STAND STRONG

Social practices as a link of resilience

An architectural exploration of how increased resilience can create a link between the before and after of an earthquake in Central Italy seismic zones

Giovanna Gaioni
Master's thesis in Architecture and Planning Beyond Sustainability
Chalmers University of Technology
Department of Architecture and Civil Engineering

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Stand Strong - Social practices as a link of resilience

Chalmers University of Technology - Architecture and Civil Engineering department
Göteborg, Sweden 2018

Examiner: Dag Tvilde, Researcher, Architecture and Civil Engineering, tvilde@chalmers.se
Supervisor: Emilio Da Cruz Brandao, Artistic Teacher, Architecture and Civil Engineering, brandao@chalmers.se

Keywords: earthquake, resilience, Italy, social practices

ABOUT THE AUTHOR

Contact
+46-790274171
g.gaioni@hotmail.com

Education
BSc Architecture, IUAV
MSc Architecture, Politecnico di Milano
Msc Architecture and Planning Beyond Sustainability, CTH

ACKNOWLEDGMENTS

First things first: a big thank you to Emilio Brandao for being a supportive tutor through my whole Chalmers journey and a present supervisor (despite being on the other side of the Atlantic Ocean) during my thesis work. Thank you to my examiner, Dag Tvilde, for interesting insights on my thesis topic and for supporting the development of this thesis work.

Thank you to Camerino Municipality, especially to Geom. Carimini, for the collaboration in sharing information. And for sharing precious information: thanks to Geom. Mariolini.

Barbara Rubino, who with one hour of her time helped me a lot when I was feeling stuck: thank you!

Thanks to my port, Mustafa, who, despite having his share of thesis work, always supported me and pushed me to do better.

A big thank you to all the friends I met at Chalmers. Special mention to the squad: Alle, Naji and Phryne, who were there through every moment of my journey at Chalmers (model making and laptop crashing included). Thanks to my favorite Swede Annsofi.

To all my friends (old but definitely gold) scattered around the world, who don't believe this will be my last diploma: thank you for always supporting me.

Another special mention to zia Agnese and zio Sergio: thank you for supporting me like your own child.

Thank you to Federico, for always being an inspiration and big role model.

And finally a big thank you to my parents, who gave me the opportunity to come to Sweden and always supported my decisions.

ABSTRACT

Stand strong is an exploration of how increased resilience, through architecture, can create a link between the before and after of an earthquake, by providing continuity of social practices.
This project aims to be a small contribution to the discourse on architecture within seismic zones in Central Italy. It is about investigating how social practices that are typical of these zones, are to be used as a potential for resilience for the communities hit by an earthquake. The strategy is a design that is present in the daily life of people and helps them to stand strong when the earthquake strikes.

In recent times the occurrence of natural hazards has increased and, in the majority of the cases, communities are the first to get hit, in terms of losses of lives but also of social connections. This, added to the fact that some communities might have to wait before reaching/receiving the aid needed, makes them fall into a sort of "stand-by phase" that makes their discomfort bigger.

So: what if local resilience were enhanced to give the community a tool of support while bigger and broader help gets to the community?

In the past 50 years, the seismic activity in the central and southern part of Italy has increased its power: these zones are now recognized as seismic areas and therefore potentially struck by earthquakes.
Some communities that lie on the so called "red zones" (zones that have high earthquake risk) have peculiar geographical and morphological characteristics that put them in a more fragile position when it comes to aid distribution and resilience after an earthquake.
Those communities have, therefore, specific identities that could turn into a big potential of resilience, and that is why this thesis focuses on their special conditions.

Analysis of the aid system and organization in Italy, and the examination of the features that characterize these communities, are therefore at the base of the research for this thesis work. Understanding the processes and the course of events, that are usually happening before and after an earthquake, were also fundamental to find the spot (physical and temporal) for the intervention.

The main aim of the thesis is then the design of an architectural element that increases the resilience of the community by providing a continuity in social practices. A simple meeting place (like the cafeteria represents for these communities) is the generator of the unit that is thought to be in place in a daily life scenario, but that empowers people to help each other in an earthquake emergency scenario, while the aid system is still organizing itself. This architecture aims to take the identity of these places and, through their social practices, turning usual social spaces into resilient spots for the community.

TABLE OF CONTENTS

INTRODUCTION

This chapter explains the framework of the thesis. An explanation of the aim, the research questions, the relevance, the reading instructions, the delimitations and the working methods and process that form this thesis work.

PROJECT SPECIFIC TERMINOLOGY*

Identity: The sum of different kinds of features that can be used to describe the history, the community, the culture, the geography, the geology, etc. of a place or object.

Resilience: Capacity to sustain and react to a specific shock or trauma and find a way to recovery. Characteristic of a community or an architectural object to sustain itself for a certain amount of time when the bigger systems (e.g. infrastructural, governmental, etc.) fall.

Prevention: The sum of initiatives and actions to reduce the vulnerabilities of the people and the building assets to natural hazards. It has 2 dimensions: technological/scientific & cultural/social. Based on specific and professional knowledge, but also on a widespread system of information and education concerning the risks and the promotion of a collective taking of responsibility. In this scenario, prevention is then a kind of "culture" connected to a common objective of protection of people's lives, building stock and maintainance of the productive sector activity. (Crespellani T., 2012)

* Definition of common terms, but with a focus on the thesis project. Common terms assume different shades in order to help the reader in understanding them in the framework of this specific thesis.

AIM

The aim of this Master's thesis is to propose a design for an intervention in different places in Italian earthquake zones. Furthermore, the aim is to create and strengthen the link between the before and after of an earthquake: focusing on the importance of keeping the sense of community and the continuity of daily life in a scenario in which everything seems to be interrupted or destroyed by the natural hazard.
The goal is to create a design that could empower small town communities to be resilient and stand strong against earthquake.
The aim is therefore to test how a design can assure the continuity of social practices while bringing the first support to the community it stands in: a daily life activity that becomes a resilient factor to help the community to stand strong.

RESEARCH QUESTIONS

This thesis deals with questions of resilience enhancement through architecture, discovering the potentials of identity as a generator of resilient architecture.
This investigation is framed within the broader context of sustainable development. The combination of research questions deals with architecture and earthquakes, specifically with architecture in highly seismic zones that host small and geographically disavantaged communities.
The following research questions will be investigated, having a principal question and related sub-queries:

How increased resilience, through architecture, can create a link between the before and after of an earthquake, by providing continuity of social practices?

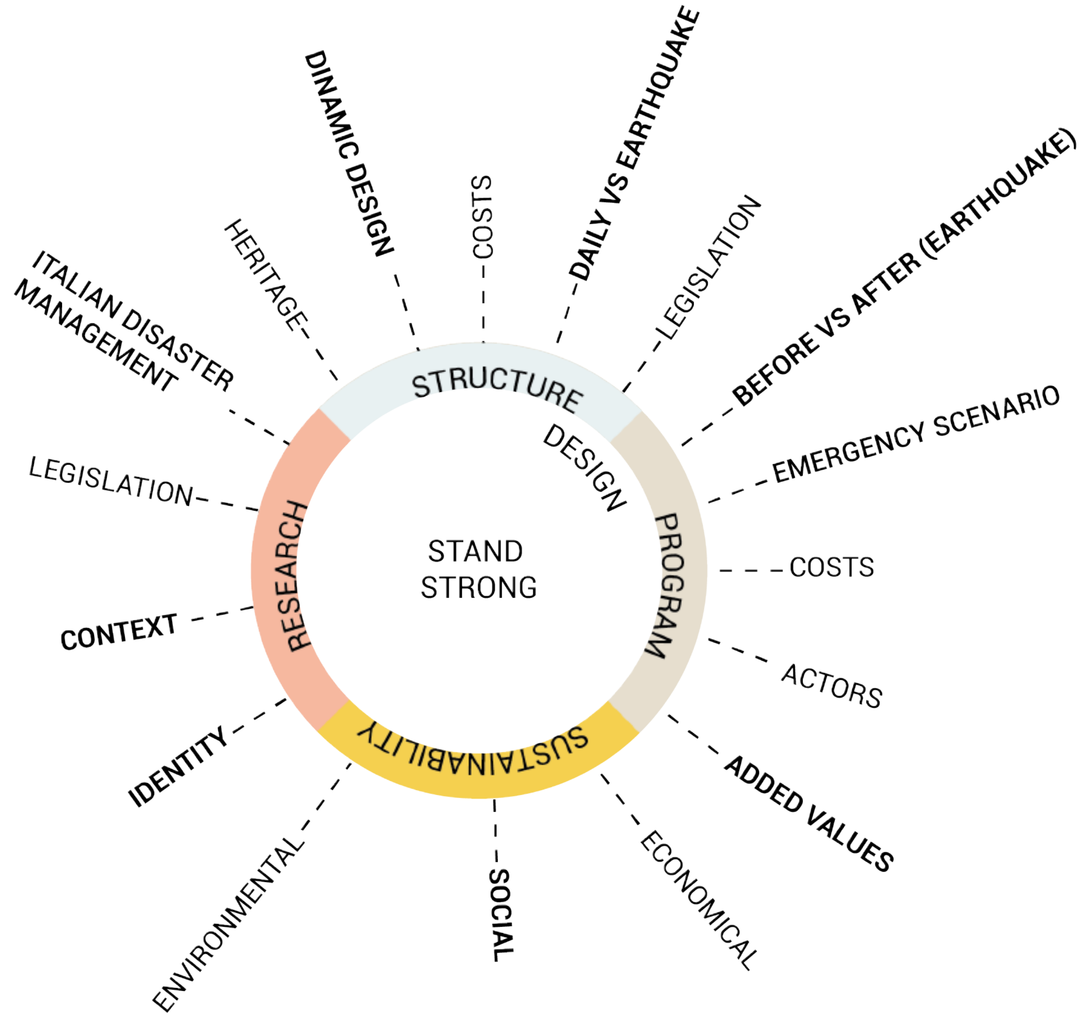
sub-questions:
- How can architecture promote resilience of small communities that are potentially cut off after an earthquake?
- How can architecture provide immediate help while a bigger system is reaching the specific location?

RELEVANCE

This project aims to be a small contribution to the discourse on architecture within seismic zones in Central Italy.
Predictability, when it comes to earthquakes, is not an option, but preparedness and resilience are. While preparedness for a natural hazard is being taken care of, resilience is still something that is relatively unexplored in the Italian architecture scenario. Combining the two of them, focusing on the identity of the places can be an option to reduce the impact of earthquake and the vulnerabilities of the communities. These matters are surely connected to the framework of sustainable development with a strong social focus, but not forgetting environmental and economical aspects.

DELIMITATIONS

This map is meant to put on the table all the macro-aspects related to the thesis project. Due to interests and limited time for developing the thesis, not all of the topics will be explored; however, their existence is acknowledged here.
Given this, the words highlighted in bold represent the main focus of this work.



WORK METHODS

For a broader understanding of the topics, different methods are used to gather information. As research is used as a base for the formulation of the design proposal, the approach that has been employed is Research for Design. Taking research as a starting point, a continuous going back and forth between the different steps of research and design is necessary to assure a stable review of both the research and the design proposal.

More in deep, the methods used are as follows:

Case studies

Conducted by reading resources to create a better knowledge and understanding of the background. This includes studies of relevant projects related to the earthquake architecture scenario, with a stronger focus on resilience strategies and prevention plans.

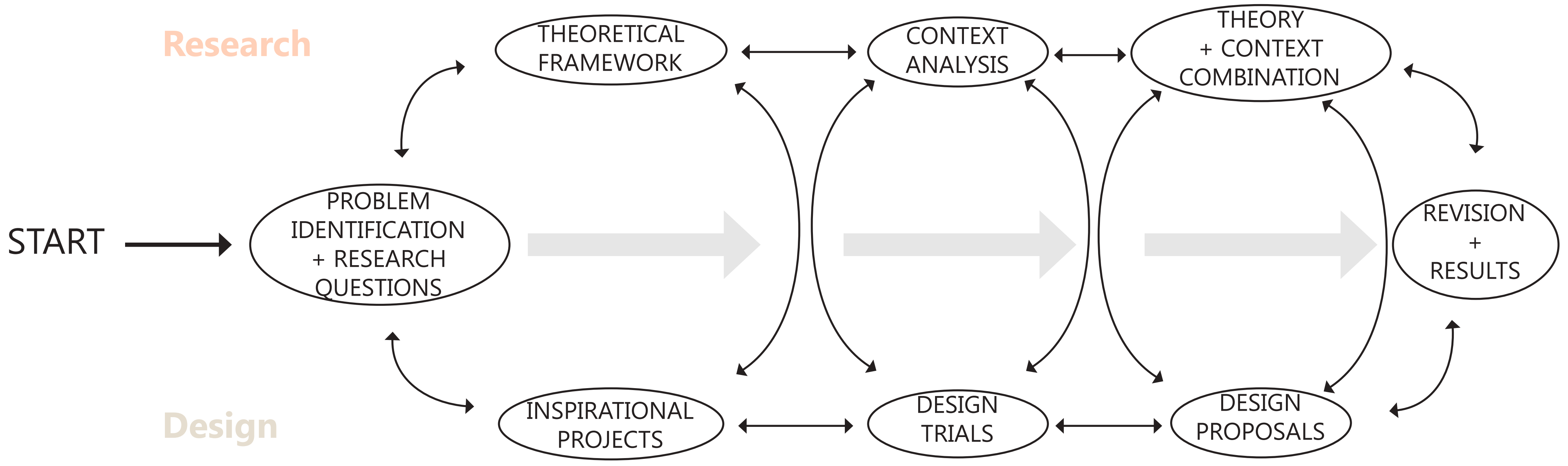
Analysis of the context and the specific site

An analysis of the broader context in terms of geographical, morphological and social features was carried out to create a good understanding of the general context and to be able to choose the pilot/specific site for the design proposal. The investigation started from a national situation, scanning the physical context but also the aid systems and organizations present in the territory. In parallel, an analysis of the specific case had to be carried out, jumping back and forth between the different scales.

