

The protection of the monument patrimony against the seismic risk.

Terms of the problem

For an evaluation of the monument patrimony vulnerability

The antiseismic adaptation of the enormous patrimony of architectural beauties existing in Italy request certainly huge investments though divisible in a long period. The start of a credible protection politics of the monument patrimony against the seismic risk makes therefore necessary the identification of precise criteria of priority to programm forms, times and costs of such an intervention. Deferring a realistic evaluation of times and costs to later researches, for whom indispensable results the involvement of the adequate political and administrative instances, I have indicated in a list the criteria on whose grounds it is possible to identificate the zones of more immediate emergence, that's of greater risk for the monument patrimony and which therefore should be a prior object of intervention.

The indication of such criteria can be derived from the study of three significant parameters :

- the vulnerability (that's the different degree of preservation) of the monument patrimony ;
- the seismicity of the national territory ;
- the territorial distribution of the monument patrimony.

It is well understood that the urgency of antiseismic protective interventions will be greater in those zones where the combination of three parameters provides higher values. Here we think it right to probe with greater breadth than in the catalogue the fundamental concepts that have presided over the evaluation of the vulnerability. In the following contribution (see § 3.3) are illustrated in detail the methodologies of characterization and calculation used.

1. FACTORS THAT INFLUENCE THE VULNERABILITY

It is plain that under the same conditions of telluric stirrings not all the buildings suffer identical damages. On the contrary (omitting to consider the variable that comes from the different geological structure of the soils for which general available data don't exist) the damages are strictly connected to some physical features of every building.

Omitting also the detailed analysis of some elements, also meaningful but hardly valuable in a general study type, as for example : the typological characteristics of the buildings, the dissymetry elements, the constituent materials, the state of the building textures. The attention should be paid to the possibility of analyzing the determining factor for the seismic-vulnerability, that is to the resistance to the dynamic inducted actions. Such a factor is given by the preservation state of the physical structures constituting the building, that is from the cohesion state of the materials that constitute it.

2. DIRECT VULNERABILITY RELIEF

Because of the lack, still nowadays, of a national monument inventory it is even clearer because it lacks an organic corpus of information on their preservation « on the field » and that is by campaigns of direct relief led by every Superintendance in its own territory district. To this aim, in a later contribution (see § 3.4), it is illustrated a schedule pattern available for large relief campaigns of the preservation state and so of the seismic vulnerability of the single buildings. It is nevertheless clear that, even having at our disposal such a synthesis instrument, the acquisition of such detailed information — if they are referred to the entire national patrimony — could occur only in very long times.

3. INDIRECT RELIEF VULNERABILITY

To the object of this study, it has been necessary to gain an instrument that permits, from now on to outline which are the national territories in which the monument patrimony is more probably more degraded on the analogy of what is possible to ascertain in general for the historical building patrimony. Such a relief has been carried out using as a source the data of the ISTAT Census 1971.

However in fact from the Census ISTAT, we don't get information on the preservation state of the monument patrimony, this is possible for what regards the larger audience not specific category of the « inhabitable historical patrimony ».

It will be better to specify that by monument patrimony we mean the edifices category of high historical-artistic interest and with different use destination, which constitutes the earliest built texture of the historical centres and the territory. These meanings are here used only for a practical exposition that's without any pretention of scientific definition or of value classification.

Going back on the ISTAT Census, the houses are classified for their building age and exactly : houses built before 1919 ; between 1919 and 1945 ; between 1945 and 1960 ; houses of unknown age. Most likely the inhabitable patrimony whose we are interested in knowing the vulnerability, ist likely to coincide with the indication : « built before 1919 », firstly because that date is far from us a time slightly above fifty years, that, according to the law, constitute the minimum age, in order that a building can be considered « endowed » of historical-artistic importance. Secondly, because, in a country as Italy, that has felt very late the effects of the Industrial Revolution, the 1919 date can be a *post quem* date for the diffuse employment of building technologies based on modern materials like iron and reinforced concrete. Thirdly because it doesn't exist any other type of deeper relief with chronological delimitations more reliable than those mentioned.

