The Italian Construction Sector Scenario between Economic Crisis and the Need for More Energy Efficiency

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Abstract: The paper presents the main aspects of contemporary Italian scenario of construction sector, underlying the importance of renewal in the next years, especially concerning energy efficiency retrofit. Moreover, the paper includes two important case studies in Italy, housing and schools buildings, which both present great needs of refurbishment.

Key words: Construction sector, refurbishment, energy efficiency, housing, schools.

1. Introduction

The construction sector in Italy is nowadays emerging from a deep economic crisis, which started back in 2007 and only recently seems to get close to the end. The last 10 years, in fact, has been some of the most negative since the end of the World War II, with a percentage of -36.5% as investments. New residential constructions, moreover, between 2007 and 2017, decreased of almost 29%; on the other hand, during the same period, extraordinary maintenance was the only increasing subsector, with a percentage of almost 21%. This is particularly important, since the Italian building stock is, on the average, quite old and with low energy performances. Most of the buildings in Italy were actually built before the first laws concerning energy efficiency; these buildings still represent one of the biggest parts of national energy consumption.

Together with the need of a deep and wide rethinking of the entire construction sector, energy renovation seems to be the “main path” for the forthcoming years; not only thanks to the Energy Efficiency Directive (2012/27/EU), which asks to

“establish a long-term strategy for mobilizing investment in the renovation of the national stock of residential and commercial buildings, both public and private” [1], or because recent studies identified in the retrofit of residential sector the largest potential for energy saving, but also because this would mean, especially in Italy, a new start for the construction sector, a great decrease of energy consumption and an increasing of internal comfort.

The paper presents the actual Italian scenario of construction sector, especially concerning the economic situation and the energy consumption, and presents some future trends that could help to step away from the crisis.

2. A Deep Crisis

Like other European countries, the construction sector in Italy during the last decade passed through a period of deep crisis. Historically, construction industry is among the ones that most contribute to the national economy, for example in terms of percentage of GDP (more than 8%) [2], and workforce.

The same construction sector, however, more than 10 years ago entered a tunnel from which it seems going out with great difficulty. Some recent signs of recovery give the impression that construction industry

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is restarting, but it is also important to remember some “endogenous” factors that do not really help this sort of re-beginning.

Firstly, a low level of innovation, both of product and processes; secondly, the role of greatest responsible for national energy consumption, a role that unfortunately is coherent with European data. But what seems more important, this role has not even been abandoned during the years of economic crisis, that strongly slowed down the entire construction sector, but not its contribution to environmental problems.

It is clear that Italian building industry needs a deep rethinking, able to bring it close, if not in a short time, at least in the near future, to more advanced sectors (e.g. car or telecommunication). The direction that must be taken by the sector as a whole, that could help the industry entirely going out from the crisis, comes out clearly by the analysis of data, such as year of construction of buildings, condition of housing stock, lack of maintenance, energy performances, etc.

By the analysis of the industry, however, it appears quite noticeable what European Union already identified: the huge potential in terms of energy savings that the existing building stock represents, that means also more employees, considering the numbers of people working in construction industry and linked ones.

3. State of the Art of Constructions in Italy: Crisis, Trends and Energy Consumption

The crisis in the construction sector started back in 2007, at the beginning of the global economic crisis.

Even worse, at that time the construction industry in Italy had the benefit of one of the most positive period of the last decades.

During the same period of time, the situation of people employed in the construction industry was equally dramatic: in fact, data show a decrease of almost 28.8% of people working in the construction industry between 2008 and 2017 (see Table 1) [2].

Data are really severe also concerning total investments in construction, that, between 2007 and 2017, decreased of 36.5%; new residential constructions, moreover, decreased of 64.2%. During the same period of time, on the other hand, extraordinary maintenance in housing was the only increasing subsector, with a percentage of almost 21% (see Table 2) [2].

