EARTHQUAKE RISK PERCEPTION, COMMUNICATION AND MITIGATION STRATEGIES ACROSS EUROPE

Piero Farabollini, Francesca Romana Lugeri, Silvia Mugnano
Editors

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4. Risk Mitigation Through Local Building Knowledge: Turkish Van Region Case Study

Chiara Braucher[1], Mattia Giandomenici[2]

Abstract

Turkey's urban expansion process, has been rapidly growing in the last two decades and, according to the global trend of profit-based strategies, the effects of these urban policies have been harshly criticized for what concerns social and cultural spillover, leading to internal displacement and pauperization of the settled population. Moreover, the same policies have deeply transformed the relationships between the communities and their environment, especially in high seismic-risk area. Resilience, a controversial term referred here to policies and strategies for risk mitigation, is often abused in order to justify large-scale urban transformation projects.

The research was developed in 2016 to support alternative perspectives on risk mitigation strategies in the built environments; the research focused on the traditional constructive technologies in adobe, investigating their sustainability and their enduring capability to respond to the inhabitants housing needs.

This chapter proposes a proactive and participative approach to the construction at large, including the direct intervention from settled communities -still persistent but in serious decrease all around the world- as an important strategy for risk mitigation, an alternative to the profit-based approach of political decisions.

Keywords: risk mitigation; adobe; Turkey; earthquake; vernacular architecture.

1. Introduction

The proposed chapter presents a research carried out in 2016 in the Southern-East Turkish, specifically in the Van Region. It was formerly

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addressed to the study of traditional adobe building techniques (C.Braucher, M. Giandomenici, 2017), still largely widespread in the Region. This led to the analysis of local knowledge and to evaluate the possibility to propose these building techniques as a sustainable response to housing needs. As well, according to the high seismic-risk features of the Region, thanks to the direct experience and to the many interviews carried out with inhabitants and builders, it has been possible to examine the perceived risk of local people about vernacular architecture and the mitigation strategies developed by builders through centuries of construction practices (Varum, H., et al., 2015).

The subject of the research has been framed into a larger analysis about the Turkish national policies on urban transformations developed in the last decades, presented in the first part of the chapter (§.2). According to the reported considerations, it is clear that the reforms regarding the construction sector and economic policies in the contemporary neoliberal urban regime are deeply connected to the policies enacted after disasters occurred by the Marmara earthquake of 1999 and the Van earthquake in 2011.

An important analysis on the effects of the 'Law regarding the transformation of areas with disaster-risks', enacted after the earthquakes occurred in the Southern-east Turkish region of Van in 2011 (Tunç, 2012), argues the 'predominance of economic resilience over other kinds of resilience': the Ankara government, through a false narrative of "national mobilisation" around the necessity of urban resilient areas, aimed at legitimising the proposed law concerning disaster risk-mitigation while mainly supporting the economic outcomes. The manipulation of risk perception has been a political strategy for deep urban and cultural transformation (Tunç, 2012) (§.2.1).

The third part of the chapter (§.3) presents some interesting considerations carried out by Yildiz Technical University Team after the 2011 earthquake concerning the progressive loss of knowledge of traditional building practices by local population which brought to a progressive decrease of resilience. (Guney et al., 2013).

The cultural transformation caused by the reformation of the policies of the construction sector is one of the main reasons why it is impossible to define an efficient risk-mitigation strategy and it is on these considerations that the field research has been developed.

First of all, the research aimed to investigate and confirm the statement of the Yildiz research team (Guney et al., 2012), connecting the ability of traditional adobe masonry buildings to resist to earthquakes with their quality in terms of construction based on the *art rule* of builders (§4.1) .

The surveyed buildings have been listed and organized in different technological abacus according to their features in order to identify particular anti-seismic devices developed along the traditional building practices (§4.2). The aim of the research was to investigate how traditional buildings respond to the inhabitants housing needs and to contribute to the elaboration of risk-mitigation strategies based on local knowledge of building practices, both for the conservation of traditional building and for the new sustainable projects, according to a sustainable approach (Correia et al., 2015) (§4.3).

