Supplemental material – tables and figures

Table A.1: Total number of museums according to official data (Istat) and OSM data

Region	Istat Museum nr.	%	OpenStreetMap (OSM) Museum nr.	%	Difference (OSM-ISTAT)	Share (OSM / ISTAT)
Piemonte	362	8.7%	297	8.3%	-65	82%
Valle D'Aosta	68	1.6%	33	0.9%	-35	49%
Lombardia	361	8.7%	429	12.0%	68	119%
Trentino-Alto Adige	163	3.9%	200	5.6%	37	123%
Veneto	290	7.0%	284	7.9%	-6	98%
Friuli Venezia Giulia	162	3.9%	142	4.0%	-20	88%
Liguria	202	4.9%	207	5.8%	5	102%
Emilia-Romagna	428	10.3%	284	7.9%	-144	66%
Toscana	446	10.7%	337	9.4%	-109	76%
Umbria	140	3.4%	130	3.6%	-10	93%
Marche	303	7.3%	90	2.5%	-213	30%
Lazio	281	6.8%	260	7.3%	-21	93%
Abruzzo	102	2.5%	58	1.6%	-44	57%
Molise	29	0.7%	24	0.7%	-5	83%
Campania	160	3.8%	187	5.2%	27	117%
Puglia	128	3.1%	108	3.0%	-20	84%
Basilicata	37	0.9%	27	0.8%	-10	73%
Calabria	155	3.7%	74	2.1%	-81	48%
Sicilia	175	4.2%	220	6.2%	45	126%
Sardegna	166	4.0%	182	5.1%	16	110%
ITALY	**4158**	**100.0%**	**3573**	**100.0%**	**-585**	**86%**

Data source: Istat and OSM (© OpenStreetMap contributors)

Table A.2: Keys associated with the museums elements on the OSM database

Variable	N	%	Variabile	N	%
x	3573	100.0%	contactfax	16	0.4%
y	3573	100.0%	contactmob	14	0.4%
id	3573	100.0%	short_name	14	0.4%
tourism	3568	99.9%	addrdistrict	12	0.3%
name	3333	95.1%	charge	12	0.3%
addrstreet	1012	28.3%	facebook	12	0.3%
addrhousen~r	848	23.7%	museum	12	0.3%
addrcity	832	23.3%	namees	12	0.3%
wikidata	806	22.6%	nameko	12	0.3%
wikipedia	796	22.3%	addrcityde	11	0.3%
addrpostcode	745	20.8%	addrcityit	11	0.3%
website	726	20.3%	artwork_type	11	0.3%

opening_ho~s	451	12.6%	building	11	0.3%
phone	428	12.0%	descriptio~u	11	0.3%
wheelchair	287	8.0%	nametr	11	0.3%
operator	286	8.0%	commentit	9	0.3%
addrcountry	267	7.5%	contactfac~k	9	0.3%
email	240	6.7%	ele	9	0.3%
source	167	4.7%	namesc	9	0.3%
nameit	158	4.4%	showroom	9	0.3%
description	116	3.2%	addrhamlet	8	0.2%
nameen	109	3.1%	addrstreetde	8	0.2%
namede	77	2.1%	addrstreetit	8	0.2%
fee	73	2.1%	descriptio~t	8	0.2%
fax	69	1.9%	addrneighb~d	6	0.2%
level	69	1.9%	created_by	6	0.2%
namehu	66	1.8%	culture	6	0.2%
note	59	1.7%	internet_a~s	6	0.2%
entrance	50	1.4%	namept	6	0.2%
toiletswhe~r	48	1.4%	old_name	6	0.2%
contactphone	47	1.3%	phone_1	6	0.2%
namezh	45	1.3%	addrsuburb	5	0.1%
loc_ref	44	1.2%	addrunit	5	0.1%
contactweb~e	42	1.2%	bunker_type	5	0.1%
start_date	42	1.2%	contacttwi~r	5	0.1%
alt_name	39	1.1%	fixme	5	0.1%
addrhouse~me	34	1.0%	is_in	5	0.1%
nameru	34	1.0%	layer	5	0.1%
refdatiopen	34	1.0%	military	5	0.1%
sourceurl	34	1.0%	nameuk	5	0.1%
contactemail	30	0.8%	official_~me	5	0.1%
historic	27	0.7%	ref	5	0.1%
addrprovince	22	0.6%	shop	5	0.1%
namefr	22	0.6%	sourcewhee	5	0.1%
addrplace	20	0.6%	addrstate	3	0.1%
amenity	19	0.5%	emailde	3	0.1%
nameja	19	0.5%			
wheelchair~n	19	0.5%			
url	17	0.5%	Other 81 fields with frequency = 1		

