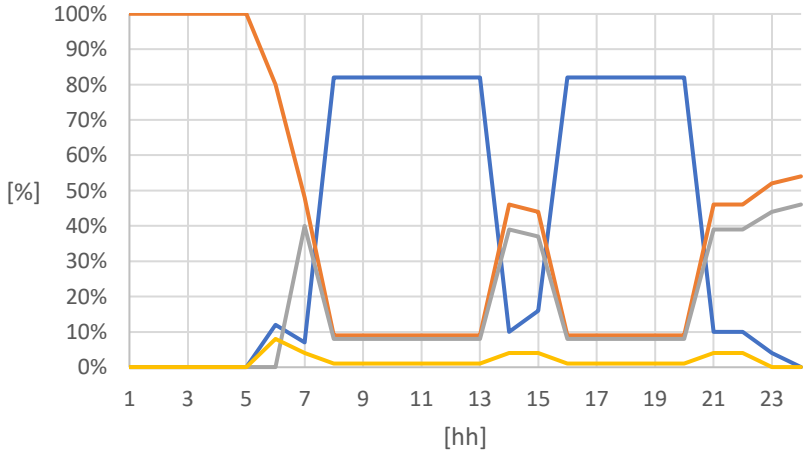
BARI	PIAZZA DELL'ODEGITRIA	BET 4B	TDC DATA

PERCENTAGE OF USERS ACCORDING TO THEIR FAMILIARITY WITH THE B.E.