The last part of the chapter (§4.4) deals with the widespread prejudice in the eastern Turkish society concerning traditional buildings (Brown, R., 2012). Through the interviews collected during the field research it has been possible to investigate these prejudices, aware that any proposal on risk-mitigation strategy or transformation project should be integrated with the local culture.

2. Neoliberal urban and housing policies in Turkey

Concerning to Turkish history, urbanization can be explained through three historical phases; the period before 1980, the period between 1980 and 2001, and the period after 2001 (Lelendais et al., 2015).The first phase corresponds to the beginning of urbanization in the 1950s, and it is clearly related to the high rate of rural migration. This period is marked by the absence of public policy on housing. The housing question was never entirely addressed as a policy in the political agenda of changing governments, and housing needs was long-time managed by individual initiatives by constructing informal settlements called *gecekondus* (Choueiri, 2008). The process of settlement through the act of land taking and self-construction of shelter by people, was not legal. The government found this convenient, since the costs and labour of urbanization were sustained by the migrants themselves. (Bekemen, 2014).

The rise of neoliberal economic rules began in Turkey during the 1980s. The government progressively lost its control on the market under the rule of former Prime Minister Turgut Özal. In terms of anti-labourism and neoliberal centralisation of state power, Turkish government under Özal engaged in real shock therapy as its counterparts did elsewhere in Europe accompanied by an export-led growth strategy (Bekemen, 2014).

During the period between 1980 and 2001, economic development dominated Turkey's public policy, and led to some large-scale development

projects such as the Southeast Anatolia Project (GAP), which involved the construction of 20 dams for hydroelectric energy production (Yuksel, 2006).

This era was also associated with the development of building co-operatives and with the introduction of larger building contractors within the housing market, identifying inner-city gecekondus as potentially profitable sites. Government had not attempted to regenerate gecekondus areas, fearing a backlash from voters and subsequent electoral defeat (Tunç, 2012).

This situation was only changed by two major crises in recent Turkey history:

- The big earthquake of 1999 in Marmara Sea, close to Istanbul, which caused the death of 16,000 people and the destruction of 20,000 buildings, underlining the security problem in the construction sector.

- The financial crisis of 2001 and the rise of neoliberal urbanisation through large urban transformation projects. The link between the financialization of capital and the built environment through new mechanisms is an effect of the IMF- led economic restructuring program in Turkey (Tunç, 2012).

These two events define a new period concerning urban transformation policies, that correspond with the political rise of AKP in 2002 elections. The neoliberal economic choices of the AKP had actually two main characteristics. The first was the support of Islamic capital groups close to the party, in order to consolidate their power as a unity of politically dominant class and capitalist group (Lelendais et al., 2015).

The second was the promotion of urban planning and development projects by accelerating the construction industry, which had already boosted during 1990s via the arise of Real Estate Investment Trusts and the privatisation of a number of urban public constructions and lands (Enlil, 2011).

In this sense, urban entrepreneurialism denotes an array of governance mechanisms and policies aimed at nurturing local and regional economic growth by creating a business environment propitious to capital accumulation and investment (Harvey, 1989).

2.1. Disaster risk management as a source of profits.

Starting from 2001, a new system of urban planning began to spread. By implementing a number of legal and institutional reforms, the AKP decided to rearrange the governance of Turkish real-estate markets and urban

planning, with significant consequences for the socioeconomic geography of cities and the rural environment. The first stage of this reorganization was the increase of the advantages of Mass Housing Administration's (TOKI) in 2003 with the law no. 4966, allowing all state lands to be used by TOKI in order to define lands for housing (www.toki.gov.tr).

In 2007, by the law no. 5609, TOKI became the sole authority in determining zones of construction and the trade of public lands. The Van earthquake in 2011 triggered a new wave of urban transformation. With the 'law regarding the transformation of areas with disaster-risks' enacted in May 2012, the government approved regeneration projects all around the country under the control of TOKI, leaving much discretion in defining 'risky zones'.

During the preparation of the law, the government built its legitimising dissertation upon the law's importance in disaster risk mitigation and attempted to create a spirit of 'national mobilisation' around the importance of this law.

However, as the general evaluation of the existing disaster risk management and urban planning policies, as well as the law's document soon revealed, this second wave of urban transformation did not differ in essence from the one pursued through 2000s, except for its strategic use of disaster risk mitigation. (Tunç, 2012).

