

Rome Ancient Walls Satellite Monitoring Project



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MISSION AND ACTIVITIES

Management, conservation and enhancement of all historical, artistic, and archaeological properties of the Municipality of Rome



MUSEUMS - MONUMENTS

ancient, medieval
modern, contemporary



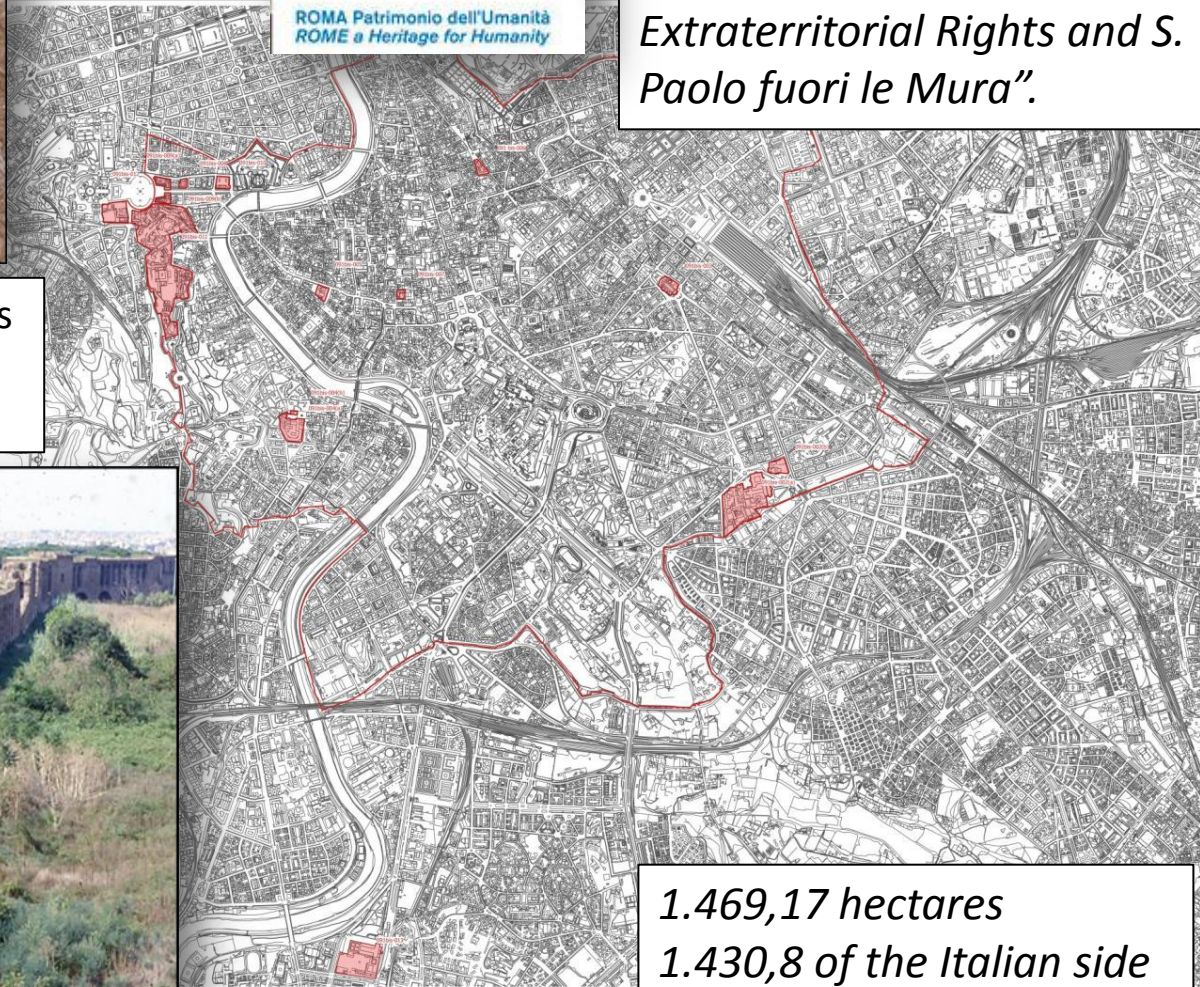
THE UNESCO SITE OF ROME AND THE AURELIAN WALL



The ancient circuit, with 18 main gates and 383 towers, ran for 19 km surrounding an area of 13.7 Km²



“The Historic Centre of Rome, the extraterritorial properties of the Holy See in that City enjoying Extraterritorial Rights and S. Paolo fuori le Mura”.