Working days



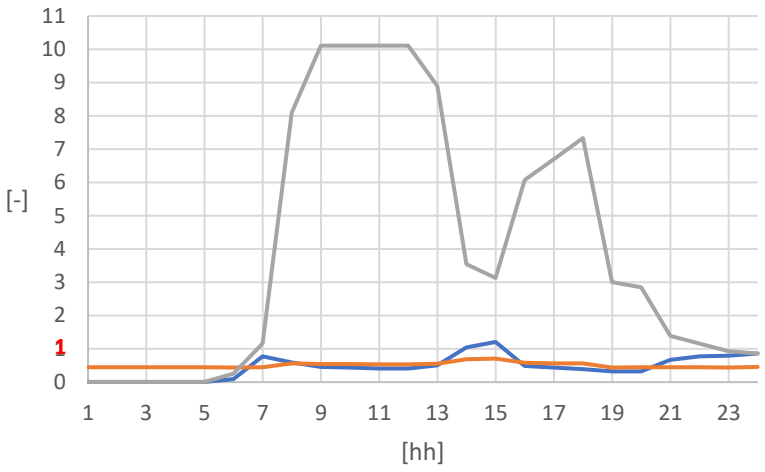
Holidays



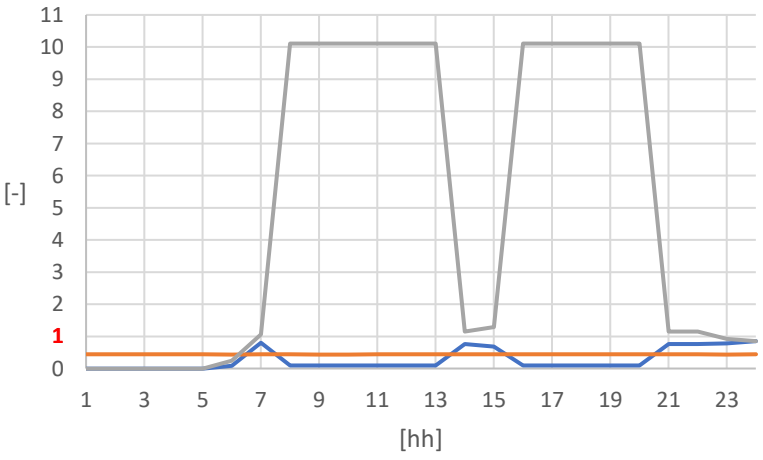
NRp Rp OOp POp

RATIOS BETWEEN SPECIFIC CATEGORIES

Working day



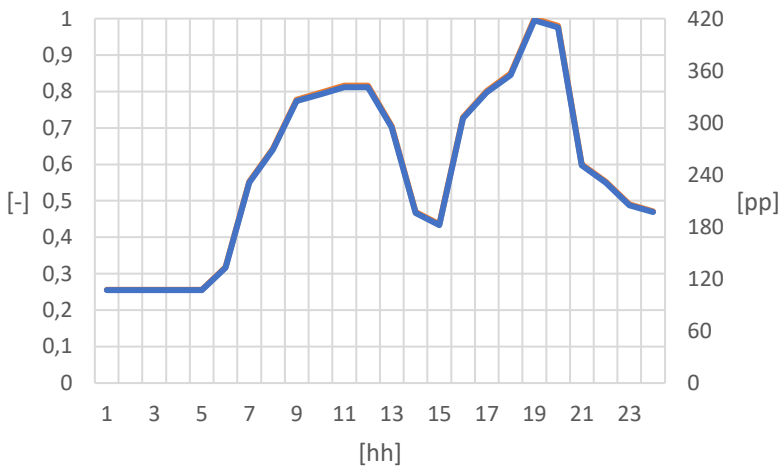
Holidays



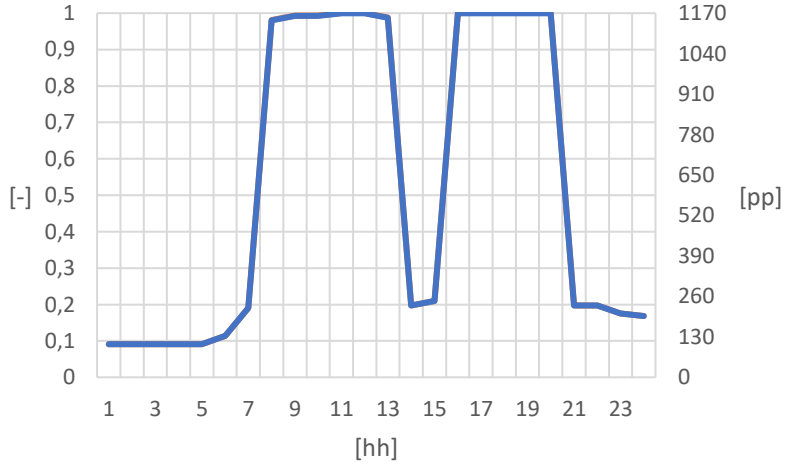
(OO+PO)/(NR+R) (T+PC+E)/(YA+A) (NR+OO+PO)/R