Previously a non-profit public institution for social housing, the TOKI today has permission to undertake 'for-profit' housing projects on state land, either through its subsidiary firms or through public–private partnerships, all to raise funds for the so-called construction of public housing.

The following table reveals, for example, the TOKI projects realized in 2012.

Table 1 - *Official websites of Mass Housing Agency, 2012.*

Social Housing	6.51%
Public Administration Housing	18.24%
For Profit Housing	75.25%

TOKI is an instrument for creating profit through both the development of projects in areas with high land rent and increasing land rents by developing construction projects.

The restructuring of the economic policies in the construction sector in this neoliberal urban regime can be summarised as follows:

- The state appears as the main propulsive force and developer via the mobilisation and the increase of politico-economic competences of various public institutions and the establishment of a new legal framework on property and urbanisation.
- Urban transformation and large-scale development projects are the main tools of intervention in land management.
- Urban transformation and UDPs are considered as catalysts of economic growth and the creation of a new capitalist and conservative class implicated with the government.
- The decision-making and the construction process of urban projects doesn't include a democratic debate with the inhabitants and has a top-down authoritarian attitude, based on security stance, ambiguously defined. (Lelandais, 2015)

In addition to these economic reasons, looking at the urban transformation process and at the legal framework which made it possible, it is clear that there has also been a social re-organization aimed to push the economically weak population to the suburban areas. (Dikec, 2009)

With this new urban regime, it was possible to undertake planning and renewal projects anywhere in Turkey, regardless of the intended outcome. Moreover, new laws have given public institutions, through TOKI (Fig. 1), the power to carry out such projects, including expropriation, repressing the inhabitants' right to opposition, resistance and negotiation.

Within this framework, city and land management is not perceived as a social human project but rather as a source of profit.

Figure 1 - *Diyarbakir suburbs 2016.*

3. 2011 earthquakes in Van Region

According to this general framework and to the widespread criticism on Turkish urban policies development, it is interesting to introduce the field research developed in 2016 in the high-risk seismic area of Van Region through a general framework of the area and the report of Yildiz Technical University team after the violent earthquake that hit the region in 2011 (Kuruscu et al., 2014).

The region presents a generally mountainous character, rich of rivers and lakes and the Van Lake is clearly the bigger one. With an average altitude of 1700 m, the region is characterized by a continental climate with cold, snowy winters and hot dry summers. Van region is divided in 13 districts with 22 municipalities and more than 580 villages with approximately 1 million 3 hundred thousand inhabitants. Nearly half of the population of the region is concentrated in Van city centre and its surroundings, while more than 400 thousands of people are still leaving in rural settlements, strongly related with their territory resources and traditional lifestyle.

The Eastern Anatolian region is one of the most seismically active regions in the world: it lies on the Anatolian plateau, one of the minor plates, with Aegean plate, created by the collision between Arabic and Eurasian plates. (Bayrak et al., 2008.)