Different sources consultation

For the understanding of the background and for the creation of a framework for the design proposal, many different sources were used: newspapers articles to documentaries, from reports of previous earthquakes in Italy to resilience plans, from videos of interviews to the communication with local institutions and inhabitants. The use of different sources gave the possibility to scan the issues in a more complete way and to formulate a more precise context description.

WORK PROCESS



THE FOCUS

This chapter dives into the focus of the thesis. From some basic notions on earthquakes, to an analysis of the Italian earthquake history. The last part of the chapter is dedicated to the recent seismic events that led to the choice of focus area and that kick-started this whole thesis project.

UNDERSTANDING EARTHQUAKES

The explanation of earthquakes can be done in different ways. In this thesis work, the understanding of this natural hazard is described through an introduction of a technical dictionary (to explain the main technical terms that are used to describe earthquakes) and the explanation of the importance of a single earthquake in terms of its energy and its impacts.

Technical dictionary

Seismicity: indicates the frequency & force of earthquakes and represents a physical characteristic of an area. ("Glossary", n.d.)
Seismic hazard of an area: the frequency and force of its earthquakes, in other words its seismicity. ("Description of the Risk", n.d.)
Seismic vulnerability: a building's potential for damage. The more vulnerable a building is (due to its type, inadequate design, poor quality materials and construction methods, lack of maintenance), the greater the consequences will be. ("Description of the Risk", n.d.)
Seismic exposure: the number of assets exposed to risk, the possibility of damage in economic terms, to cultural heritage or the loss of human lives. ("Description of the Risk", n.d.)
Magnitude: The measurement of the energy liberated by an earthquake at his hypocenter. It is calculated starting from the amplitude of the seismic waves recorded by the seismograph, and it is given on a logarithmic scale of values of the energy recorded. Each point of magnitude corresponds to an increase of around 30 times the energy. ("Glossary", n.d.)
Fault: The movement of the lithospheric plates that make up the earth's crust causes great pressure on rocks deep down, leading to their breakage along fracture surfaces called faults. Rocks near the fault planes (the slip surface) are often intensely fragmented due to friction between the blocks of rock in relative motion. ("Glossary", n.d.)
Active fault: A fault that shows signs of slipping between the two volumes of rock/ground in the past 40,000 years, leading to presume that they may slip some more. ("Glossary", n.d.)
Seismic sequence: The sum of seismic events that happen in the same area during a certain period of time (from days to months). Usually the sequence is characterized by a main shake, followed by small ones. ("Glossary", n.d.)

Intensity VS. Magnitude / Mercalli VS. Richter Scales

		Modified Mercalli Scale	Richter Magnitude Scale	
Instrumental	I	Detected only by sensitive instruments	1.5	Micro
Weak	II	Felt by few people at best, especially on upper floors; delicately suspended objects may swing	2	
Slight	III	Felt noticeably indoors, but not always recognized as an earthquake; standing autos rock slightly, vibrations like a passing truck	2.5	Minor
Moderate	IV	Felt indoors by many; outdoors by few, at night some awaken; dishes, windows, doors disturbed; standing autos rock noticeably	3 3.5	Light
Rather strong	V	Felt by most people; some breakage of dishes, windows and plaster; disturbance of tall objects	4	
Strong	VI	Felt by all, many frightened and run outdoors; falling plaster and chimneys, damage small	4.5	Moderate
Very strong	VII	Everybody runs outdoors; damage to buildings varies depending on quality of construction; notices by drivers of autos	5	
Desctructive	VIII	Panel walls thrown out of frames, walls, monuments, chimneys fall; sand and mud ejected; drivers of auto disturbed	5.5 6	Strong
Ruinous	IX	Buildings shifted off foundations, cracked, thrown out of plumb; ground cracked; underground pipes broken	6.5	Major
Disastrous	X	Most masonry and fram structures destroyed; ground cracked, rails bent, landslides	7	
Very disastrous	XI	Few structures remain standing; bridges destroyed, fissures in ground, pipes broken, landslides, rail bent	7.5	Great
Catastrophic	XII	Damage total; waves seen on ground surface, lines of sight and level distorted, objects thrown up into air	8	Catastrophic

RICHTER VS MERCALLI

The Richter magnitude scale is a base-10 logarithmic scale based on the amplitude of waves. It indicates the energy released by an earthquake (its magnitude) that is measured through seismographs. Example: a magnitude 4 earthquake shakes 10 times stronger than a magnitude 3 one.

The Modified Mercalli Scale is a subjective scale with linear values. It indicates the intensity of an earthquake based on its observed damages and effects on earth's surface, humans, man-made structures, and objects.

(Difference Between | Descriptive Analysis and Comparisons, 2018)

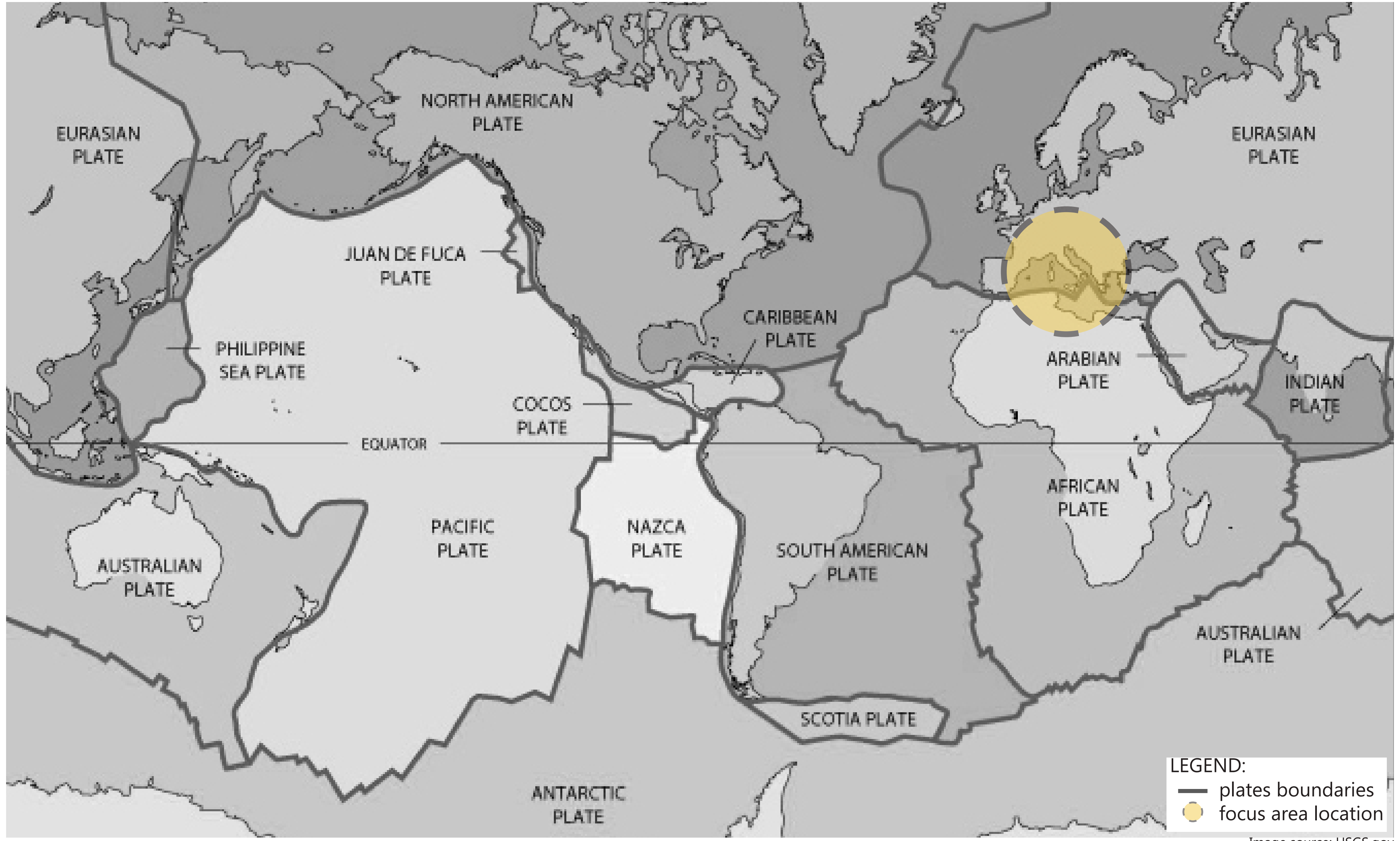


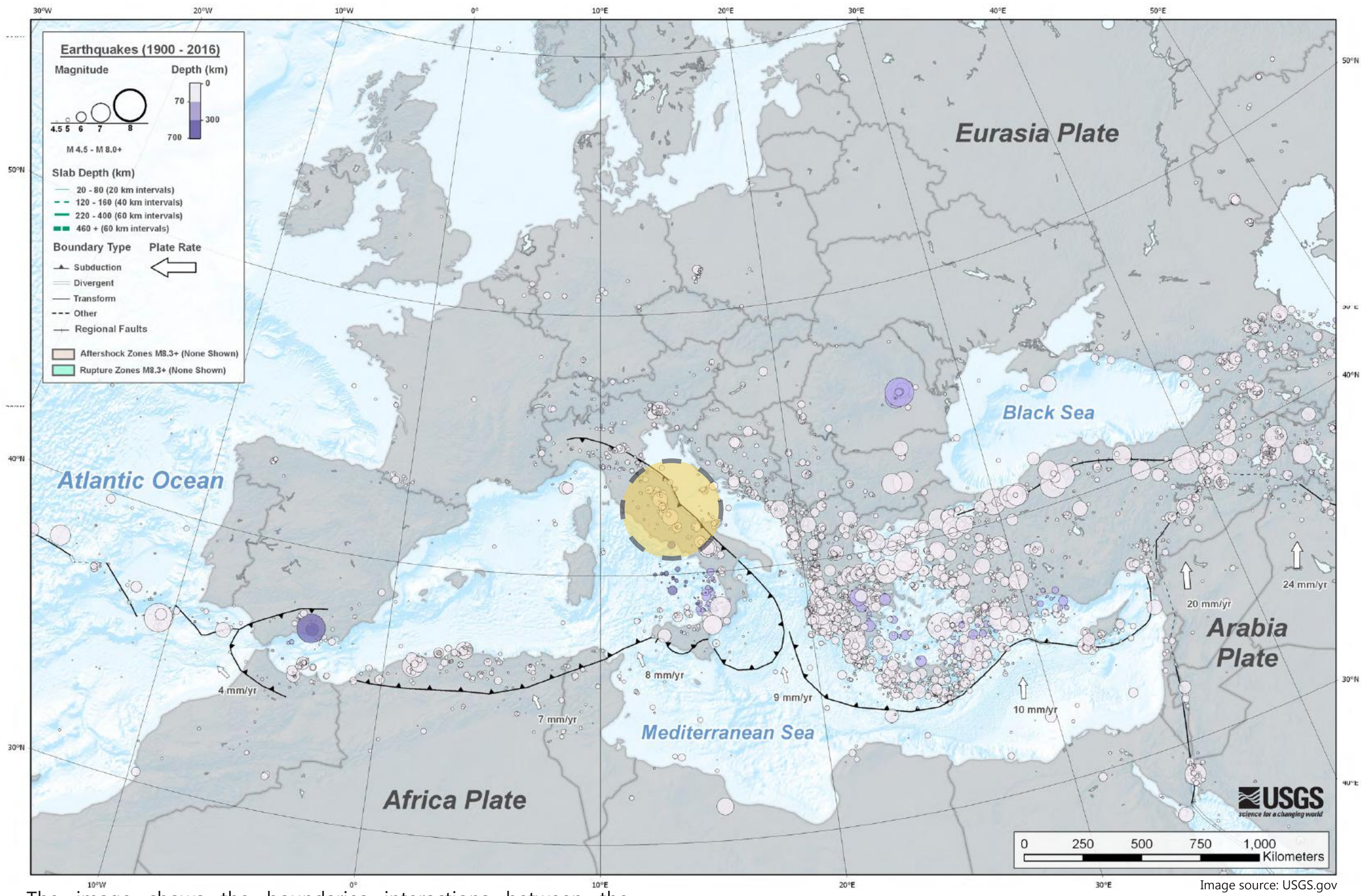
Image source: USGS.gov

The lithosphere of the earth is divided into a small number of plates which float on and travel independently over the mantle and much of the earth's seismic activity occurs at the boundaries of these plates (Merriam Webster Online, 2018)

The image above shows the boundaries between the plates in a global scale.