USERS OVERALL NORMALIZED NUMBER

Working days

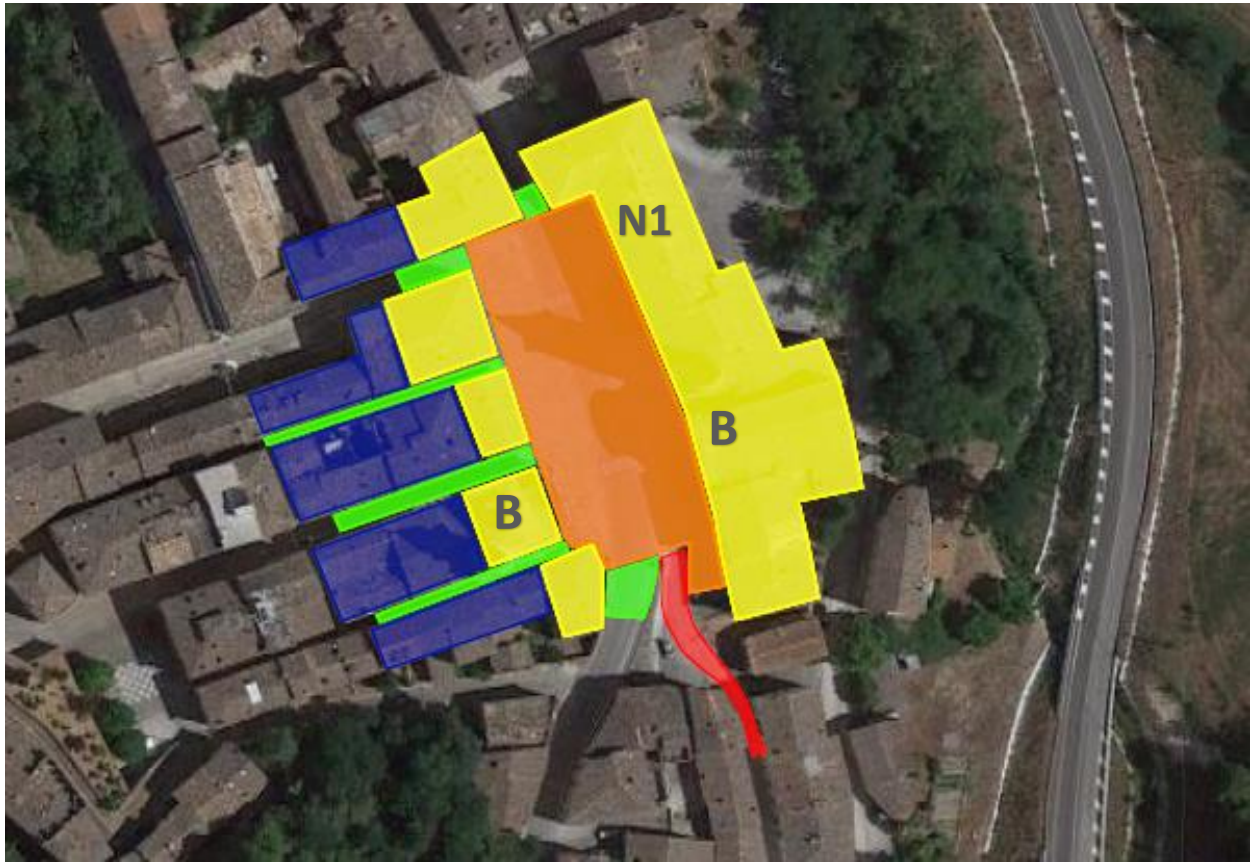


Holidays



BE S2ECURE draft

CALDAROLA | PIAZZA VITTORIO EMANUELE | BET 1A | BEC DATA

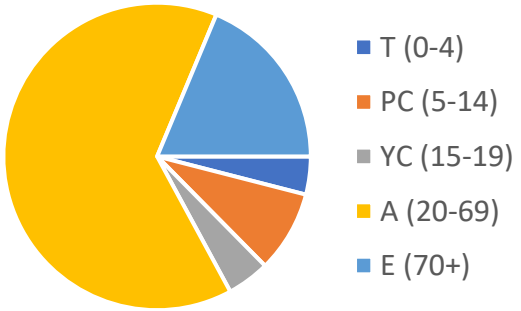


0 25 50

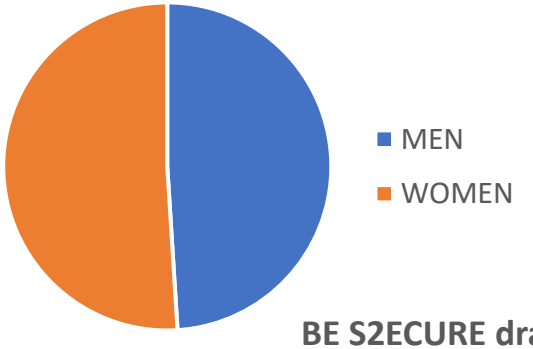
OUTDOOR AREA	AREA [m²]	PCT [%]
Walkable	1510	72%
Carrigeable	580	28%
Unwalkable	0	0%
Dehor	0	0%
NET AREA	2090	100%
GROSS AREA	2090	100%
STREETS AREA	**AREA [m²]**	**PCT [%]**
Walkable	355	66%
Carrigeable	185	34%
Unwalkable	0	0%
Dehor	0	0%
INDOOR AREA	**AREA [m²]**	**I/O RATIO [-]**
Accessible	8400	4,02
Total	8400	4,02