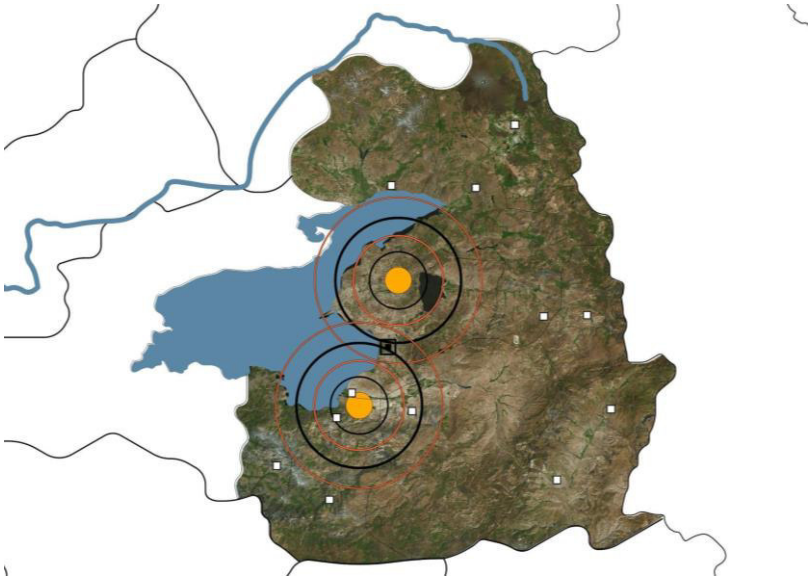

Figure 2 - *Epicentre map 2011 Earthquakes.*

Along the history many earthquakes had occurred in the East Anatolia region, the major earthquakes occurred in the year 1111 causing damage and having a magnitude around 6.5-7. In the year 1646 or 1648, Van was again struck by magnitude of 6.7 quake killing around 2000 people. In 1881, magnitude of 6.3 earthquakes near Van killed 95 people (Guney et al., 2012).

In 23 October 2011, Van city, in Eastern Turkey, was hit by a large earthquake at 13:41 (10:41 GMT), on Sunday afternoon of magnitude 7.2. This earthquake had a shallow hypocenter depth of about 10 km. The Van earthquake, where epicenter was about 16 km north of Van city at Tabanlı village, between Ercis Town and Van city, devastated the area (Fig. 2). During this earthquake 644 people died, 2608 people injured and 2307 buildings totally collapsed.

On November 9, 2011, the second Van-Edremit centered earthquake occurred at 21.23 (18.23 GMT) of magnitude 5.6. The epicenter of the earthquake was near the Edremit town south of Van.

The buildings previously having slight or medium damage in Van city center now totally collapsed or were heavily damaged (Guney D., et al. 2013).

Focusing now the attention on the behavior of adobe masonry buildings, or more in general on unreinforced masonry structures, is possible to highlight some interesting considerations underlined by Yildiz Technical University reports carried after the 2011 Van earthquakes. Upon masonry building details the damages were strictly connected with the qualitative poorness of construction knowledge: in fact, most of the masonry buildings had damages but there were also adobe, brick or stone masonry buildings that had no damage (Fig.3) (Guney D., et al., 2012).

When their construction year was investigated, it was possible to understand that the older buildings had no or slight damages. The reason might be in the organization of the foundation. Building masters, being aware that rigid building on rigid soil might be dangerous for the building, had introduced special techniques to change the natural frequency of soil or provided flexible footings at high seismic zones. As also pronounced by old villagers the foundations of masonry village houses were constructed on a layer of ~40 cm sand till 1960's. The thick layer of sand, gravel or stone pieces provided a change in the natural frequency of soil as well as adequate subsurface permeability to avoid a high water table condition. It is possible to argue that the traditional construction method was forgotten, that's why many masonry buildings had suffered during these earthquakes (Guney D. et al 2015).

Therefore, one of the most significant problem about seismic performances of masonry buildings it is then referred to the lack of memory upon construction matter, the lack of knowledge due to a relatively shortage of technical studies regarding strategies of heritage conservation. The aim of the research refers to the improvement of vernacular construction technologies knowledge, and it is in this direction that the paper has to be read. Using simple and economic technological devices, the seismic performance of the unreinforced houses improves.

Figure 3 - *Adobe house with anti-seismic presides*

According to this goal, the education of local workers and contractors is very important: skilled workmanship and the appreciation of the traditional construction methods will increase seismic resistance of unreinforced masonry buildings. For this reason, it is necessary to develop guidelines for the construction of unreinforced masonry buildings, especially in rural areas (Guney D. et al., 2015). The field research then, aimed to increase the scientific knowledge above vernacular architecture and anti-seismic historical presides through observation and interviews.

4. Field Research and Outcomes

The field research is a cognitive practice of places direct experience, based on observation and interviews. Concerning rural and urban settlements, as material expression of relationships in between men and with the surroundings environment, the direct experience of places provides essential data for an aware territorial framework and social-cultural context.

The observations of existing structures, of their damages due to the passing of time, to the abandonment or to extraordinary traumatic events as the recurring earthquakes, from whom the region is interested, provides many extremely important technological information.