It is so identified the research field from which we can extract data extensible, with good approximation, to monument patrimony. It is in fact likely that in those areas of the country where the inhabitable historical patrimony comes out to be in a bad preservation state, for reasons we cannot exactly identify, but however related to local situations of depopulation and economic stagnation, even the monument surfaces feel the effects of an analogue state of debasement.

It must be noted, besides, an even limited « zone of juxtaposition » between the two classes of patrimony (inhabitable buildings of high historical-artistic interest).

Besides there is to observe a certain constant of quantitative proportions between the two classes (in the communes with an elevated number of monument edifices a large presence of historical inhabitable patrimony is noticeable).

It is not to be disregarded that the indications here gained on the vulnerability of the historical inhabitable patrimony, constitute data immediately available from the local administrations, whose concern are the urban-building administration and the planning and the incentive to the relative interventions of functional and structural recovery.

The investigation on the vulnerability of the historical inhabitable patrimony of all the Italian communes has been freely realized by the CRESME for the present occasion (see the contribute cited above § 3.3).

4. CONCLUSIONS

From the research has been deduced a cartography of the vulnerability that makes emerge substantial confirms, in comparison with what it could be supposed and that's the building debasement is greater in the areas of the South and the Center than in the North : Besides the entire map obtained is not of the « leopard skin » type but it rather presents concatenations among areas of the same debasement. Lastly it is quite interesting to observe a certain coincidence between debasement and orographical course. The vulnerability, in other words, tends to increase in the mountain zones, above all in the appenninical zones, above all central-southern. Because such zones are very often affected also by high seismic dangerousness, we are tempted to venture the hypothesis of an almost partial causal dependence of the first phenomenon on the second one. But besides this hypothesis that would be hard to verify, we observe, however, a frequent and worrying copresence of two of the factors that contribute to make the seismic risk elevated (see All. 1).

NATIONAL AND REGIONAL DATA

REGIONS	Number of Townships	Number and regional proportion of townships with level vulnerability						Not Classified
		Low		Medium		High		
		Number	% Regional	Number	% Regional	Number	% Regional	
Piemonte	1.209	360	29,8	330	27,3	519	42,9	
Valle d'Aosta	74	21	28,4	21	28,4	32	43,2	
Lombardia	1.546	902	58,3	351	22,7	293	19,0	
Trentino Alto Adige	340	187	55,0	93	27,4	60	17,6	
Veneto	582	177	30,4	172	29,6	233	40,0	
Friuli Venezia G.	219	47	21,5	68	31,1	103	47,0	1
Liguria	235	114	48,5	64	27,2	57	24,3	
Emilia Romagna	341	113	33,1	115	33,7	113	33,1	
Toscana	287	98	34,1	101	35,2	88	30,7	
Umbria	91	16	17,6	25	27,5	50	54,9	
Marche	246	51	20,7	61	24,2	134	54,5	
Lazio	374	142	38,0	98	26,2	134	35,8	
Abruzzi	305	42	13,8	71	23,3	192	63,0	
Molise	136	21	15,4	24	17,6	91	66,9	
Campania	544	145	26,7	133	24,4	266	48,9	
Puglia	252	66	26,2	53	21,0	133	52,8	
Basilicata	129	27	20,9	22	17,1	80	62,0	
Calabria	408	71	17,4	69	16,9	268	65,7	
Sicilia	382	99	25,9	107	28,0	173	45,3	3
Sardegna	356	62	17,4	76	21,3	218	61,2	
Italy Total	8.056	2.761	34,3	2.054	25,5	3.237	40,2	4

DATA FOR FOUR TEST PROVINCES

PROVINCE	Number of Townships	Number and percentage of level of township vulnerability					
		Low		Medium		High	
		Number	%	Number	%	Number	%
Ancona	49	15	30,6	16	32,7	18	36,7
Perugia	59	10	16,9	18	30,5	31	52,5
Laernia	52	8	15,4	9	17,3	35	67,3
Salerno	157	48	30,6	44	28,0	65	41,4

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