This is particularly important, since the Italian building stock is, on the average, quite old, with a low energy efficiency; most of the buildings, in fact, (almost 65%) were built before 1976, that means before the first laws concerning energy efficiency. This is one of the reasons why buildings represent one of the biggest part of national energy consumption. Data of 2016 show that the civil sector (residential and non-residential) is the greatest responsible for national energy consumptions (39.4%), followed by transport (32.0%) and industry (21.0%) (Fig. 1) [3]. Even more important is the trend of the last years: observing, in fact, the trend of all sectors between 1990 and 2016, the only two sectors with increasing consumptions are civil (+40.7%) and transport (+14.3%) [3].

Table 1 Workers in construction industry (thousands).

Years	Employees	Free lances	Total	% variations compared to the same period of the previous year		
2008	1,238	714	1,953			
2009	1,197	720	1,917	-3.4	0.8	-1.8
2010	1,169	720	1,889	-2.3	0.1	-1.4
2011	1,098	693	1,791	-6.1	-3.7	-5.2
2012	1,033	667	1,700	-5.9	-3.8	-5.1
2013	919	634	1,553	-11.0	-5.0	-8.6
2014	861	623	1,484	-6.3	-1.8	-4.4
2015	864	605	1,468	0.2	-2.9	-1.1
2016	840	563	1,404	-2.7	-6.9	-4.4
2017 (first 9 months)	852	563	1,416	-0.4	-0.4	0.1

Table 2 Investments in construction. (°) Estimation.

	2016 (°) millions of euro	2014	2015	2016	2017	2018 (°)	2017-2007 (°)
		Quantity variations (%)					
Constructions	122,727	-6.8	-1.0	-0.7	-0.1	2.4	-36.5
Housing	66,090	-7.1	-0.3	-0.3	0.1	1.7	-28.9
- new	19,584	-21.7	-2.1	-3.3	-0.7	2.8	-64.2
- extraordinary	46,505	1.5	0.5	1.0	0.5	1.3	20.9
Maintenance (°)							
Other	56,637	-6.5	-1.8	-1.0	-0.4	3.2	-43.4
- private	33,171	-7.5	-4.3	1.7	1.5	3.7	-36.8
- public	23,466	-5.1	1.9	-4.7	-3.0	2.5	-50.3

Fig. 1 Final energy consumption by sector in Italy, 2016.

All the previous data leave no space for interpretation. The construction sector is, nowadays, going out from such a deep crisis that seems really hard to return to the previous performances, in terms of profits, employees, etc., especially in a short time. Moreover, together with the need of a wide rethinking of the entire construction sector, energy retrofit seems to be the most important way for the upcoming years, for several reasons:

- The Energy Efficiency Directive (2012/27/EU), as already seen, asks to “establish a long-term strategy for mobilizing investment in the renovation of the national stock of residential and commercial buildings, both public and private”;
- Recent studies identified in the retrofit of residential sector the largest potential for energy saving;
- This would mean, particularly in Italy, a restarting

of the construction sector, a great decrease of energy consumption and an increasing of internal comfort.

As seen, extraordinary maintenance is the one and only sector that grew in the last ten years as investments (see Table 2). Moreover, at the moment, refurbishment sector represents the greatest part of the entire production value of constructions and it seems to remain the same for years to come.

4. The Refurbishment Sector

According to the study of Chamber of Deputies, Environmental Department and CRESME, dated 2017, the value of production in construction sector in 2016 was 166.2 billions of euro (it was 163.1 in 2015 and 162.0 in 2014). The study subdivides this value into three areas: *new*, *refurbishment* and *renewable plants*, that amount respectively 43.0, 121.6 and 1.6 billions of

euro. Moreover, the refurbishment sector is divided into *ordinary maintenance* (36.2 billions) and *extraordinary maintenance* (85.4 billions). The sum of these two subsectors gives the whole of the refurbishment sector in Italy (121.6 billions of euro), equivalent to 73.1% of the total (Fig. 2) [4].

It is also important to underline that in 2006, considering this one as the last year of the growing period of construction sector and the “peak year” during the first years of 2000s, the refurbishment sector was equivalent to only 55%.