At the same time, interviews to inhabitants and builders represent a direct testimony about technological characteristics and functions of the buildings. Every meeting, tale or explication is part of the oral history of a place and contributes to the development of a more conscious point of view, necessary to advance hypothesis and to imagine coherent answers. The research has been implemented walking, crossing places and sharing time with their inhabitants.

The field research has been carried out, according to this framework, particularly searching for the anti-seismic devices of traditional buildings in the Southern-East Turkish region.

The research was in specifically carried out in three districts of Upper Mesopotamian Region in the East of Turkey: Tuşba (Van city), Gürpınar and Gevaş. These areas have been study by the authors between the end of August and the end of September 2016.

4.1. Methods and Tools

The research focused specifically on the survey of adobe houses, it seemed necessary to elaborate a support that allowed to systematically organize a large number of information for each building. For this reason a specific form was elaborated in order to collect and synthesize the data that were considered significant (Braucher, C., Giandomenici, M., 2016.) for the definition of the "rules-of-tombs" from structural and architectural point of view that characterize vernacular architecture of Van Region.

The form, was based on AeDES model (Baggio, C., et al., 2007), elaborated by Italian Civil Protection in order to carry out the first level emergency assessment of damages due to earthquakes events.

All of the considerations, gathered thanks to the 50 surveyed buildings and to the interviews, have been organized in 50 schedules divided in three columns (Fig. 4):