Data source: Istat and OSM (© OpenStreetMap contributors)

Table A.3: Examples of inconsistency in the mapping of OSM museums

Possible reason of inconsistency:	Bergamo		Bologna		Roma	
Tagging the container building, villa or garden as a museum	1	8%	2	12%	14	23%
Tagging archaeological areas as museums	0	0%	0	0%	7	11%
Including museums which do not meet eligibility criteria	4	31%	10	59%	22	36%
Mapping art shops and private galleries which are not actual museums	8	62%	3	18%	9	15%
Other reasons	0	0%	2	12%	9	15%
Total OSM-only museums	**13**	**100%**	**17**	**100%**	**61**	**100%**

Data source: Istat and OSM (© OpenStreetMap contributors)

Note: Illustrative experiment conducted in three cities only. The reasons for inconsistency are elaborated by the author and not verified with the OSM community or contributors who created the object

Figure A.1: Museums mapped in both sources, only in official data (Istat) and only in OSM data
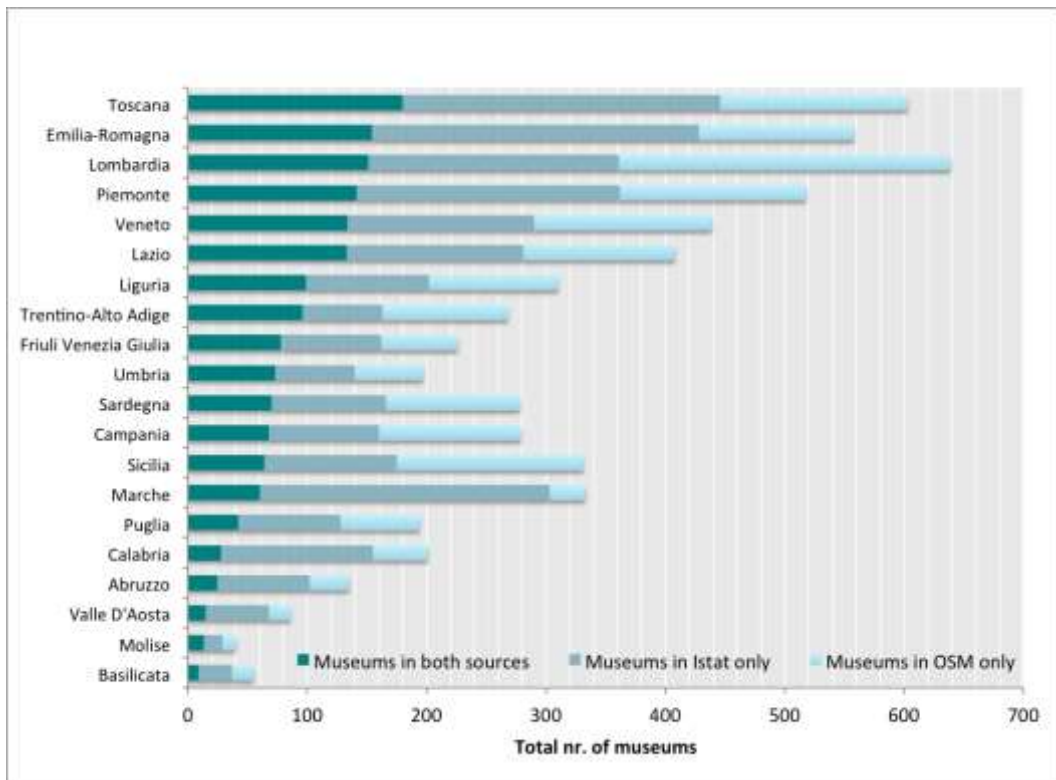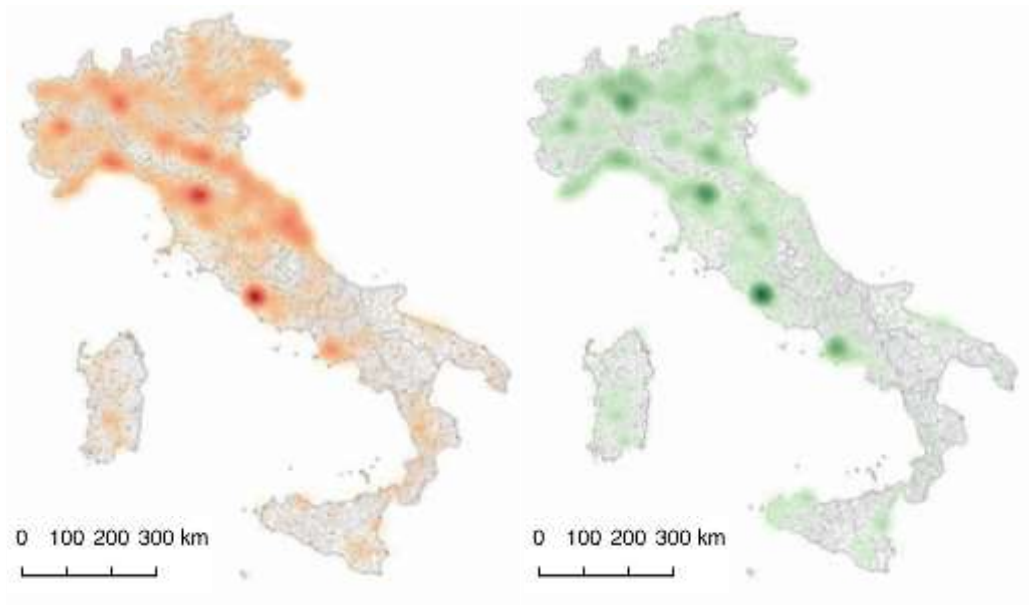