1.469,17 hectares
1.430,8 of the Italian side
38,9 of the Vatican State



CONSERVATION AND MANAGEMENT OF URBAN ARCHAEOLOGICAL HERITAGE

Critical elements

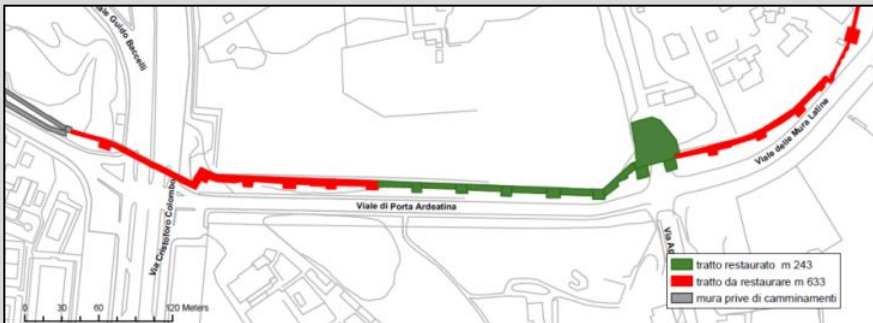
Environmental factors (Pollution, Climate/micro-climate, Vegetation and chemical/biological agents, Earthquakes, Water damage, Geological substrate)

Anthropic factors (Phases and construction techniques, Demolition and cutting for urban expansion, Ancient and modern conservative interventions, Superstructures, Vandalism)

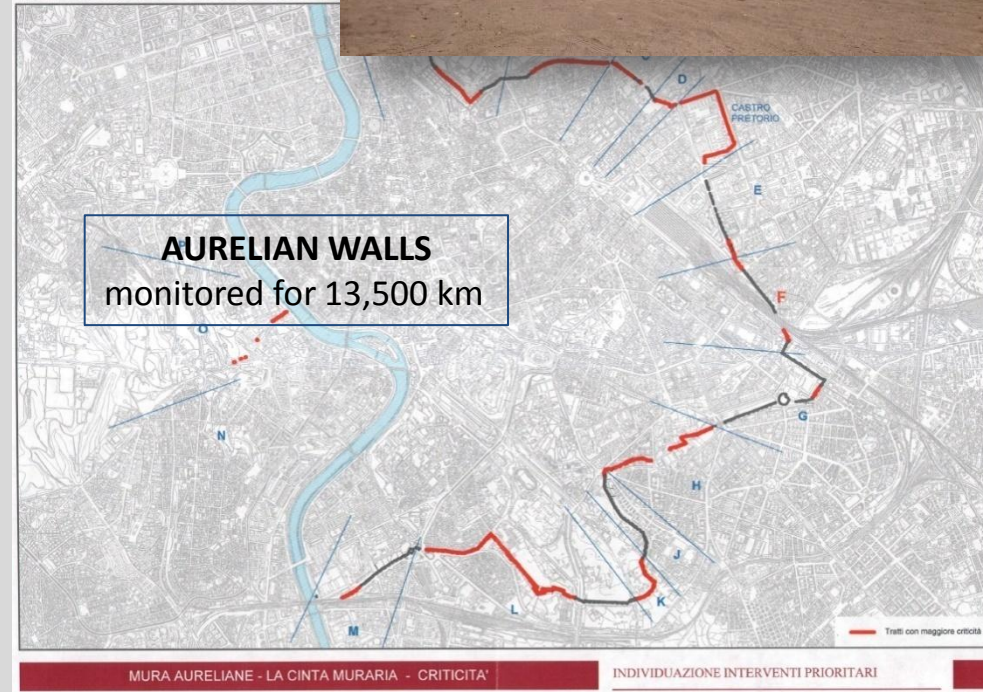
«Progetto Osservatori» G.I.S. A Risk Map of the Walls