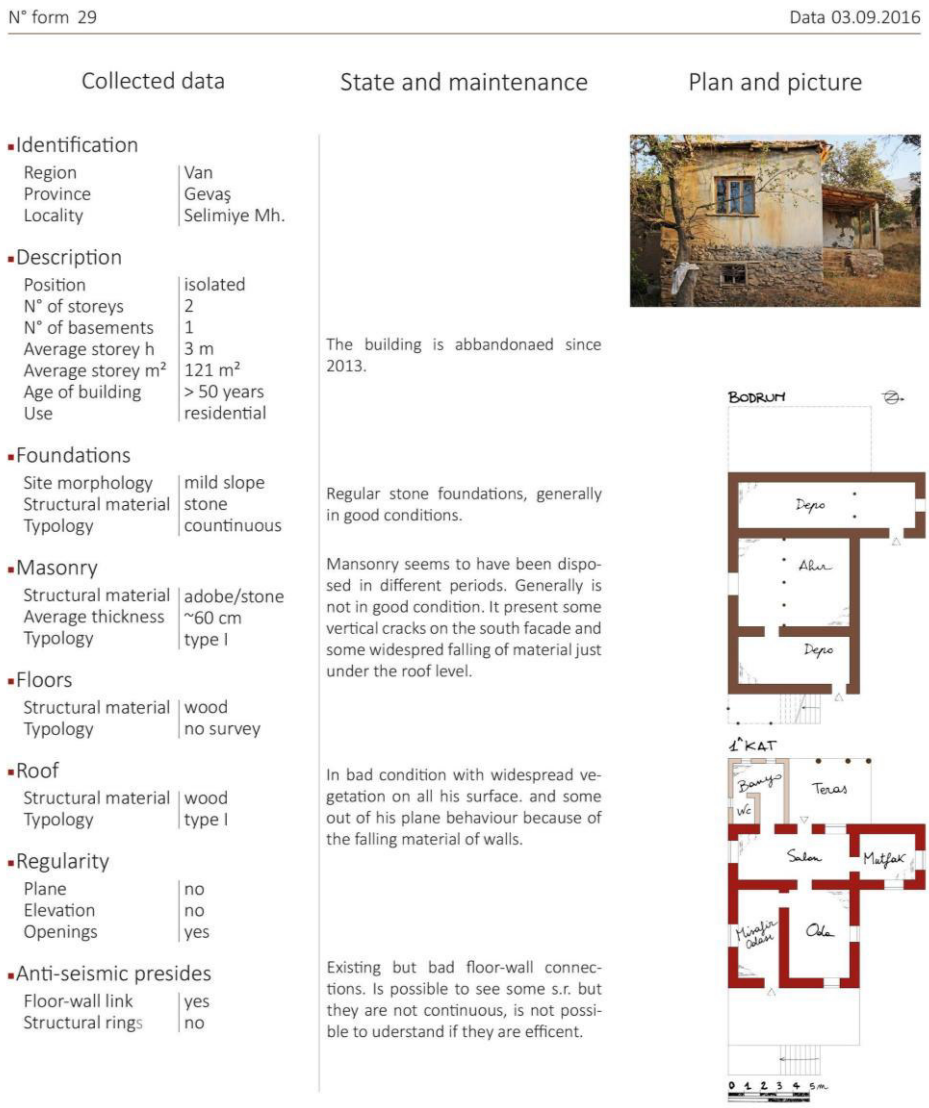

Figure 4 - *Resume schedule, provided one for each house.*

- the left one concern the geographical identification and the general description of the building. Then, the structure is analysed providing specific

descriptions of macro-elements characteristics (foundation, masonry, floors, roof), specific considerations about the regularity features, and the presence of the anti-seismic presides;

- in the right column, is provided a general descriptive picture of the building in order to represent the aesthetical features of the building and its plan, useful to describe the different functions of the building spaces. The different colours of the walls, reported in the plan, explain also the different building material (stones, mud bricks, concrete blocks);

- the central column is more specific and different for each building: concerning all the data collected through the interviews and the impressions due to the direct observation of the element's qualities and their state of maintenance, are here reported particular transformations, specific structural problems like cracks, failing of material or disconnections, and the particular finishing details, plasters and decorations.

According to the consideration expressed by Yildiz University Team reported above (Guney et al., 2015), it is important to underline that the surveyed houses present an average age around 50 years old. This means that most of them, have been hit and resisted at least to three or four important seismic events and to dozens of smaller activities. It is also important to remember that these 50 houses are just a small part of the existing adobe buildings, and really few examples in respect to all the adobe buildings present in the region.

Thanks to the interview carried out to inhabitants and builders, it has been possible to gather information regarding the mixture used for blocks and its process of aging, the typology of the mortar, the foundations building method, all of the expedients in the construction process, till the waterproofing of the roof and the disposition of the channels.

4.2. Outcomes on constructive technologies

The information collected during the field research allowed to provide a comprehensive catalogue where it is possible to systematically identify specific features and recognize recurrences and similarities among the surveyed buildings. Along the research it is possible to recognize the repetition of similar constructive choices regarding blocks disposition, the floors and the roof technologies. According to this observations, different Abacus for the structural elements were elaborated and reported in the research results.

Concerning the vertical structural elements, it has been recognizing a general recurrence of 60 cm thickness for the wall sections (just few cases are 50 cm) reached through the combination of 3 different types of mud-bricks sizes and arrangement.

The 'Floors Abacus' contains three kinds of constructive technologies. All of them are structurally made by wooden beams and they differ for the composition to the secondary spanning choices. All of them are here analysed in their different layers and considering the opportunity to provide different finishing touches. Beams and also the other wooden layers are made using the popular tree (*kavak*), largely widespread in the region, in the places where there is not an evident deforestation process

Concerning roofs, it is firstly important to report that most of the buildings, quite all of them, presented the traditional flat roof (type I) until 10-15 years ago. Then, because of the maintenance process that these kinds of roofs require and because of the snow in winter, many surveyed buildings now present metal sheet, shaped differently according to the plan dimensions and the inhabitant personal choices. All of them are reported in the Roof Abacus with some indications and it is interesting to highlight that, also if metal sheet is later added, the earthen finishing (at least of 5-10 cm) disposes over the last floor, is continuing to provide the thermal comfort expected by the people used to the 20-25 cm traditional heavy roof.

Concerning the anti-seismic presides, it was possible to observe different types of connections between bricks (ammorsamento), often well done. One of the most interesting technological elements observed during the field research were the wooden ring beams (hattıl) largely widespread all around the region as an important seismic preside. The element, made by two small (5x5 – 10x10) wooden beams, follows the plan section all around the building walls. The two parts are connected each other by wooden sticks placed every 40-50 cm.

The empty parts are filled with the same earthen mixture used for the blocks to reach the wood level in order to restart the blocks courses (Fig. 5).