WHY ITALY? THE ITALIAN CONTEXT

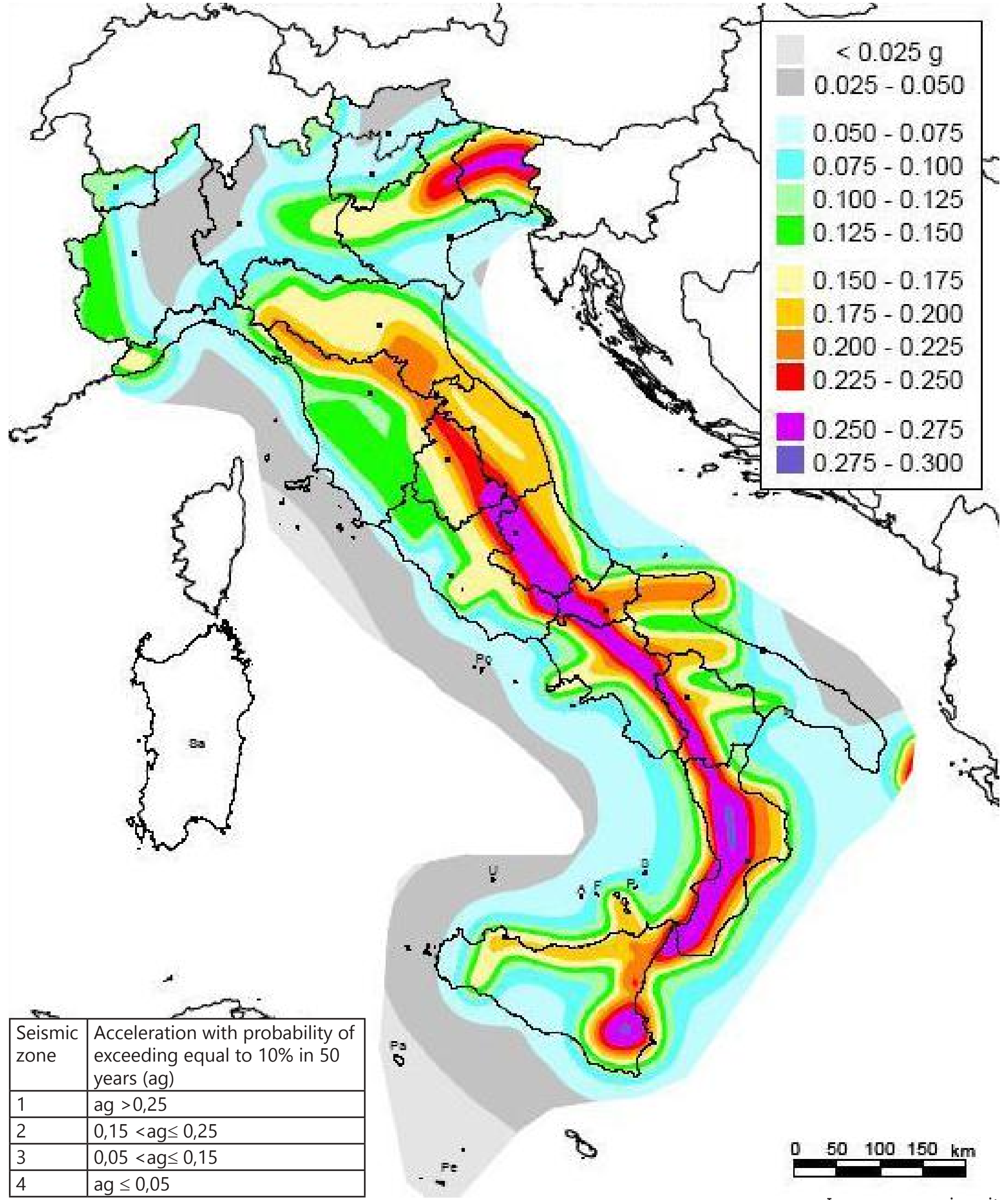
Italy has a medium-high seismic hazard (due to the frequency and intensity of phenomena), very high vulnerability (due to the fragility of building, infrastructural, industrial, production and service assets), and an extremely high exposure (due to population density and its historical, artistic and monumental heritage that is one of its kind in the world). Therefore, the peninsula has a high seismic risk in terms of victims, damage to buildings, and direct & indirect costs expected after an earthquake. ("Description of the Risk", n.d.)



The image shows the boundaries interactions between the lithospheric plates and active faults in the Mediterranean context.

Image source: USGS.gov

Seismic risk map

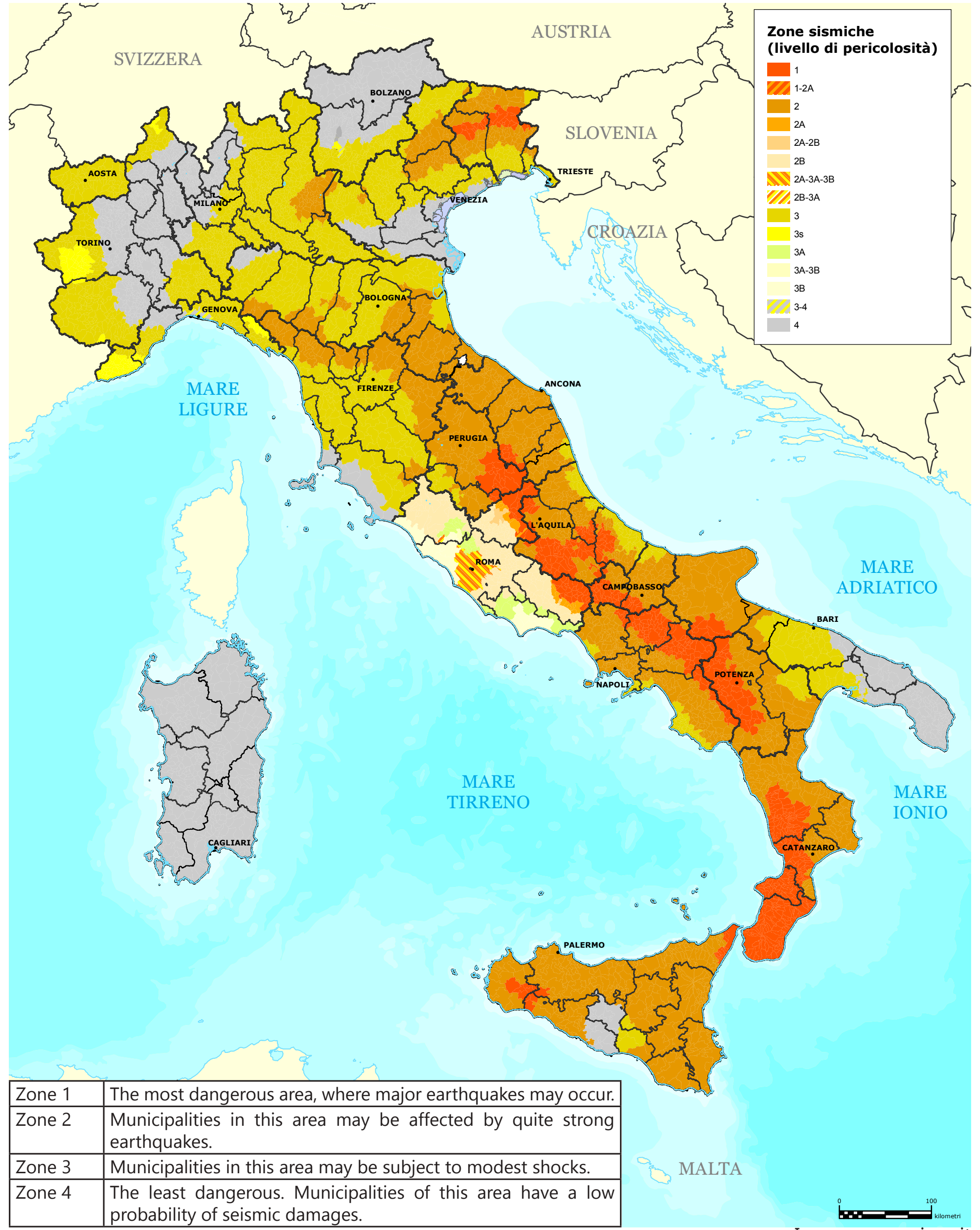


Seismic zone	Acceleration with probability of exceeding equal to 10% in 50 years (ag)
1	ag >0,25
2	0,15 <ag≤ 0,25
3	0,05 <ag≤ 0,15
4	ag ≤ 0,05

Image source: ingv.it

Values represent maximum ground acceleration with a 10% probability of excess in 50 years referred to rigid grounds (V_{s30} > 800 m/s, cat. A, punto 3.2.1 of D.M. 14.09.2005)

Seismic classification



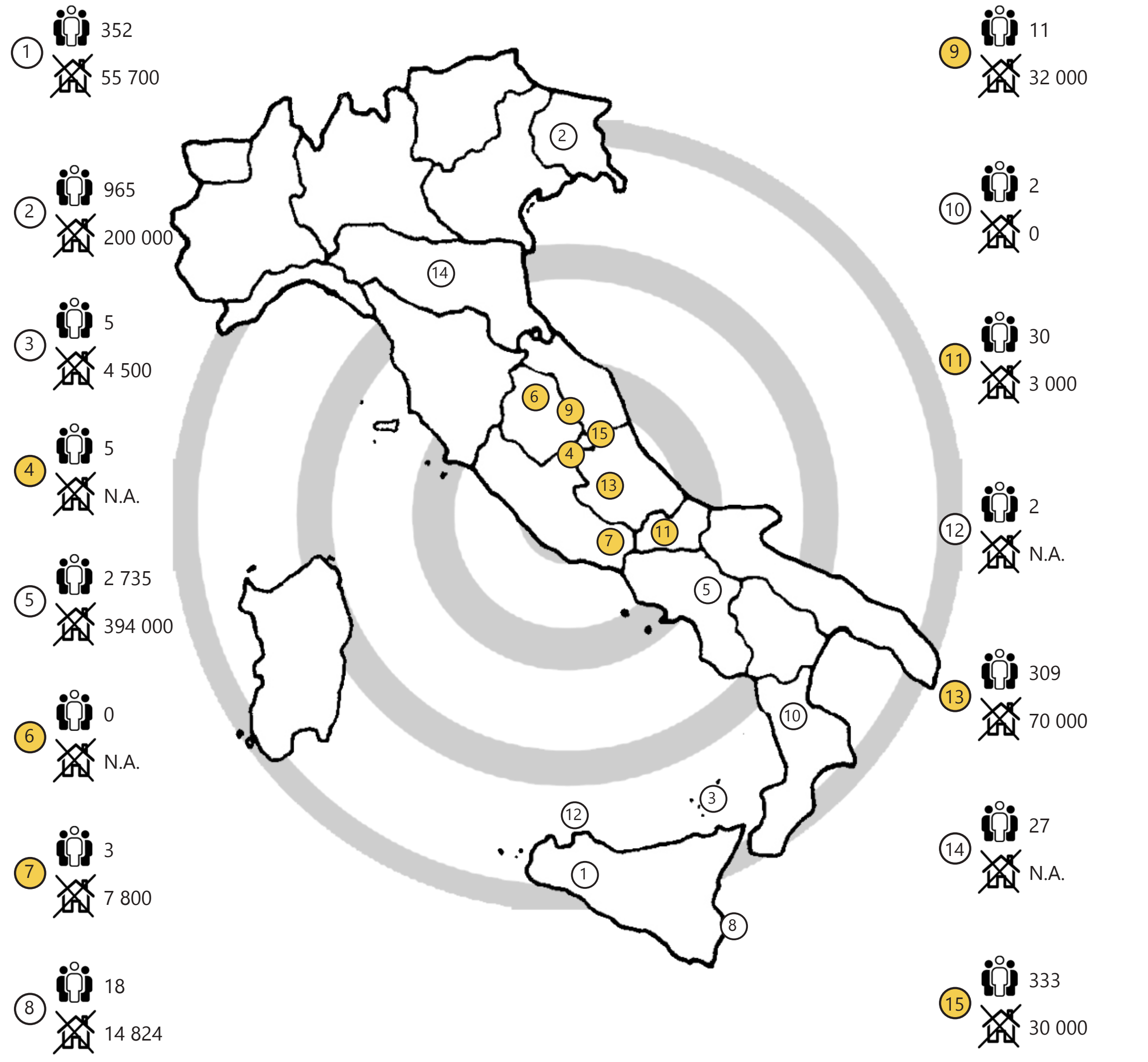
Zone 1	The most dangerous area, where major earthquakes may occur.
Zone 2	Municipalities in this area may be affected by quite strong earthquakes.
Zone 3	Municipalities in this area may be subject to modest shocks.
Zone 4	The least dangerous. Municipalities of this area have a low probability of seismic damages.

Image source: ingv.it

Autonomous regions and provinces acknowledgement of the Prime Ministerial Decree n. 3274, 20 March 2003

EARTHQUAKE HISTORY

As mentioned before, Italy is a seismic country and this is shown in its history. A recollection of data about the history of the country in terms of important earthquakes and following governmental actions are exposed in the following pages. Starting from a timeline that shows the identity of Italy, pointing out the events with a Magnitude of 5 or higher. Some of the more important events were fundamental to push for a change in the Italian legislation about earthquake safety and building codes. The law evolution is described in page 21 with a timeline showing the main changes in the identity of the country through prevention.



LEGEND:

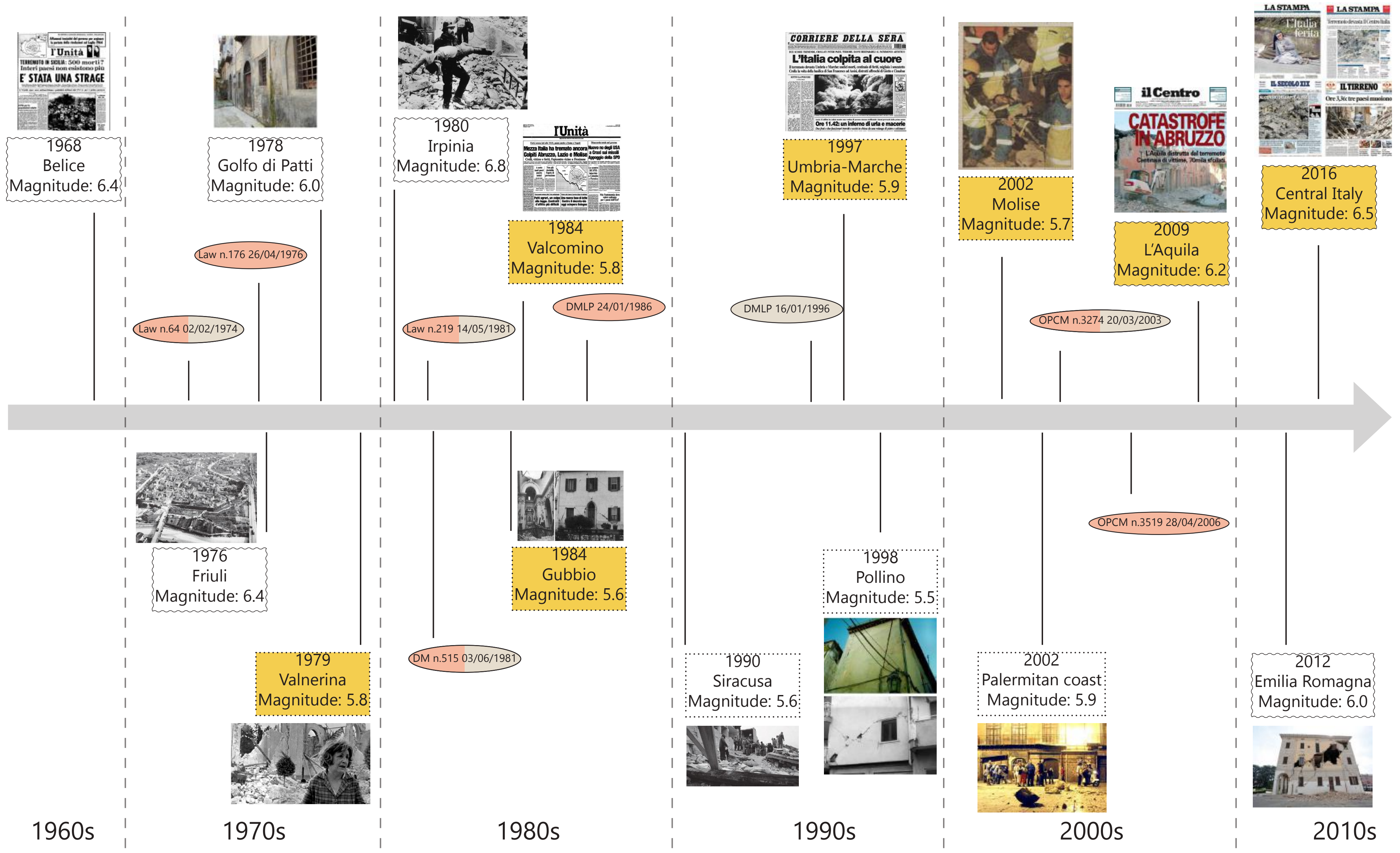
Earthquakes in Central Italy

Victims

People who lost their houses

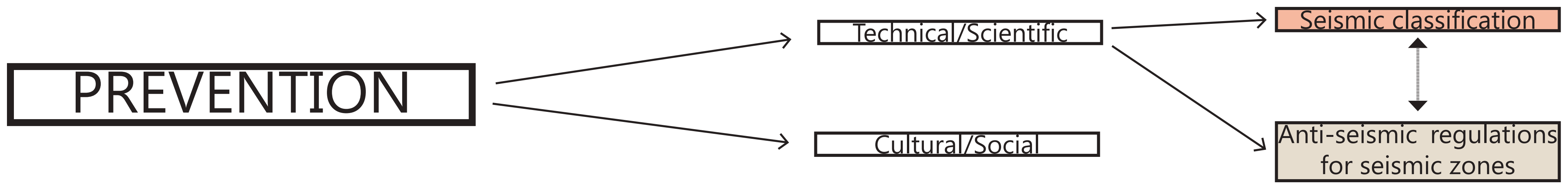
(INGV Terremoti, 2018)

1968 - 2018: 50 years of earthquake history in Italy



Earthquakes in Central Italy

(INGV Terremoti, 2018)



Law n.64 of February 2, **1974** gives measures for construction with specific limitations for seismic zones

After the law, the Ministerial Decree n. 40 was released on March 3, **1975**. This document disciplines the constructions that are to be fabricated in zones declared seismic by the art. 3 of the law from the previous year.

In **1976**, the Seismic Service Institution was created with the Law n.176 issued on the 26th of April. The institution is given the task to update the knowledge about the national territory seismicity and to arrange technical elements in order to update the regulations.

In **1979**, a project by CNR created the shake maps for the Italian territory to be able to quantify the level of exposition of the country to earthquakes.

Two years after, the Law n.219 of May 14, **1981** and the Ministerial Decree n.515 of the 3rd of June were issued. The Law dictated measures for the reconstruction after the earthquake in the regions of Campania and Basilicata and the Decree introduced a third category of seismic zones, with a lower seismicity ending in a configuration of category with the following coefficient C:
Category I: C=0,1 (1975)
Category II: C=0,07 (1975)
Category III: C=0,04 (1981)

A re-design of the limit of the seismic classification of the National territory was carried out with the Ministerial Decree of Public Works of January 24, **1986** and a big number of municipalities was added to the list of interested towns.

On January 16, **1996** another update to the building code was made through a Ministerial Decree of Public Works.

In **1998**, the National Seismic Service proposes a study of seismic reclassification of the territory. This proposition, called "'98 Proposal" was approved by the Big Risks Commision, but never adopted by the Public Works Ministry. In **2002**, another earthquake happened, but this time in a supposedly non-seismic zone. This was a major push for change in the National regulations.

In **2003**, with the Order of the President of the Council of Ministers n.3274, a fourth seismic zone was added to the list and the general regulations for construction and classification were updated. From that moment, the whole Italian territory is considered seismic and divided in four different categories.

In **2006**, another risk study was attached to the Order of the President of the Council of Ministers n.3519. With that document the Regions had an up to date tool for the classification or their territories. The tool was furthermore enriched with the addition of the so called "acceleration intervals (ag)", probability of exceeding 10% in 50 years, to be attributed to the four seismic zones.

("History of the seismic classification in Italy", n.d.)

THE 2016 EARTHQUAKE SEQUENCE

In 2016, a seismic sequence started in the end of August and kept shaking the Country until 2018. It was a long sequence, characterized by main events:

- August 24, 2016, 2 earthquakes of Mw 6.0 and Mw 5.4 Magnitude near the town of Amatrice
- October 26, 2016, 2 events of Mw 5.4 and 5.9 Magnitude hit the area at the border between Marche and Umbria regions
- October 30, 2016, a Magnitude 6.5 earthquake: this was the strongest seismic event registered in Italy in the past 30 years
- January 18, 2017, after almost 5 months from the beginning of the seismic emergency, four earthquakes of Magnitude >=5.0 hit, in the same days a snow storm was passing all over Central Italy making rescue operations more difficult. As a result of the combination between the two natural events (earthquake and snow storm), some of the small communities got completely isolated and unreacheable from aid and supplies.

The 2016 sequence was geographically located in between two other past sequences: the 1997 seismic sequence (Umbria-Marche regions) and the 2009 one (L'Aquila).

(INGV - Gruppo di Lavoro INGV sul Terremoto in centro Italia, 2017)

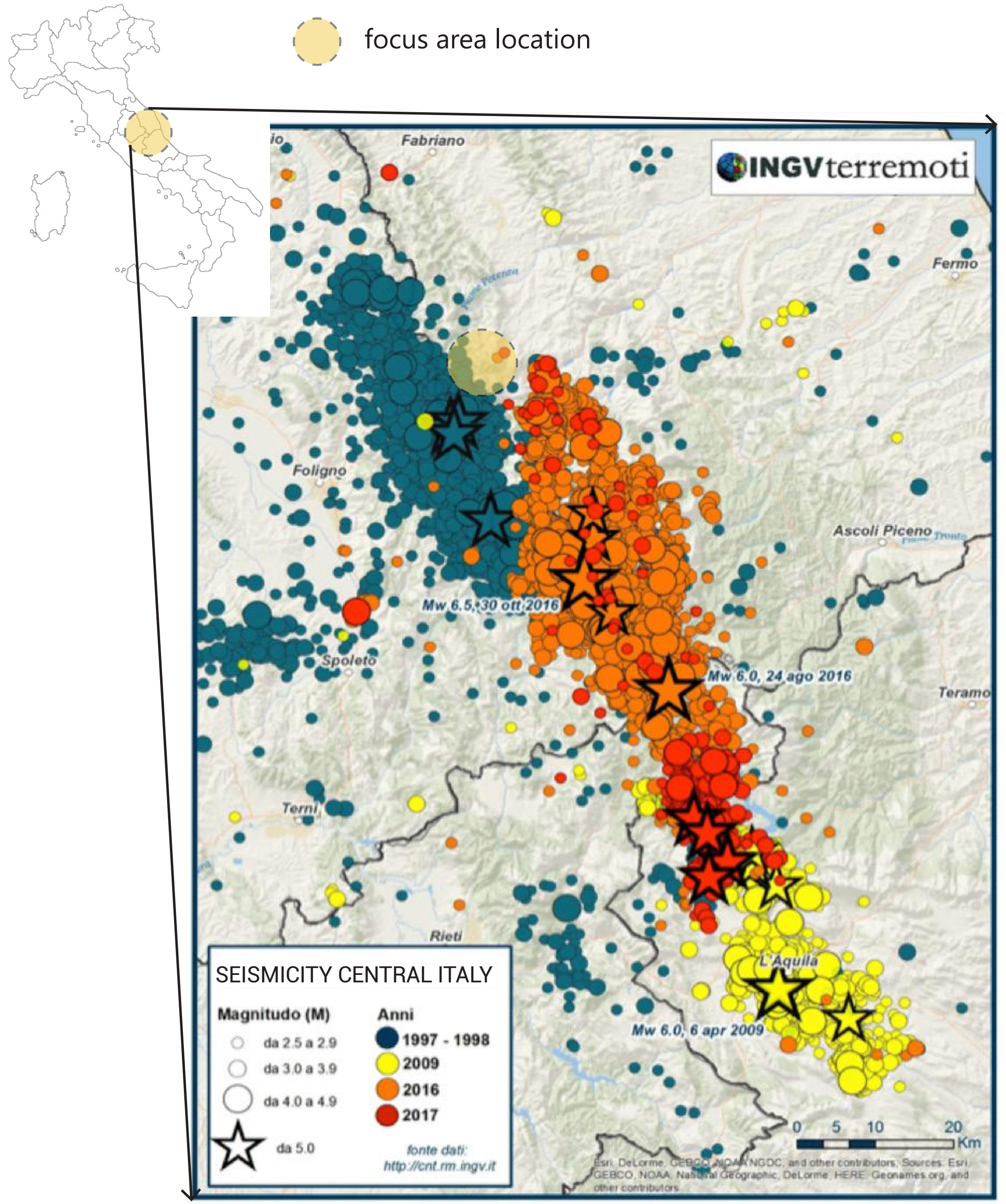


Image source: ingvterremoti.wordpress.com

Image source: lostatodellecose.com
The day after - Pescara del Tronto, Central Italy

Image source: strettoweb.com
Solidarity among citizens

Image source: commons.wikimedia.org
The aftermath in the town of Amatrice

FACTS AND DATA

- The strongest seismic event in the past 30 years (in Italy)
- Seismic sequence started in August 2016 and keeps shaking the country until now
- Earthquakes accompanied by snow storms
- 4 Main events (earthquakes) ranging from a magnitude of 5.0 to a magnitude of 6.5
- The main affected areas were mountain and hill communities, some of which got completely isolated and unreachable from aid and supplies

Failure of infrastructure

After the storm

POTENTIALS OF THE FOCUS AREA

As previously mentioned, the main affected areas where small communities that lay on mountain sides or hill tops, and that were cut off from the main system for several hours or even days, due to the failure of the roads and infrastructures.
The situation was certainly not made better by water and snow storms that accompanied the seismic events and made the delivery of aid and supplies to these communities slower and inconsistent.
All of these facts led to the decision to focus on these communities, that have common characteristics and that have a big social **potential** for resilience.

"The earth never stops shaking in my town"
Franco Arminio

MOUNTAIN AND HILL TOWNS

- Earthquakes as part of the identity
- Mountain/hill context
- Small communities with strong sense of unity/ community
- Low population (0-7000)
- Few roads to reach them
- First one to get disconnected when system fails
- Squares and cafès as main meeting point
- Cafès become "institutions"

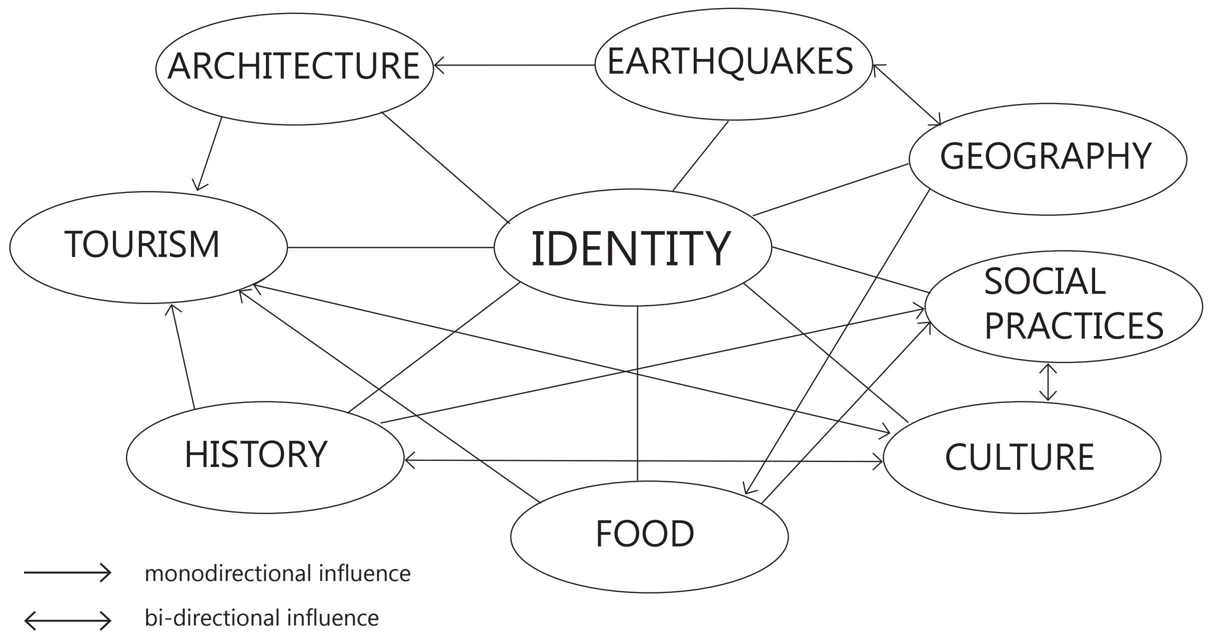


Image source: dartortorromeo.com
Cafeteria as main gathering place

"... as soon as you take a step, everybody already knows, even before you move... The hunger for gossip, that the people from the villages have in their DNA, gets satisfied in that mystic and almost transcendental place: the bar/cafeteria..."

(Valdichiana Living, 2017)

These are towns where everybody knows each other and this contributes to the constant flow of information that is collected in the cafè, that becomes the **main center for the social practices** of the village.