SENSITIVE TARGETS	ID	N°
Airport, metro, rail stations	A	0
Theatres, museums, churches	B	2
Hospital, schools, universities	C	0
Government buildings	N1	1

Users' age distribution



Users' gender distribution



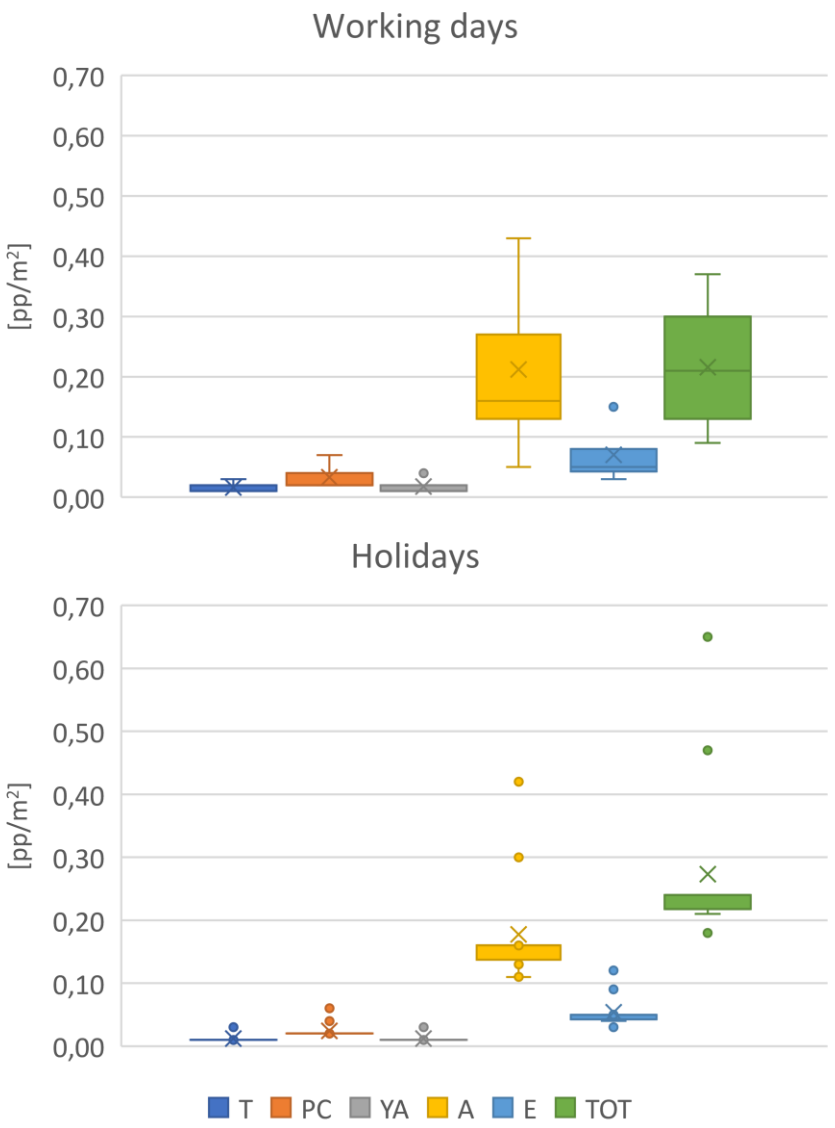
B.E. AREAS

- OUTDOOR AREA
- STREETS AREA
- INDOOR AREA