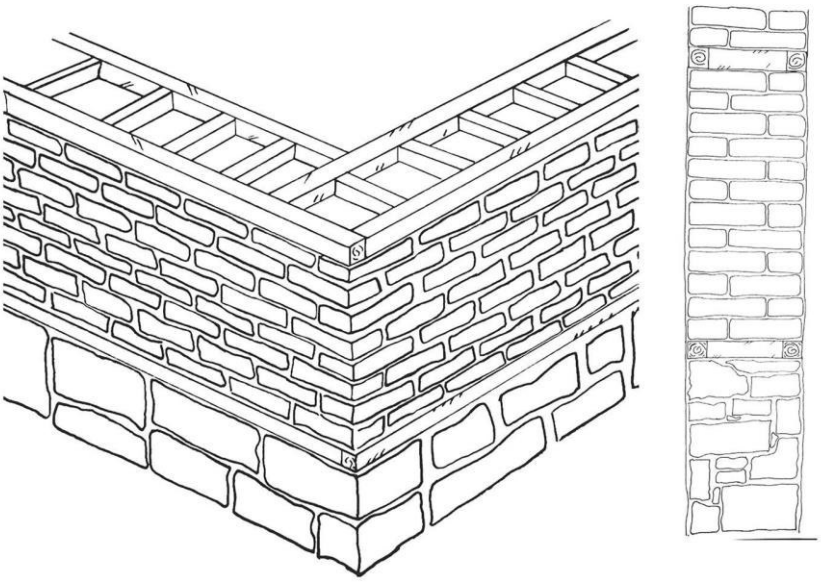

Figure 5 - *Wooden beams, seismic preside.*

4.3. Outcomes on constructive process

A common feature observed in all the surveyed houses, a generally widespread habit in the region, is self-construction. Building with earthen blocks and wooden technics is still a living knowledge for people.

Most of the inhabitants are able to deal with progressive transformation in order to adapt the house to the changeable needs of the family. Growing of inhabitants, functional adaptation, technological improvement lead people to directly operate on the building structure. Maintenance interventions are also necessaries in order to keep efficient, for example, the external finishing of walls or the earthen roof.

A significant observation derived from the field research, is the widespread decision to add over the traditional flat roof a light wooden structure to support sloping metal sheet. The new roof guarantees a good protection to the abundant rains and snowing days especially in winter times and does not need yearly maintenance as earthen roof require. Anyway, the addiction does not compromise the climatic performance of the earthen covering, maintained under the sheets.

Observing building plans, is easy to guess the addiction of rooms from the initial simple modular form, through the inhabitant's interviews was possible

to get many information about that. It is furthermore interesting to highlight the characteristics of construction material of transformation. Old addictions were carried through earthen blocks but since concrete blocks came to be easily accessible to people they preferred, not always anyway, to do it with them. However, interviews also revealed that concrete blocks addiction are less comfortable from climatic point of view and sometimes, during the earthquakes occurred in the region, they presented more problems than earthen-built part. according to the high number of building surveyed and generally observed, it is possible to conclude that they well resisted to many different earthquake and that, starting from the analyses of their technologies, is possible to elaborate risk mitigation strategies both for the traditional buildings and for the new construction projects.

4.4. Discussion on preconceptions about traditional buildings

Thanks to the direct experience of the field research, it has been possible to verify widespread presence of preconceptions and prejudices on the earthen (kerpic) construction matter and on vernacular architecture in general. Although the people who are still living in their adobe houses demonstrate to appreciate their living condition, is generally observable the lack of awareness about the presence of earthen building around the region, and a suspicious attitude on the matter.

In the following paragraphs some of these preconceptions are discussed moving directly from some sentences collected during the interviews to the inhabitants (Fig. 6).

Figure 6 - *Van rural area 2016.*

4.4.1. "Kerpic houses are not good for earthquakes"

As far as adobe technologies were not chosen as a profitable construction material, there is a deep lack of studies and about them, implemented only by scientists who saw its potentiality concerning its qualities in terms of environmental, economical, social and cultural values.

This lack of knowledge is real but not unbridgeable; in order to fill up this lack many strategies and studies can be provided. First of all is possible to underline a comparative approach between adobe and traditional cooked blocks. This technology was deeply analysed because of its widespread utilisation in historical centres and monumental architecture through a deductive method.