This led to the following reflection: a village is not just a sum of houses, but it is also a **mix of social and daily rituals** that the identity of these places consists of. So, while the reconstruction of the provision of housing is extremely important, the **securing** of these rituals is also crucial to the well-being of the community.

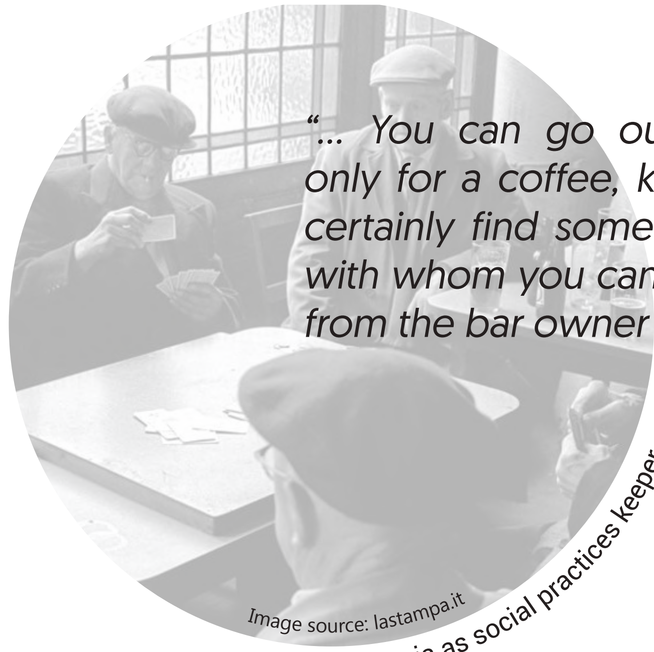


Image source: lastampa.it
Cafeteria as social practices keeper

"... You can go out to the [local] bar only for a coffee, knowing that you will certainly find somebody you know and with whom you can have a chat [starting from the bar owner himself]..."

(Valdichiana Living, 2017)

THE CONTEXT

This chapter explains the specific context. Going more in detail to the specific chosen pilot site for the intervention.

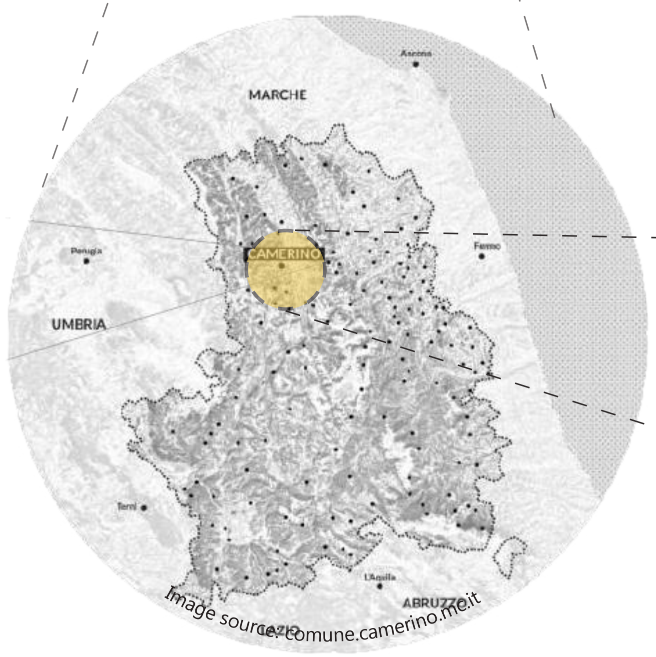
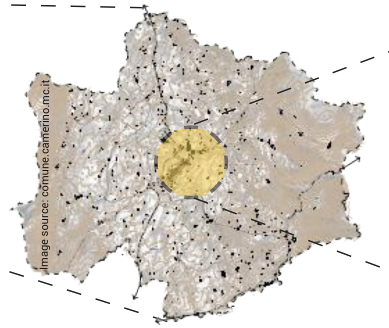


Image source: comune.camerino.me.it

CAMERINO AND ITS CONTEXT

So the next step was choosing a test field for the proposal: the town of Camerino in the Marche region. Camerino is a small medieval town in the heart of the Marchigian Appenine in Central Italy. The Municipality includes several small towns that are spread over a total area of 129.88 km^2.

Why Camerino?
The town was particulary affected by the recent earthquake sequence and it has all the before mentioned characteristics of the small towns. Furthermore, because of its position, its peculiarities and its historical/architectural importance, it was chosen by the Italian government (through the Civil Protection Department) as a pilot case to experiment a new strategy of reconstruction and development.



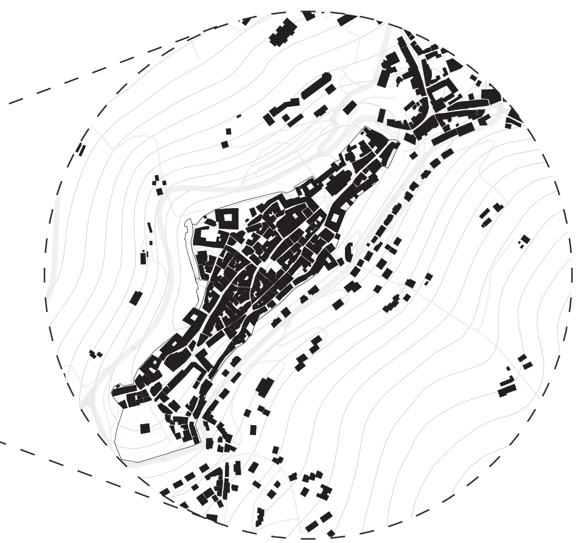



Image source: corriere.it


Image source: tibiceco.it


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Image source: commons.wikimedia.org

RISK MANAGEMENT OVERVIEW

To get a better understanding of the context, when it comes to earthquakes, the next mandatory step was looking into disaster risk management strategies that are applied in Italy. The first one is the national procedure that is currently in use. The second is the one that has been proposed as the new strategy (with Camerino as a pilot case) by the architecture firm Cucinella architects.

Both strategies have a linear configuration and include consecutive actions, but the second one adds one step, called development, that virtually connects with the previous phases.

National procedure

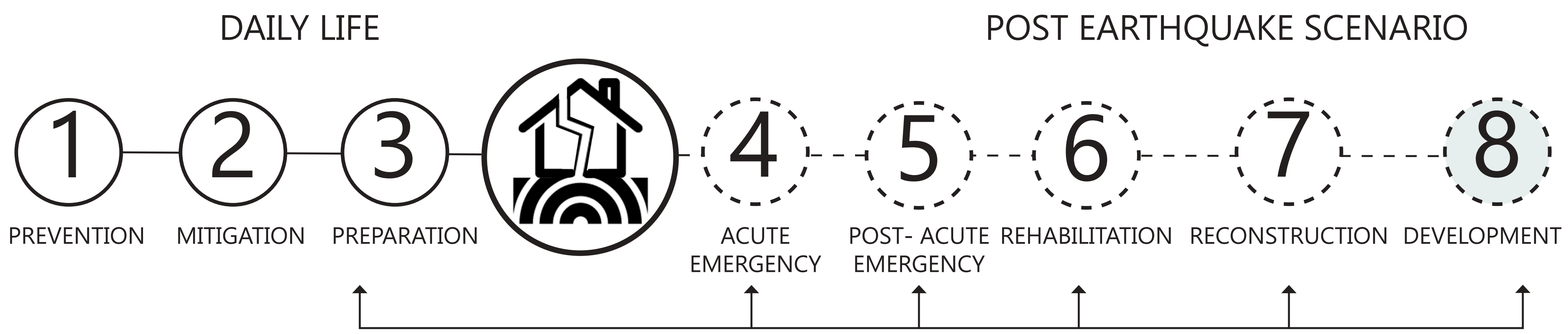
The Civil Protection Department follows 7 steps as distasters and risk management strategy. A linear strategy, based on consecutive actions.

1. **Reduce risk** factors
2. Measures to **reduce frequency** and **intensity** of risks
3. Provide **tools for preparation** to answer the emergency
4. Operational Committee + Crisis unit activated (**first aid**)
5. **Assistance** to people (Augustus method)
6. Transition phase between emergency and reconstruction: estimation of damages + **temporary settlements** establishment (residential modules, mobile canteens, mobile sanitation modules, etc.)
7. Management of the disaster is held to the population to **restore the balance**

(Mario Cucinella Architects, 2017)

Adaptive strategy

The strategic plan, proposed by Cucinella Architects, establishes 8 steps for the management of earthquakes and risks. Same linear configuration as National Procedure, but with the addition of one step, that connects the development step (n.8) with the before and after of the earthquake. A strategy that is divided in several phases and that adapts to the context and to the reaction of the community to the first interventions. A combination of immediate actions (even temporary ones) and visions for future development.

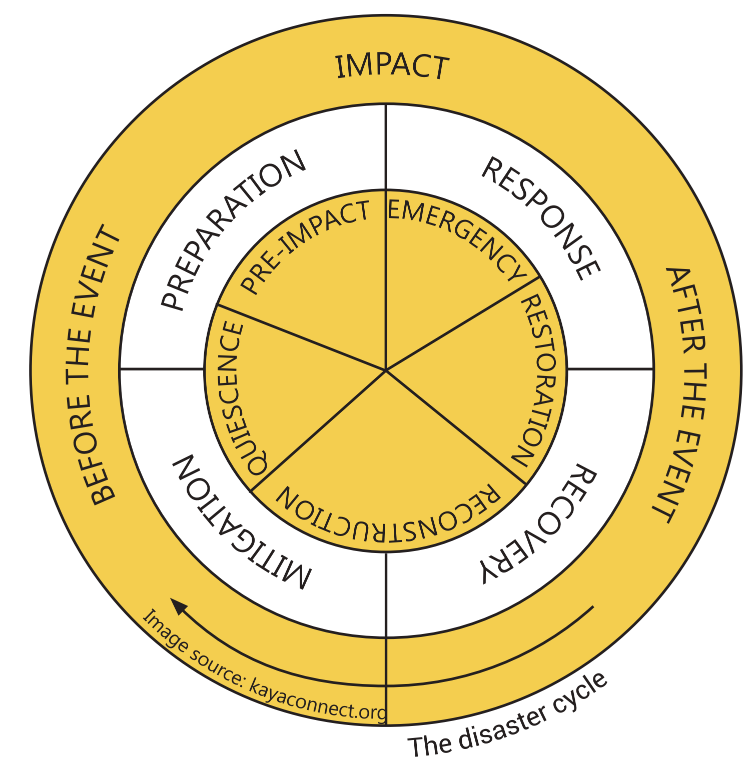


1. Micro-zoning
2. Measures to **reduce vulnerabilities**
3. Provide tools for preparation to answer the emergency (Emergency plan) + **Strategies** for rehabilitation and development
4. Operational Committee + Crisis unit activated (**first aid**)
5. **Assistance** to people (Augustus method)
6. Transition phase between emergency and reconstruction: estimation of damages + **temporary settlements** establishment (residential modules, mobile canteens, mobile sanitation modules, etc.)
7. Management of the disaster is held to the population to **restore the balance**
8. **Development** in accordance with strategies and damages experienced

(Mario Cucinella Architects, 2017)

STRATEGY FORMULATION

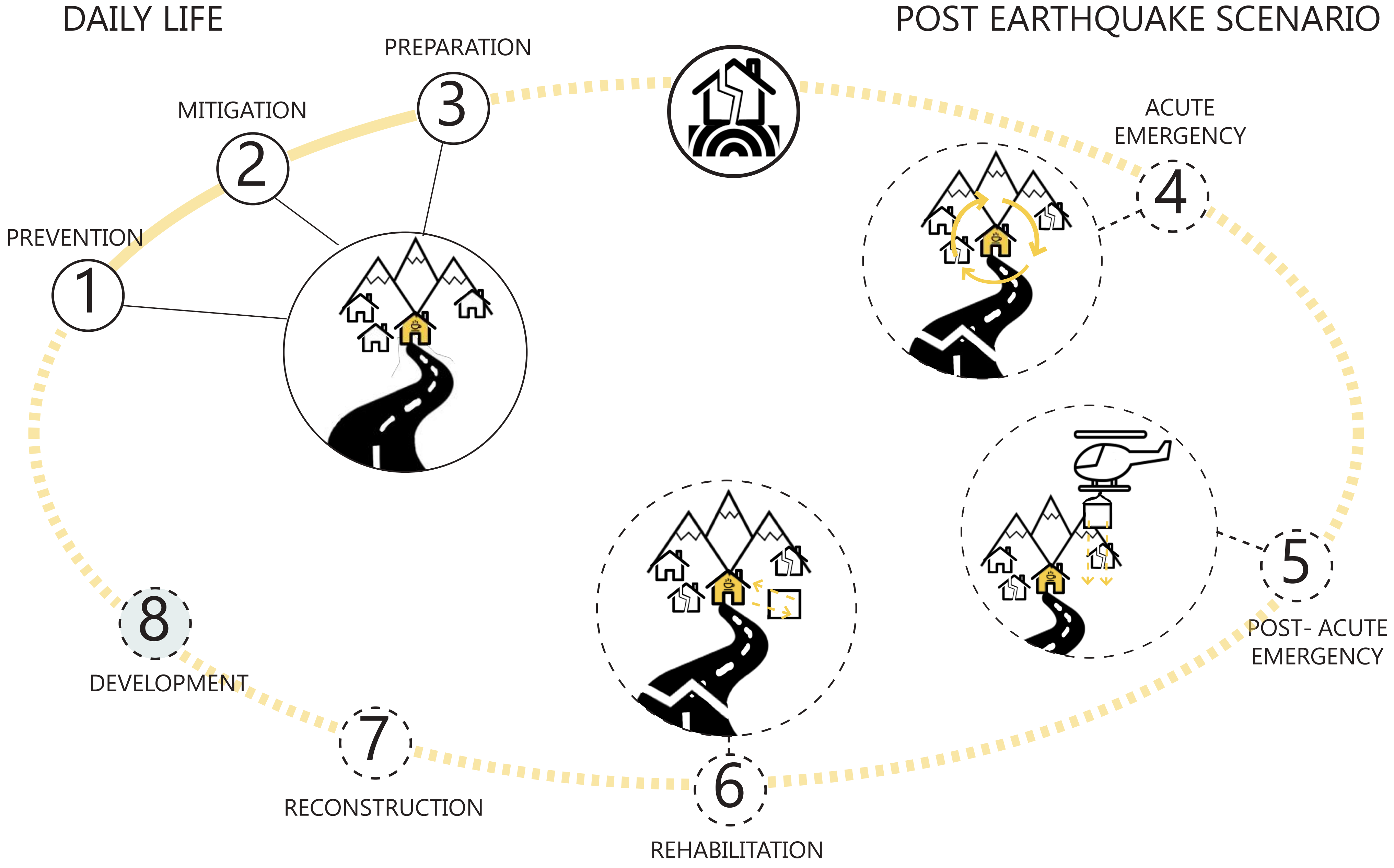
So where does "Stand Strong" intervention fit in this context? The proposed strategy is not a completely new one, but it combines the National one and the adaptive one in a circular serie of events, understanding the course of events as something that will eventually repeat itself, but keeping in mind that, while we cannot prevent or stop an earthquake from happening, we can learn and develop better strategies to stand strong against it.