- EXCLUDED STREETS AREA
- SECONDARY INDOOR AREA

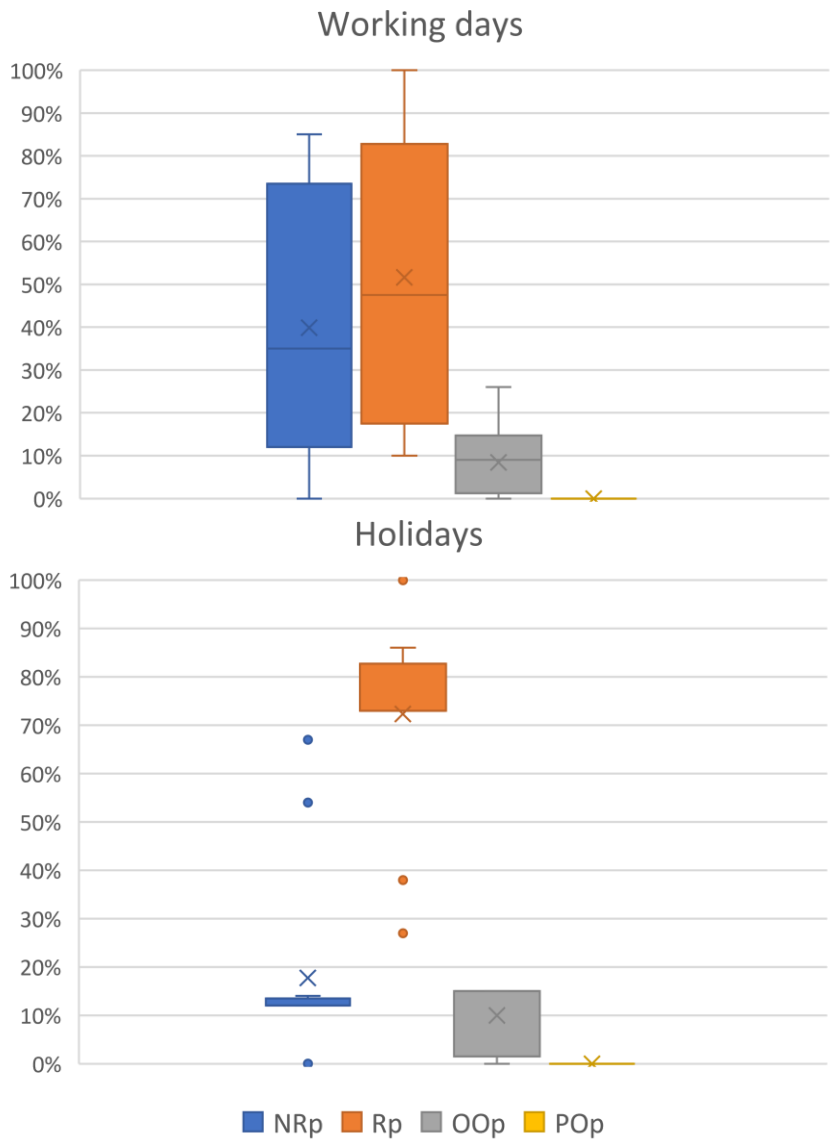
BE S2ECURE draft

CALDAROLA	PIAZZA VITTORIO EMANUELE	BET 1A	OUC DATA

DAILY DENSITY DISTRIBUTION IN OUTDOOR ORGANIZED PER USERS' AGE RANGE



DAILY PERCENTAGE DISTRIBUTION OF USERS PER FAMILIARITY WITH THE B.E.