According to CRESME, on a previous document concerning the same subject, the importance of refurbishment will remain high for years to come, as a result of certain factors, including:

- The strong decreasing of new constructions leads to an increase of buildings ageing and of the obsolescence of their components;
- The “customization” of the property subject to sale;
- The evolution of the European regulations, even for what concerns the energy performance;
- The renewal of tax deductions [5].

The European Commission showed which direction Europe should take during next years to increase energy savings, especially concerning buildings: “The greatest energy saving potential lies in buildings. The plan focuses on instruments to trigger the renovation process in public and private buildings and to improve

the energy performance of the components and appliances used in them. It promotes the exemplary role of the public sector, proposing to accelerate the refurbishment rate of public buildings through a binding target and to introduce energy efficiency criteria in public spending. It also foresees obligations for utilities to enable their customers to cut their energy consumption” [6].

Italy, such as during the last years, continues the energy building refitting policies trough tax deduction also for all 2018 [7]. Among the available measures there are:

- The tax deduction of 65% for thermal insulation of external walls, heat pumps, building automation systems, solar collectors for hot water and hybrid generators;
- The tax deduction of 70% and 75% for condominiums;
- The deduction of 50% for substitution of windows, solar shadings, biomass and condensing boilers;
- Finally, the law extended the 65% deduction for one year, expiring December on 31st, of the costs for actions relating to the adoption of anti-seismic measures.

This is the situation, right now, concerning the Italian construction sector. Having in mind all the previous data, it is quite clear that refurbishment and energy requalification are essential to keep, maybe not healthy, but at least “alive”, the building sector.

Fig. 2 Production value in construction, 2016 (billions of euro).

This is also the reason why building materials and components producers, in the last few years, showed a strong interest in refitting, implementing the number of building products designed for the refurbishment sector [8].

Many studies, for example, underline the great potential that lies beneath the replacement of windows, at the moment one of the greatest lack in thermal performance of buildings. The replacement of windows, all over Europe, could result in a significant increase of energy performance, such as fuel consumption and emission of greenhouse gases. Based upon these, many producers developed products for the refurbishment market, both new windows and frames to be installed over the old ones. For example, the market offers today PVC frame with reduced section specifically designed to be installed directly over the wood frame of existing windows, a solution that limits the invasiveness of the operation. Similarly, thermal insulator producers developed different products for the improvement of the thermal performance of the building, particularly reducing the thickness of materials. Aerogel is one of these, a material with a nano treatment that can reach very high level of thermal insulation in a few centimeters of thickness (Fig. 3).

5. Two Case Studies: Housing and Schools

The Italian housing stock is a good example of the average state of conservation of buildings, since it represents the great majority of buildings [9-11]. According to the 15th national population and housing census of 2011, buildings and complexes of buildings are 14,515,795 units, grown of 13.1% compared to 2001 census. Among these, residential units are 12,187,698 units, grown of 8.6% compared to 2001. 25% of the entire housing stock was built before 1946; in particular, 1,832,504 buildings (equivalent to 15% of total housing buildings) were built before 1919 [12] (Fig. 4).

Investments in housing, as seen, had a major decrease between 2007 and 2017 (-64.2%, estimated), turning the tide of the previous decade [4] (Fig. 5). On the other side, investments in housing refurbishment were 38% of total, confirming the trend of the previous years [2].

According to CRESME, 49.6 billions of euro in 2016 were related to extraordinary maintenance in the housing sector; again, the same study underlines that extraordinary maintenance increased, during the period between 2006 and 2016, from 38 to almost 50 billions of euro [4]. Based on this, it is possible to assume that

Fig. 3 Spaceloft®, low thickness thermal insulator with Aerogel. Producer: Aspen Aerogels. (Photo: Aktarus Group S.r.l.).

Fig. 4 Italian housing stock, age.

Fig. 5 Investment in housing.

refurbishment and maintenance sectors will continue to be crucial also in the next future [5] (see Table 3).