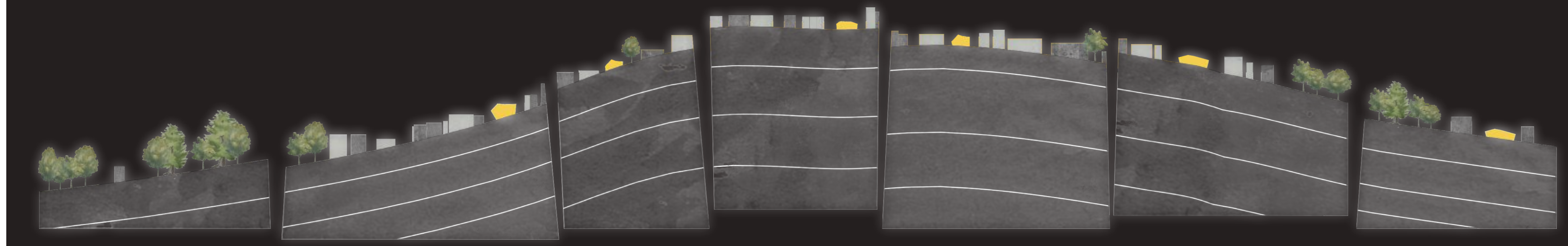


There are no distinct endings or beginnings of each stage of the disaster cycle. Each stage flows into the next and at times it can even go back. (Humanitarian Leadership Academy, 2018)

Where does “Stand Strong” fit?

A replicable measure that can be applied to similar territories/cases in order to intervene in the prevention phase, but having effects on the later stages. Interventions to increase safety, security, and resilience of the territory and the towns themselves.



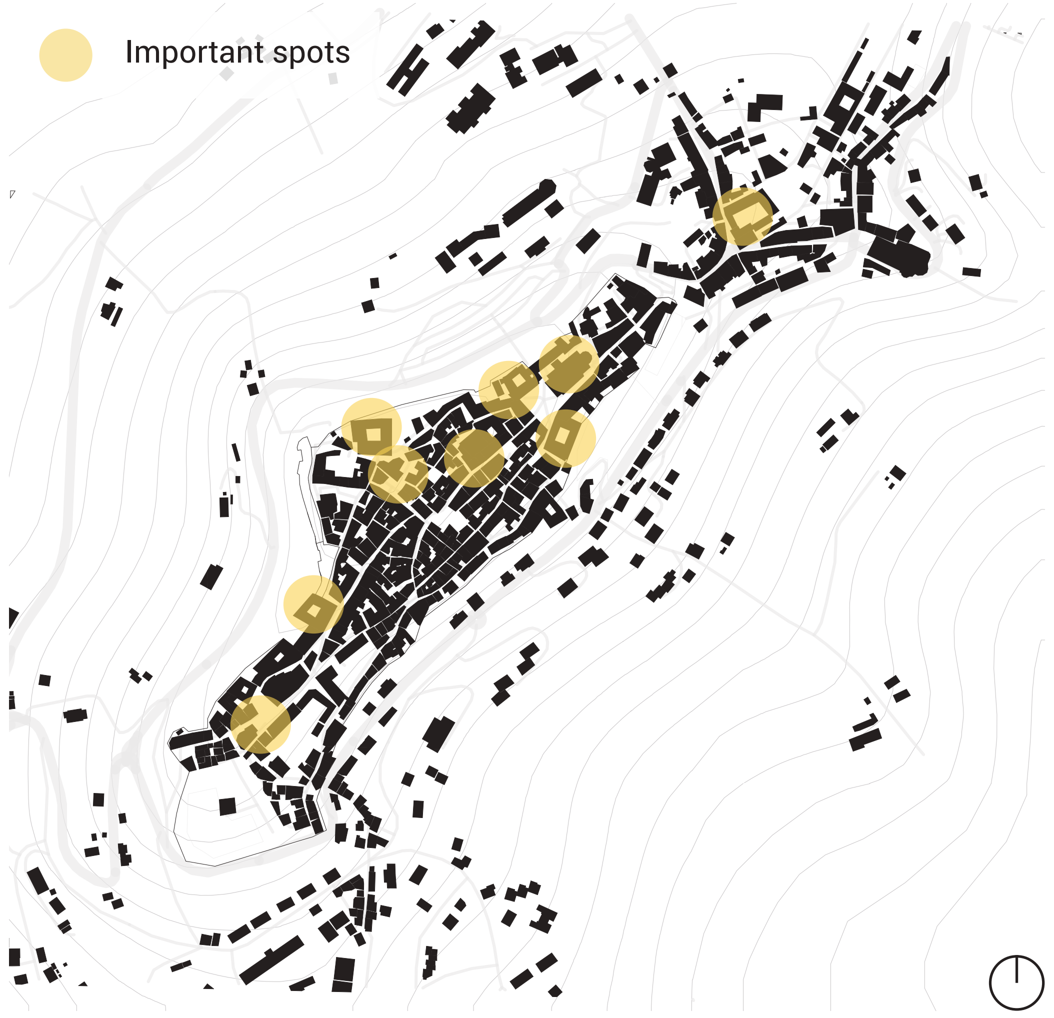


“When the earth breaks, these are the things that STAND STRONG”

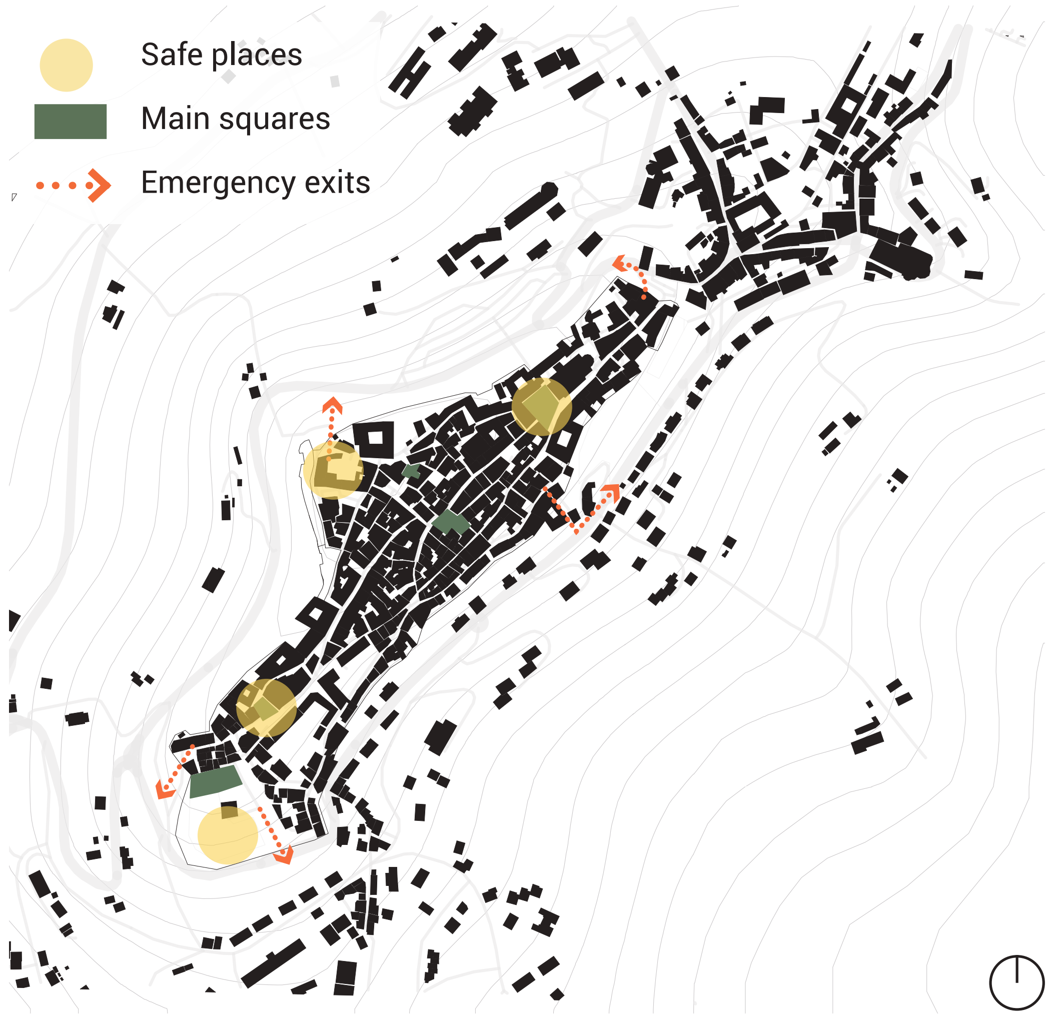
These small interventions have a core, the cafeteria, that, as we have seen, is the focal point of the social practices of these places. What is suggested then is one or multiple units, depending on the size of the community, that are placed in **strategic and safe** points in the urban context, in order to reach the community near them. Units that, when the earth breaks, have the ability to STAND STRONG.

A deeper analysis of the town was necessary to understand where could be the more suitable spots to place the interventions. First, the main important spots of the city were identified. Then, earthquake safe places, together with main squares and appointed emergency exits were pointed out. Finally, three possible locations for these interventions were selected, but the final proposal of this thesis is focusing on one of them.