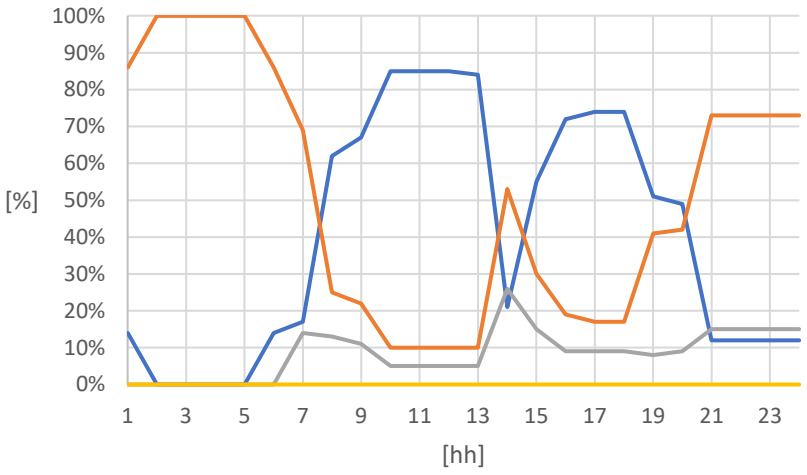
USERS OVERALL NUMBER IN THE B.E.: MAXIMUM AND MEDIAN VALUES

	MAX	50 pctl
WD	1515	526
H	1359	507

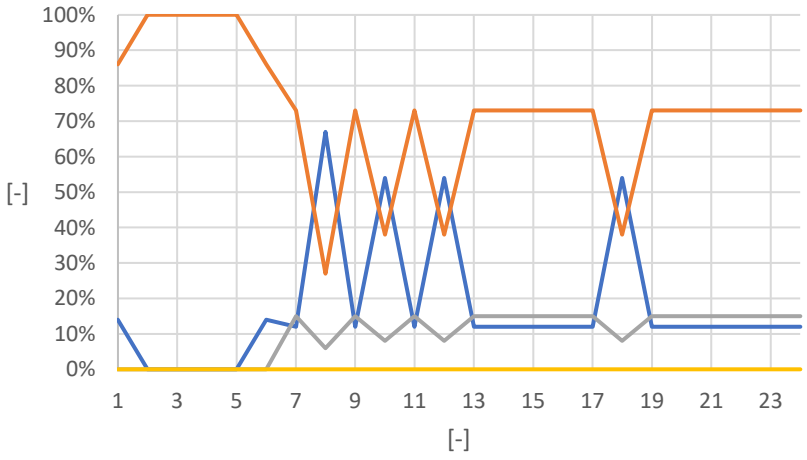
CALDAROLA	PIAZZA VITTORIO EMANUELE	BET 1A	TDC DATA

PERCENTAGE OF USERS ACCORDING TO THEIR FAMILIARITY WITH THE B.E.