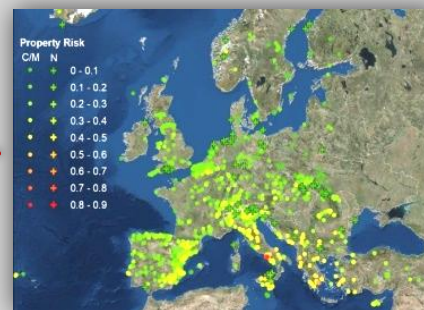
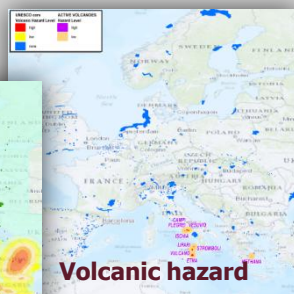
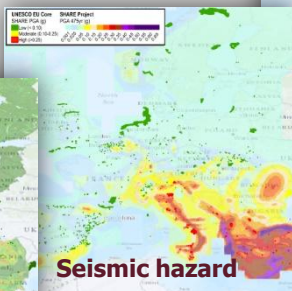
Collapse (2007)
and restoration



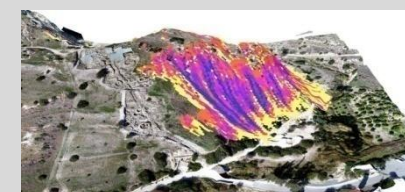
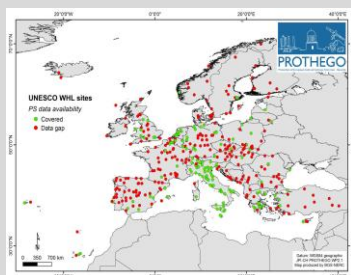
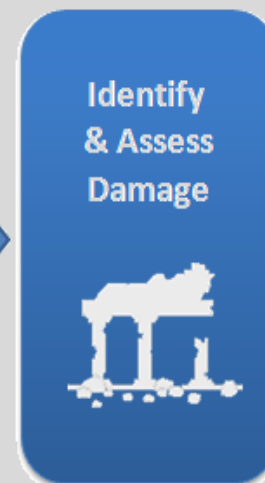
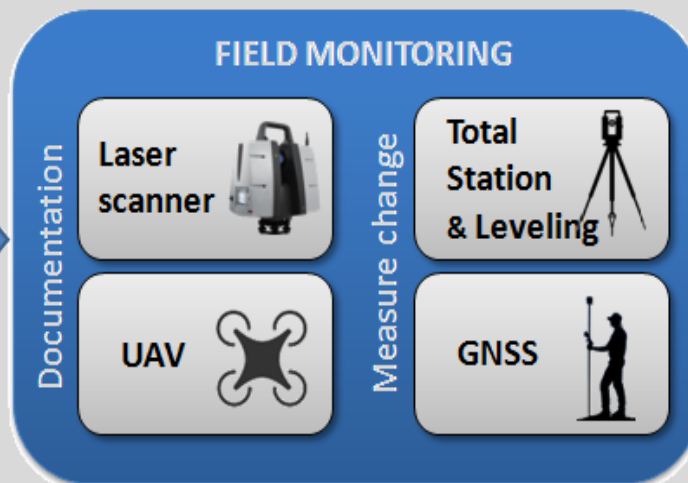
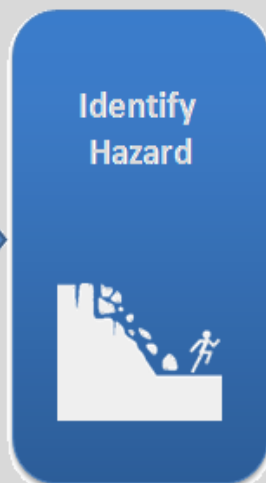
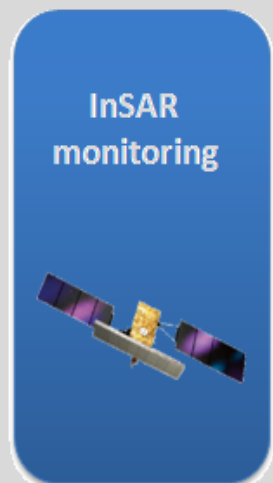
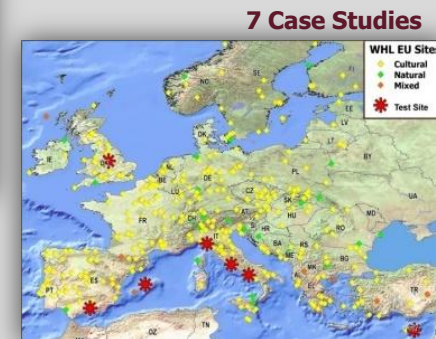
in red: high risk!