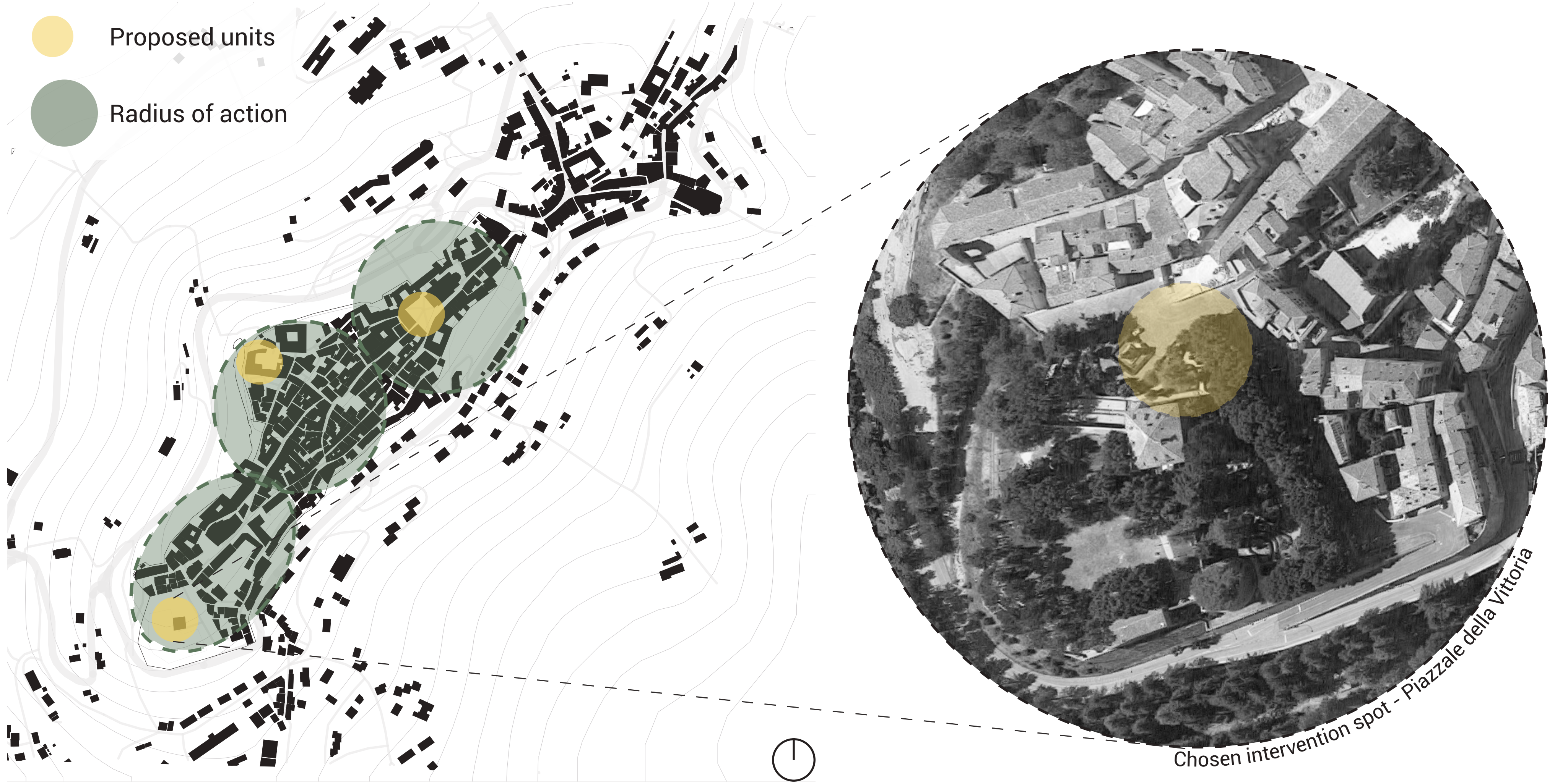
Important cultural and historical spots



Main squares, safe places and emergency exits



Possible implementation spots

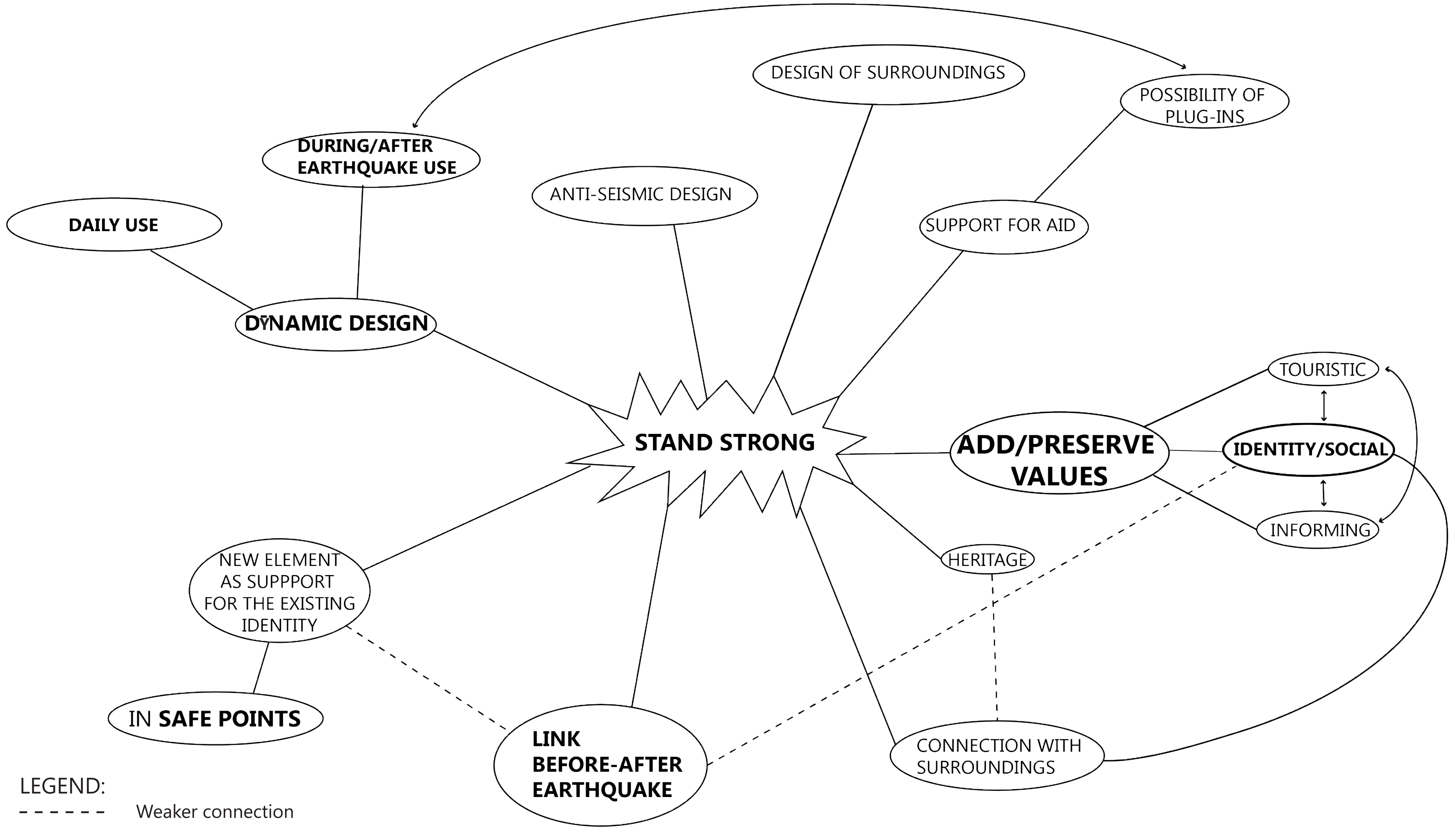


THE PROPOSAL

The design proposal is based on hypothesis raised after the analysis of the physical context and of the identity features highlighted in previous chapters.

Hypothesis:
- Social practices can be used to increase resilience of small communities against earthquake
- Social practices through architecture can create a link between the daily life & the post-earthquake life and increase community resilience

DESIGN DELIMITATIONS



LEGEND:

- - - - - - Weaker connection

⟷ Interdependency

KSDKKD Stronger focus

A delimitation diagram to help understanding the focus of the design solution. Generated through a brainstorming session, it highlights the most important features of the proposal.

DESIGN REFERENCES

Auditorium del parco, L'Aquila (Italy)
Project by: Renzo Piano Building Workshop

This project was implemented after the earthquake that hit Abruzzo region (Italy) in 2009 (pages 19-20 of this document). The main affected urban settlement was the city of L'Aquila, that was profoundly damaged and struggled for long time to recover from the seismic event.

MAIN INTERESTING FEATURES:

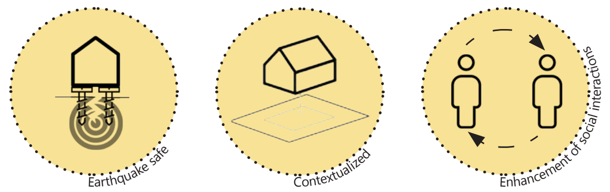
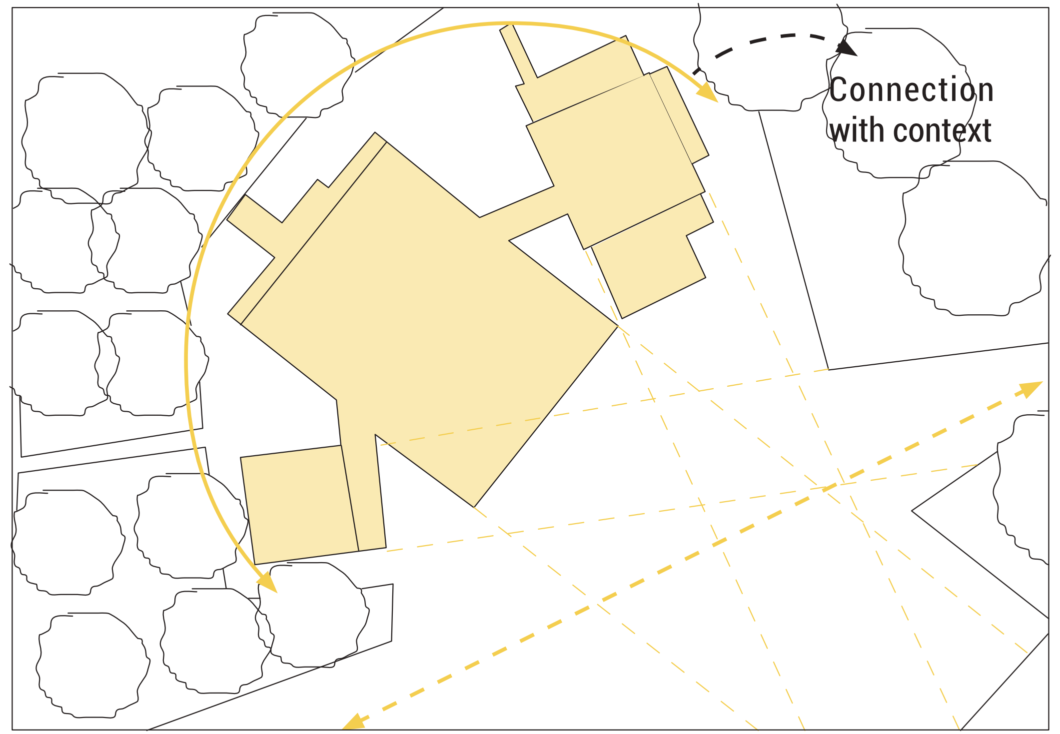
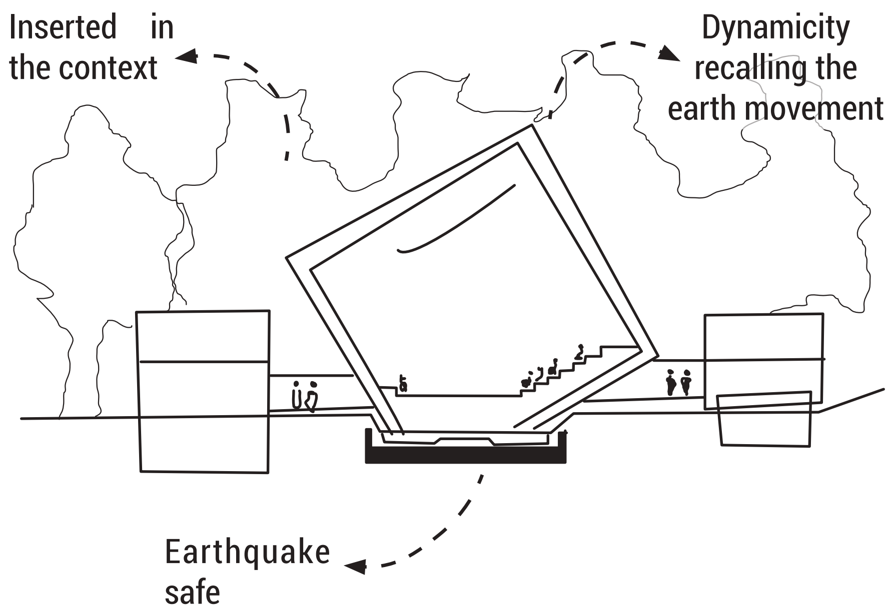


Image source: huffingtonpost.it





Amatrice food area, Amatrice (Italy)
Project by: Stefano Boeri Architetti

This project was implemented after the most recent earthquake that is also the case study and the starting point of this thesis work. Amatrice was a city that based its economy on food industry. The project gives the community, that was severely hit by the series of earthquakes that started in August 2016 in Central Italy, new spaces to meet and taste local food.

MAIN INTERESTING FEATURES:

Image source: inhabitat.com

FOUNDATION SYSTEM: BASE ISOLATION

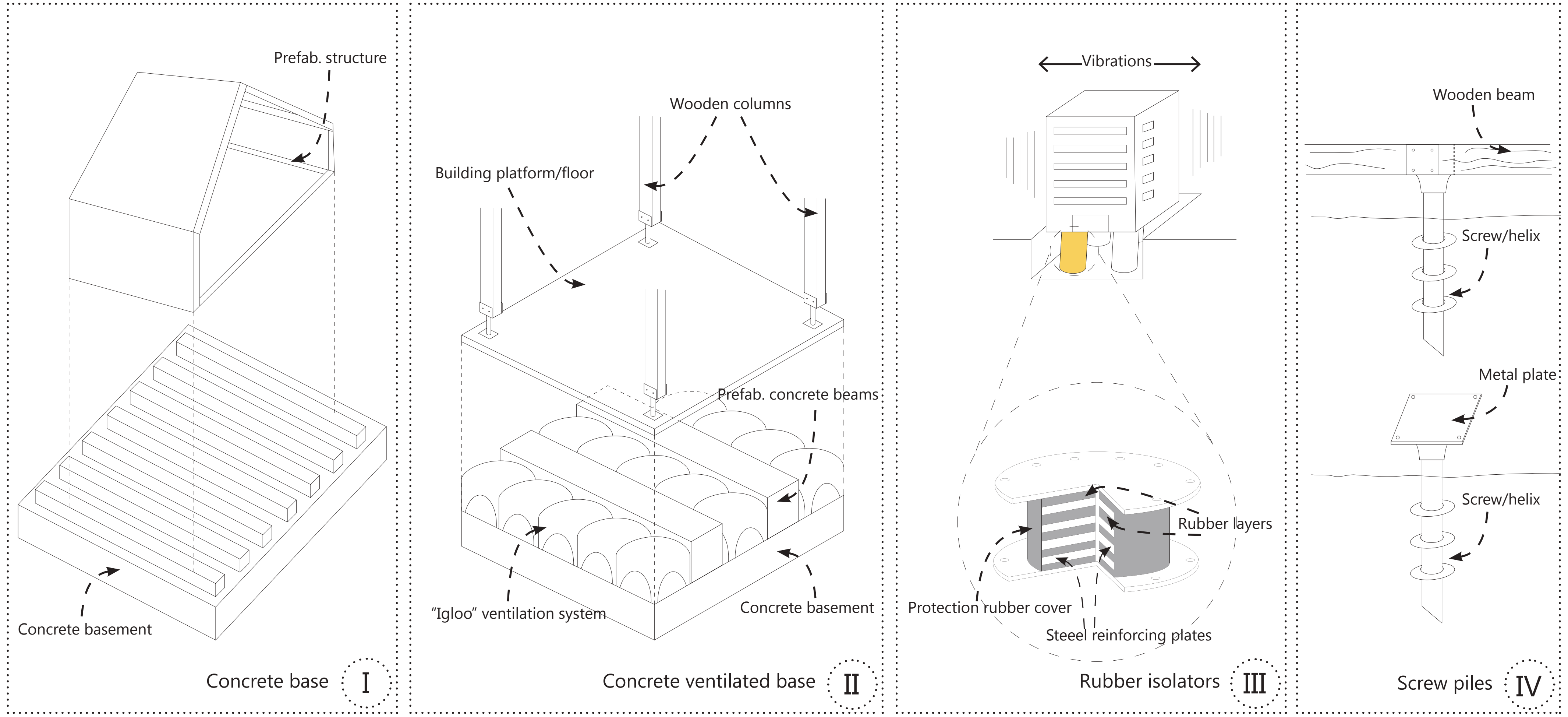
Base isolation: how does it work?