Starting from the wide knowledge about this technology is possible to focus on the analogies with the adobe one in order to understand the behaviour of mud bricks masonry.

The similarities concern multiple aspects between them: first of all the building process doesn't present any significant difference, the disposition of the brick element follow the same rules and devices.

The whole structure is composed by the same elements: massive walls divided in piers and spandrels as resistant elements, wooden elastic floors or brick vaults, several types of roofs due to climate, material availability and tradition. Masonry structures are generally particularly vulnerable to earthquake forces and several damages can occur during this extraordinary

situation. They can be divided in two main types: in-plane damages, out of plane damages.

The main difference between the two techniques it is the resistance of the brick as a single element, the uncooked one normally presents a resistance 3 times less than the cooked one.

Considering these data, is possible to analyse the structural qualities of existing constructions according to their maintenance state and to gain important data to improve the knowledge regarding adobe construction. Through the extension of awareness is possible to implement intervention on built heritage and to project new building according to the art rules provided by the existing ones.

With more detailed analyses, is even possible to project new buildings with different spatial requirement. Is possible to compare analysis of traditional masonry (bricks stone) with the mud bricks masonry in order to predict the structural behaviour of buildings and to carry on quantitative analyses using numerical programs normally used to study masonry ordinary buildings.

4.4.2. "Kerpic houses are poor people don't want them"

Apart from the evident assumption that generalization can never be done regarding people needs and desires, two different questionable points are contained in this statement.

The concept of poorness is not proper of any kind of material itself. It is instead a category depending on a more general definition tied to the ruled class developing idea which fix, separate and determinate a hierarchical scale for many aspect of life in a specific geographical and social area.

Furthermore, about traditional building materials like adobe, stone and, until few years ago, also wood, they were categorized as poor and inadequate to answer to modern housing standards but, according to the contemporary goal of sustainability they can instead represent an interesting field of research also for new projects.

5. Conclusions

According to the general criticism widespread in the contemporary analyses about neoliberal urban transformation policies, it seems to be

important to investigate alternative practices in order to develop efficient and suitable policies of risk mitigation for high-risk area.

The research presented in this chapter deals with seismic risk and moves from the quick analyses and considerations reported after the last destructive earthquake of 2011 in Van region, into an in-depth research on traditional building technologies and local housing culture in order to verify the effective persistence of them as an appropriate answer to people housing needs. The observation of existing structures and their damages due to the passing of time, abandonment or traumatic events which interested the area, is extremely important to gather technical information. The interviews to inhabitants and builders represent a direct testimony about technological characteristics and functions of the buildings. Every meeting, tale or explication is part of the oral history of a place and contributes to the development of a more conscious point of view, necessary to advance hypothesis and to imagine coherent answers for people needs. The results confirmed a still widespread presence of traditional buildings and the hypothesis of Yildiz Technical University about the loss of constructive knowledge and the low quality of construction practices enacted in the last decades as the main reasons of the destruction after the earthquake.

The outcomes reported about constructive technological and constructive process would represent an empirical base to increase awareness on such a building heritage, in order to elaborate strategies for its maintenance and to develop technic guidelines for sustainable and traditional construction projects.

The numerous traditional buildings, still inhabited and well maintained by people, suggest the opportunity to consider these technologies as a field to be investigate in order to materially reduce the seismic risk, looking for a cultural rehabilitation of them in the socio-cultural widespread perception through practices of information and communication.

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Increasingly, socio-natural risks and disasters represent the result of an unsustainable interaction between human beings and environment. The current scientific debate has generally agreed on the idea that the impact of natural hazards needs to take into account the social vulnerabilities and exposures to risk of the affected population. The most recent earthquakes have unequivocally shown the complexity of the phenomena and their multi-scale dynamics. Indeed, the territory is the combination of natural, social and cultural environment and only by exploring its anatomy and physiology, it will be possible to manage and protect it in the best way.
This volume collects a quite wider range of national and international case studies, which investigate how socio-natural risks are perceived and communicated and which strategies the different communities are implementing to mitigate the seismic risk. This publication has been possible thanks to a fruitful discussion that some scholars had at the 36th General Assembly of the European Seismological Commission held in Malta from 2 to 7 September 2018.

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