Working days



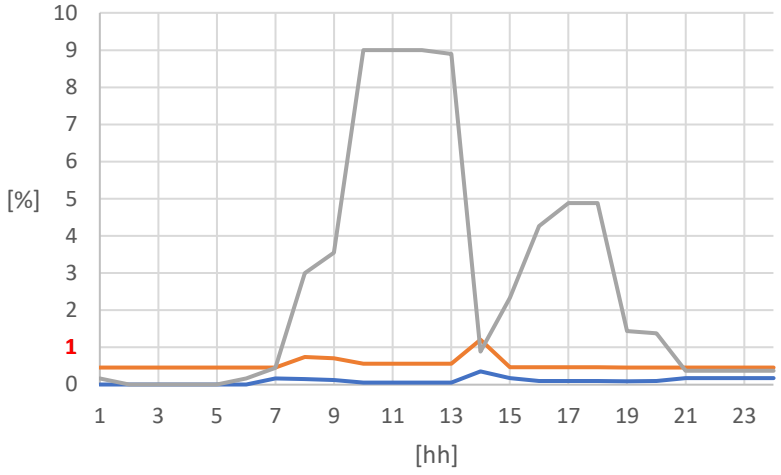
Holidays



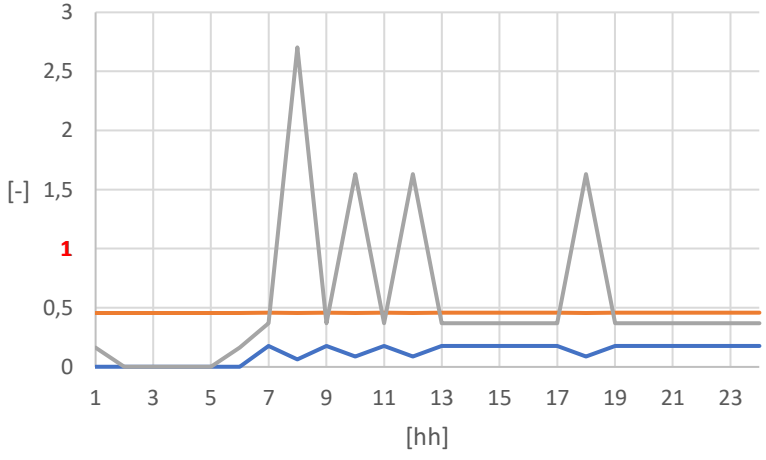
NRp Rp OOp POp

RATIOS BETWEEN SPECIFIC CATEGORIES

Working days



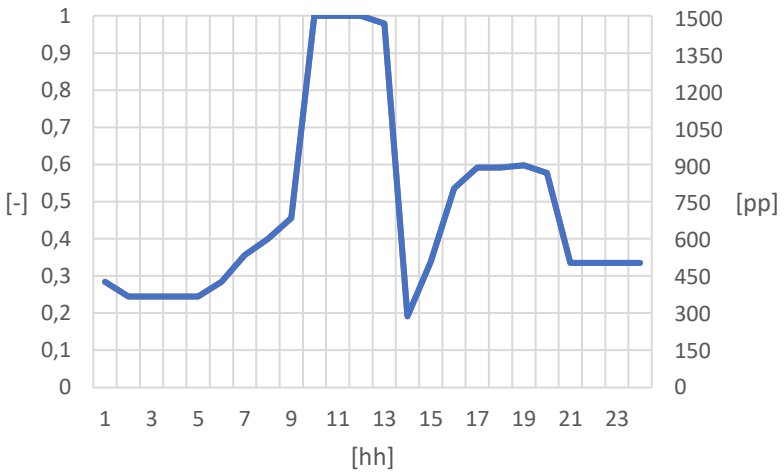
Holidays



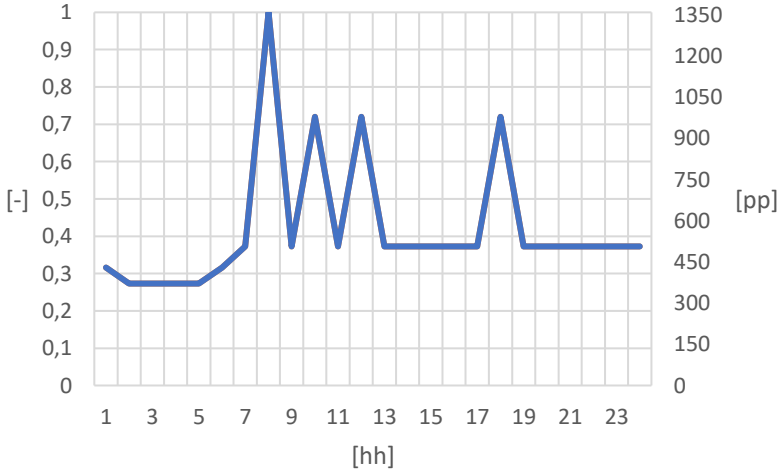
(OO+PO)/(NR+R) (T+PC+E)/(YA+A) (NR+OO+PO)/R

USERS OVERALL NORMALIZED NUMBER

Working days



Holidays



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