School buildings are another important sector that needs a major planning for refurbishment and improvement in energy efficiency [13]. The need for a comprehensive program of redevelopment of school buildings comes straight from the Italian Central Government: “The political agenda is built and must

been built particularly on a vision and a model of society: in this case, a society where the educational system becomes the most effective leverage for the State and for citizens to achieve more important political targets: a civil growth, an economic development and a social equity. These are three tasks, starting from education, but not exclusively contained in it, that politicians can and should pursue, especially in these times” [14].

Table 3 Housing in buildings more than 40 years old, percentage on the total.

	2011	2021
Metropolitan town	76.2%	85.2%
Capital town	68.7%	79.7%

Table 4 Schools, year of construction.

Construction year	
Before 1800	1%
1800-1899	3%
1900-1920	4%
1921-1945	8%
1946-1960	12%
1961-1975	27%
Since 1976	32%
No data	14%

School buildings in Italy are, on the average, in a poor condition. According to the *Italian Anagrafe dell'Edilizia Scolastica* and some other studies (Legambiente, Tuttoscuola, Cittadinanzattiva), many factors (safety, security, energy efficiency, etc.) are not sufficient to guarantee a sufficient quality condition to users, especially for children. 55% of schools, for example, were built before 1976, which means—such as housing—before the first laws about seismic safety and about reduction of energy consumption (see Table 4).

Other important factors say a lot about the average condition of Italian schools. For example, the presence of static testing certification, which according the Legambiente only 53.7% of schools have [15]; even worse is the situation concerning the seismic safety: according to ANCE/CRESME, schools in seismic areas are 24,073, and those in hydrogeological critical areas are 6,251 [16].

Energy efficiency aspects are particularly important. Even if the use of renewable resources in school buildings is increasingly (from 13.5% in 2012 to 18.2% in 2017), and the percentage of energy obtained from renewables sources is 59.0%, the percentage of school designed using bioclimatic criteria is only 0.9% [15]. This last data is relevant to understand how much still needs to be done for the energy efficiency improvement of school buildings.

6. Conclusion: The Role of Environmental Design

Apparently, there is no need to remark the importance of refurbishment and improvement of energy efficiency in existing building at this historical moment. The deep crisis of construction sector, not yet totally over, the poor condition of building stock, both from aging and energy efficiency point of view, the emblematic examples of housing and schools, are, without any doubt, sufficient reasons and solid enough basis to establish future investment programmes, both from central and local authorities. Also, the academic and research sector could have a leading role in this trend, for example starting course of studies oriented to renovation. Data show clearly that refurbishment and maintenance activities are here to stay during the forthcoming years. Preparing future architects to a specified role—such as experts in housing renovation, or public building, etc.—could be a way to establish a permanent “task force” able to constantly work to improve energy efficiency of buildings. Especially now, when applied research on products and materials—which, as shown, are becoming more and more important in the refurbishment market—is far away from the universities and is pretty exclusive of producers.

Environmental design can surely have a major role

in the coming years, especially thinking about its “multilevel” approach, even if the passage from the component (materials and construction products) to the environment must be seen not only from the dimensional point of view. If, as it is, the environmental impact a building process must be considered from a comprehensive point of view, having in mind the entire life cycle. This is even more difficult in renovation activities, where existing buildings were designed in a totally different historical context, probably with a great lack of attention to environmental problems. This can only be done in a proper way considering the building not only as a “single object” to be refurbished “piece by piece” (new windows, external thermal insulation, green roofs, solar systems, etc.), but really as part of a whole environment.

Having in mind this holistic approach, the “refurbishment era”, which could be called the one in which we are living now, must be seen as a great opportunity for a radical change, where “quantity” is not only (or not *any more*, preferably) the most important target of construction sector (more GPD, more square and cubic meters, more procurement, etc.). Wide innovation programmes and a real “integrated design management” play a great role to permit better performance of buildings, from a single one (a single part of it) to the entire built environment.

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