THE PROTHEGO METHODOLOGY



Property RISK INDEX



THE ROME WALLS CASE STUDY

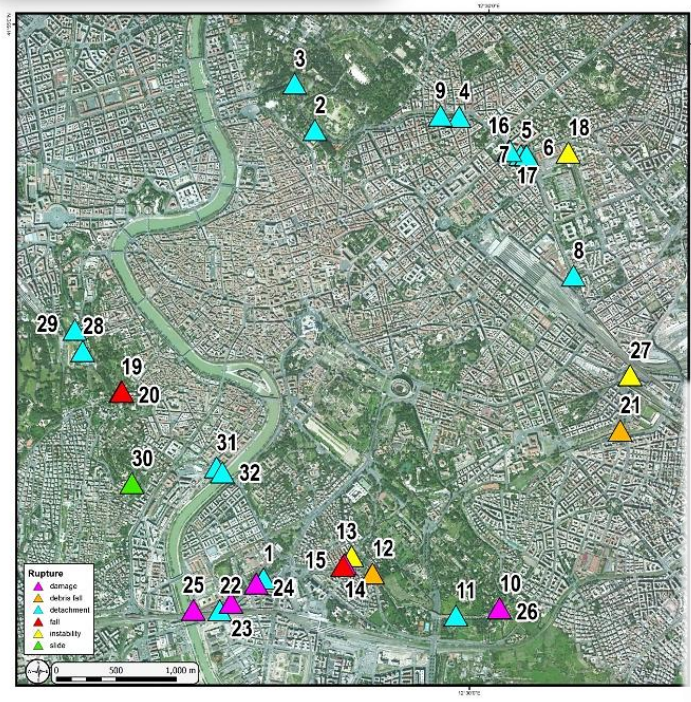
from *Progetto Osservatori* Report ...

SETTORE K	Via delle Mura Latine (da K01 a K13)	SCHEDA 10
Localizzazione	Fronte esterno: Via delle Mura Latine da Porta latina a porta S. Sebastiano Fronte interno: Via di Porta Latina Fronte di Porta S. Sebastiano: Proprietà Private	
Accessibilità	Fronte esterno: accessibile Fronte interno: accessibile Piazza di rispetto all'interno della proprietà privata Rappresentanza del Brasile presso la FAO Ambasciata del Canada presso la S. Sede Proprietà Barbara S.r.l.	
Praticabilità	Camminamento: Pericoloso in parte Interno torri: pericoloso da K01 a K07-K08 non in sicurezza accesso dal Museo delle Mura da K03 a K13 to parte	
Uso attuale	Camminamento: non utilizzati Interno torri: non utilizzati Torre K13: Depositi/magazzini del Museo	
Opere provvisorie	Fronte esterno: Recinzione provvisoria per pericolo	
Area a verde	Fronte esterno: degradata Fronte interno: degradata nelle aree non incluse nelle proprietà private	
Criteri	Fronte esterno: Sicurezza Fronte interno: Sicurezza Camminamenti: Sicurezza	
Dati dimensionali medi	lunghezza: m 450 h: m 11 Fronte esterno: m 11 Fronte interno: m 11	
Somma dei costi "al netto dell'IVA"		
Lavori		€ 3.700.000,00
Oneri per la sicurezza		€ 350.000,00
Somme a disposizione per opere in economia (IPE - Rimborsi a fattura)		€ 450.000,00
TOTALE GENERALE		€ 4.500.000,00
Stima dei tempi	750 gg	

Attributes:

- Date
- **Typology**
- Dimensions
- Causes
- Wall element
- Intervention
- Responsible