Figure A.2. Examples of museums mapped both as points and as polygons (museum/garden of Boboli, Florence, left; and Regional Museum of Science, Turin, right)
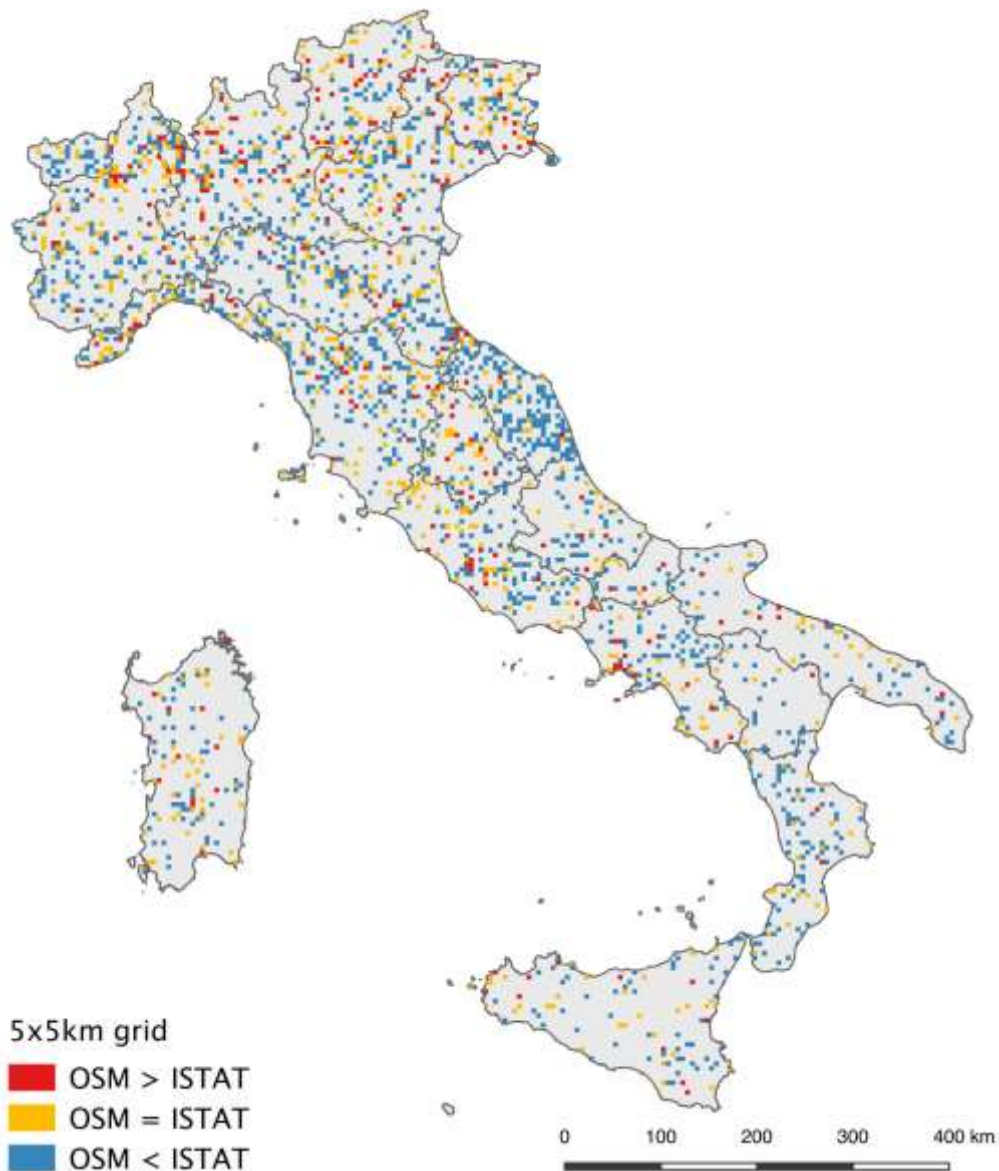

Data source: Istat and OSM (© OpenStreetMap contributors)

Figure A.3: Density of museums (*Kernel Density Estimation*), official data (left - red) and OSM data (right - green)