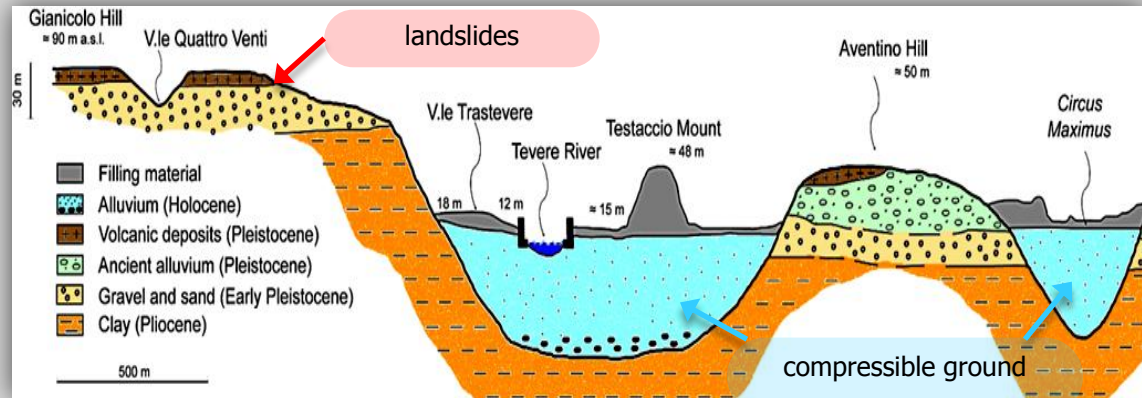
... to Damage Inventory



Rupture Typology:

- ▲ damage 7
- ▲ debris fall 3
- ▲ detachment 16
- ▲ fall 2
- ▲ instability 3
- ▲ slide 1

Geo-hazards

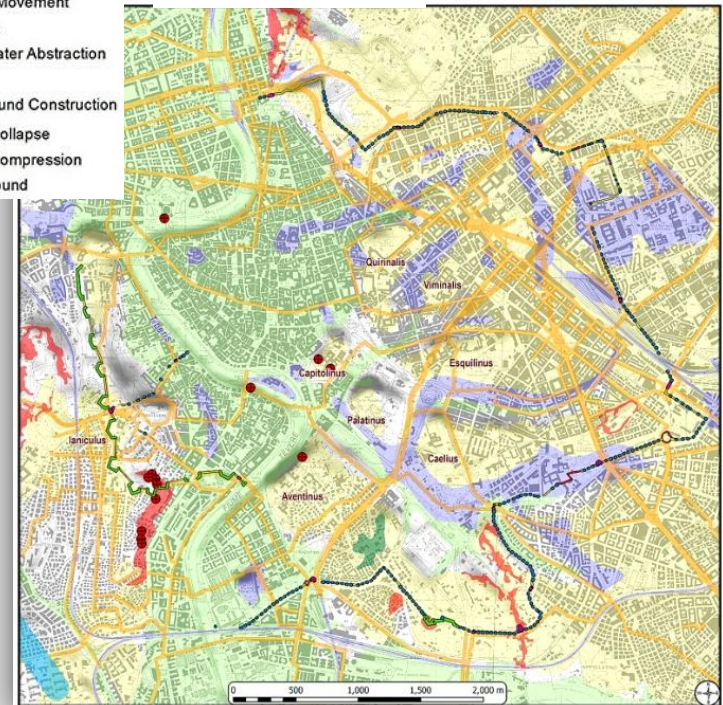


PanGe

ISPRA

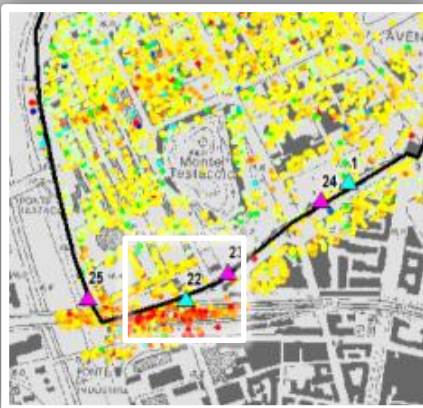
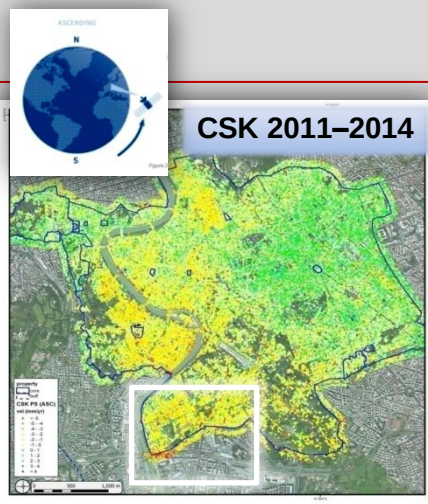
ISPRA - Frane Roma

- Tectonic Movement
- Volcanic Movement
- Landslide
- Groundwater Abstraction
- Mining
- Underground Construction
- Ground Collapse
- Ground Compression
- Made Ground



PS INSAR MONITORING

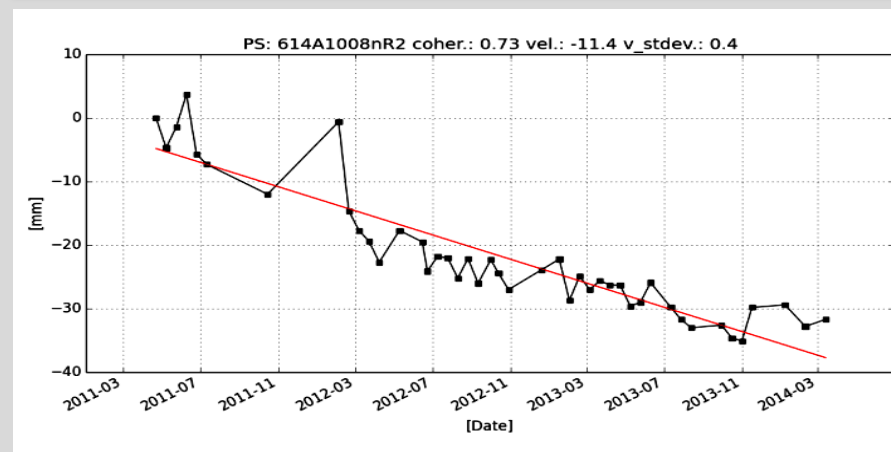
CSK 2011–2014



Wall cover detachment due to train transit on the railway.
Restored in 2012.

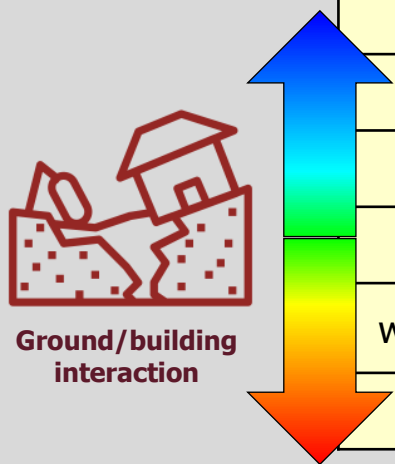


ID 22	# of PS	Vel.	STD	Coherence
50m buffer	66	-3.60	0.27	0.78
614A1008nR2	1	-11.04	0.40	0.73



THE ROME WALLS RESULTS

Count of damages by displacement and timing compared to PS dataset timespan (2011-2014)



Ground Displacement		Rupture period					
<i>style</i>	<i>mm/yr</i>	pre	in	post	along	susceptible	none
uplift	> 3	1					1
weak uplift	$2 \div 3$						
stable	$-2 \div 2$	2		1	3	2	1
weak lowering	$-2 \div -3$		2		1	1	1
lowering	< -3		2		2		6

- ➡ DInSAR analysis provide a large number of site-wide displacement measurements (PS) with small cost and without impact.
- ➡ PS are proxy data useful to define warning tresholds and to build site scale early-warning systems.
- ➡ Ongoing and future high resolution monitoring allows stakeholders to properly plan interventions, as restoring and mitigation.
- ➡ The good results foster the improvement of multidisciplinary approach.

Thank You!



<http://www.sovrintendenzaroma.it/content/progetto-osservatori-un-gis-il-monitoraggio-dei-monumenti-di-roma>

<http://www.prothego.eu/>