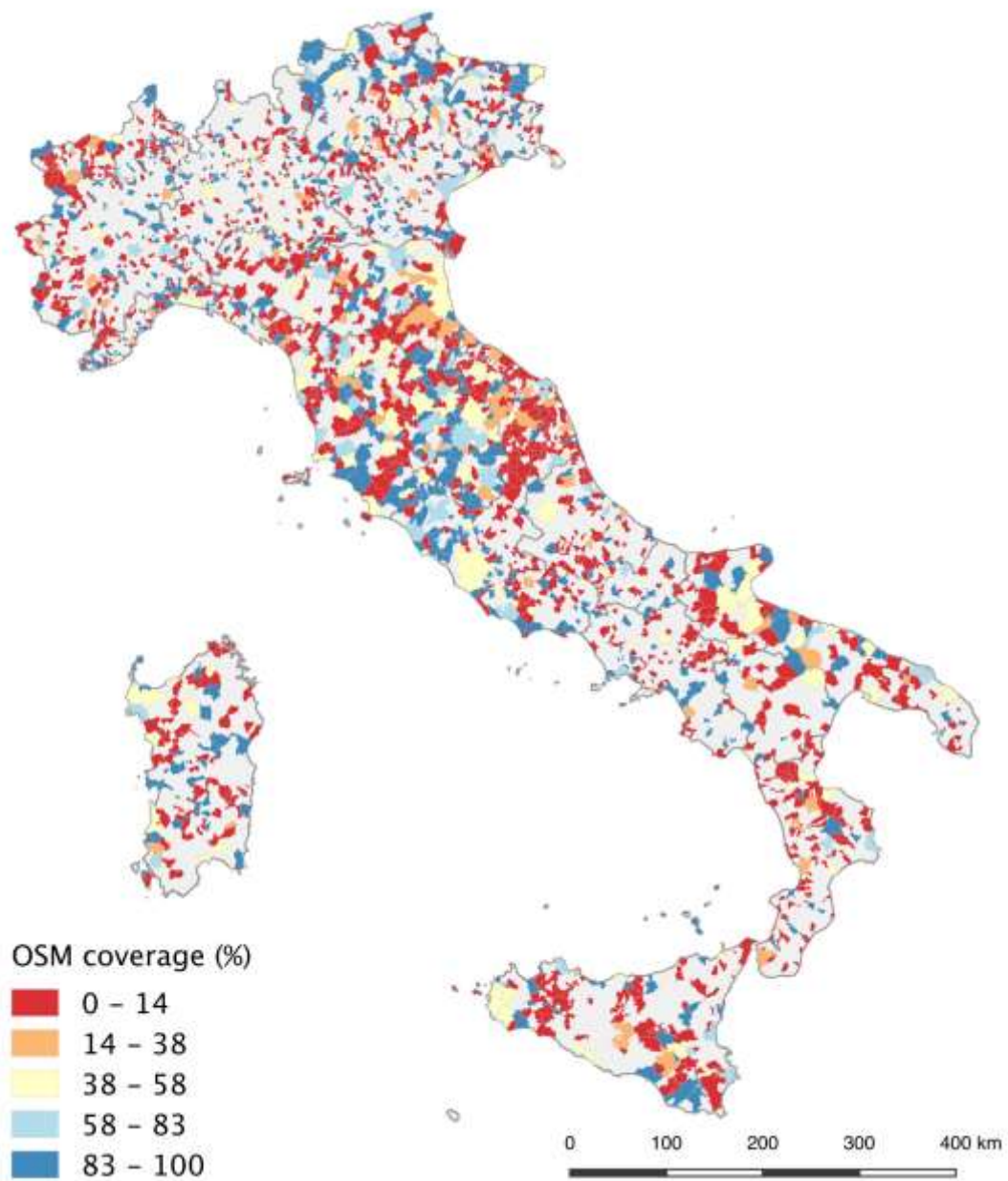Data source: Istat and OSM (© OpenStreetMap contributors)

Fig. A.4: Total number of museums: comparison among OSM data and official data (5km square grid)

5x5km grid

▮ (red)	OSM > ISTAT
▮ (orange)	OSM = ISTAT
▮ (blue)	OSM < ISTAT

0   100   200   300   400 km

Data source: Istat and OSM (© OpenStreetMap contributors)

Caption: 2362 cells contained at least a museum; they accounted for 18% of the total number of cells and covered a 60-thousend square kilometres area. In 40% of those cells (coloured in red) the number of museums was higher in OSM than in official data. The cells in which the OSM source was lacking (coloured in blue), were mostly located in the inland areas of Marche, Emilia-Romagna and Tuscany in Central Italy, Piemonte in Northern, Lazio, Abruzzo and Calabria in Southern. Agglomerations of orange/red cells were evident around the main urban areas (such as Rome, Naples, Milan, Turin etc.) and in a horizontal band lying across northern Italy

Figure A.5: OSM coverage in Italian municipalities

OSM coverage (%)
- 0 – 14
- 14 – 38
- 38 – 58
- 58 – 83
- 83 – 100

Data source: Istat and OSM (© OpenStreetMap contributors)

Figure A.6: Point data: Istat museums (red circles) and OSM museums (green squares)