The concept of separating the structure from the ground to avoid earthquake damage is simple to understand: in an earthquake the ground moves and its movement is the reponsible for most of the damage to structures. So, using a base-isolation system, the ground will move but the building will not move.
But what is base isolation? Base isolation is a flexible system that reduces earthquake damage to the structure and its contents. Base isolation system absorbs and deflects the energy released from the earthquake before it is transferred to the structure. The term "isolation" refers to reduced interaction between structure and the ground. The base isolators mitigate the effect of an earthquake by essentially isolating the structure from potentially dangerous ground motions. The base-isolation techniques prove to be very effective for the seismic protection of new framed buildings as well as for the seismic retrofitting of existing ones. (Fathima, 2016).

Main objectives of base isolation systems:

- Minimizing interruption of use of facility (Immediate Occupancy Performance Level)
- Reducing damaging deformations in structural and non-structural components
- Protection of building frame
- Protection of non-structural components & contents
- Provide for an operational facility after the earthquake
- Protection of life - safety of occupants
- Improvement for safety of building

(Fathima, 2016)



After understanding the principles of base isolation, different foundation and building base systems have been analyzed and compared to find which one could best fit the purpose in the project's context.

SOLUTION	I Concrete base	II Concrete ventilated base	III Rubber isolators	IV Screw piles
MATERIALS	• Concrete • Iron • Prefabbricated structure (on top)	• Concrete • Iron • Plastic (igloo) • Steel (on top) • Wood (on top)	• Rubber • Steel • Building (on top)	• Steel • Steel or wood (on top)
ENVIRONMENTAL IMPACT	🌱🌱	🌱🌱	🌱🌱🌱	🌱🌱🌱🌱🌱
USUAL IMPLEMENTATION	Small and medium buildings construction	Small and medium buildings construction	Big buildings construction Bridges	Small and light buildings construction
MAIN CHARACTERISTICS	Possibility of installing prefab. structure on top	Ventilated Possibility of installing prefab. structure on top	Big dimensions Used for big buildings with many floors Not convenient for small buildings	Light weight Easy to install Easy to disassemble Cheap solution

LEGEND:

🌱🌱🌱🌱🌱 "Greener" solution

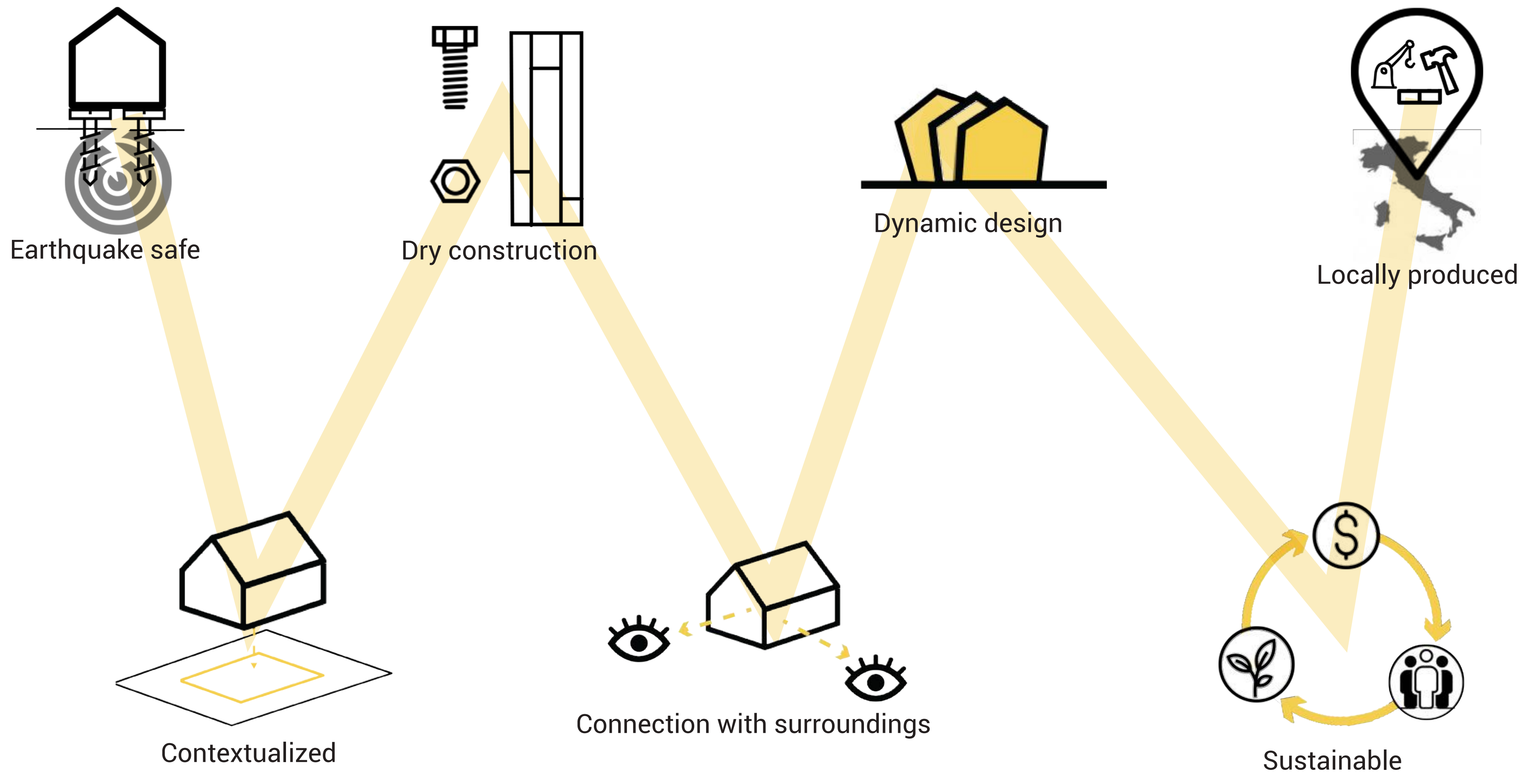
🌱 Least environmental friendly

(yellow box) Choosen solution

For good resistance to earthquakes, it is optimal that the structure is light and flexible. For the project, the optimal solution, and chosen one, is the one that combines low costs with environmental friendly solutions. Since the units are thought as small interventions, for a major cost/effectiveness, the chosen solution is the **screw pile foundation system.**

DESIGN PARAMETERS

The study of the references, of the possibilities for the foundations system, and the analysis of the context, lead to the definition of seven main design parameters that the design should potentially be based on.

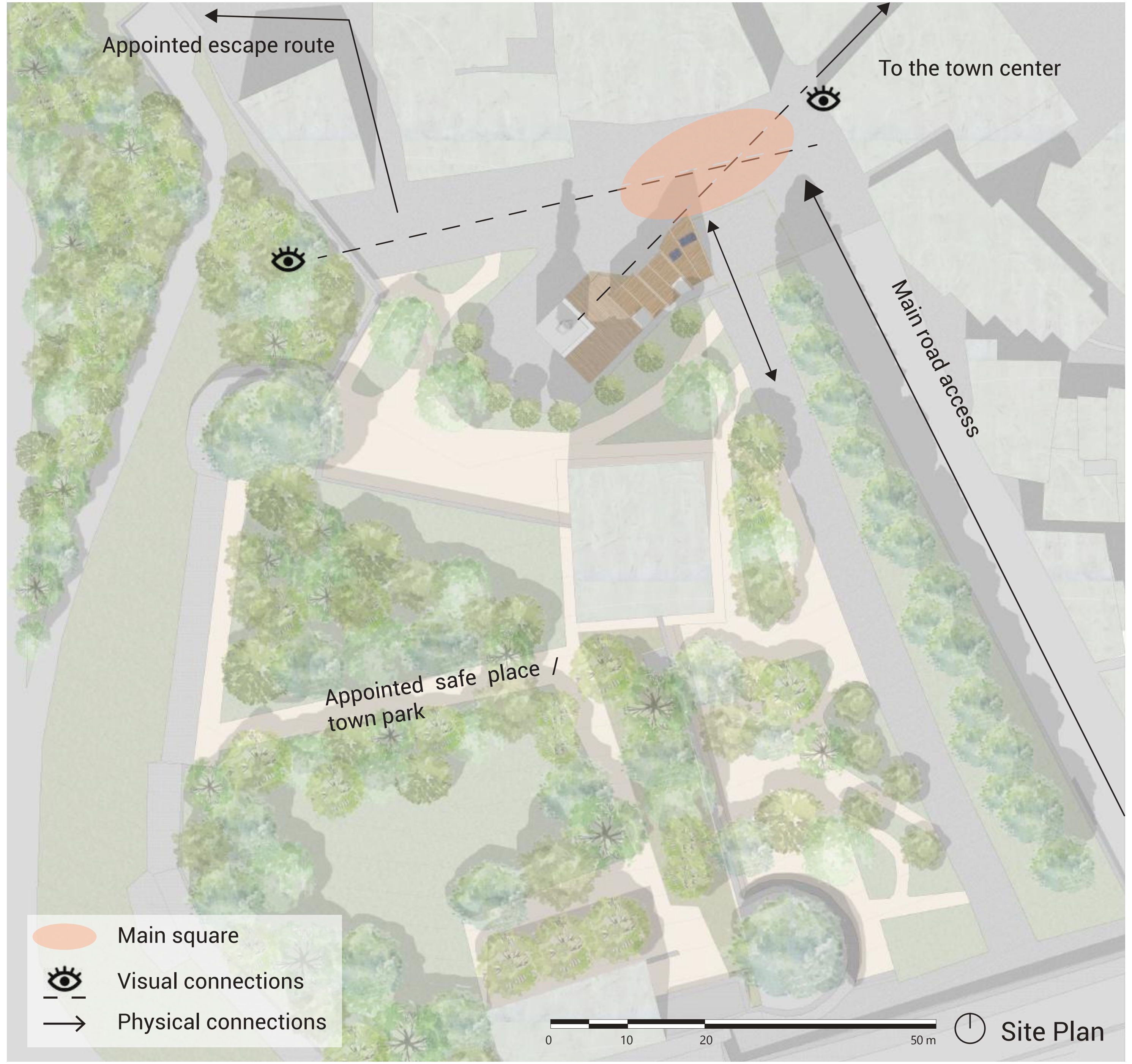


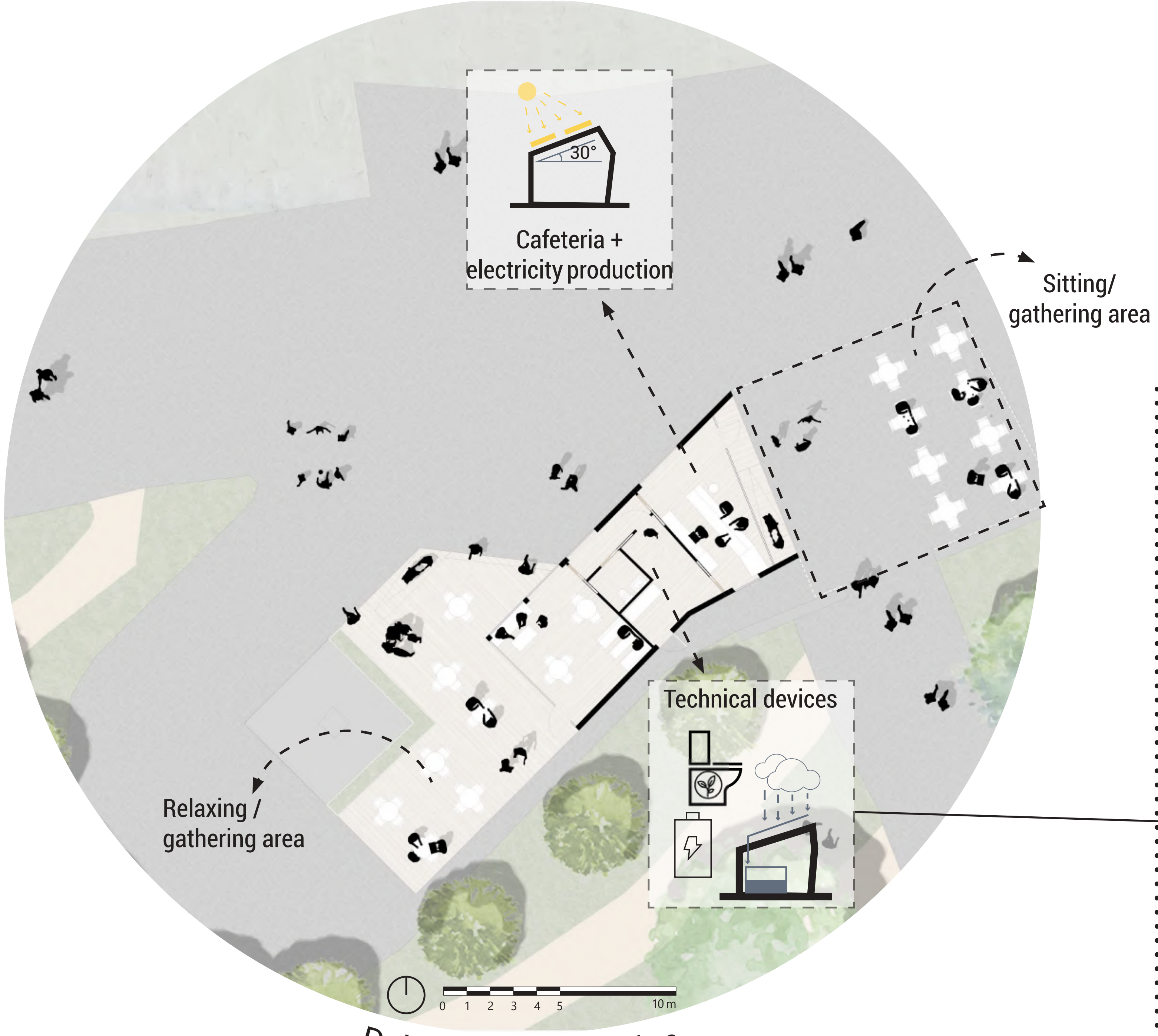
PROPOSED UNIT

The lines to generate the design have been taken from the site's main axis, that converge in the public square that the intervention faces.

Then the design is virtually divided in 4 main thematic areas:
- the cafeteria with energy production on the roof,
- the technical area where the compost toilet, the water collection & purification devices are placed,
- the gathering areas that include the deck that opens to the square and the area in front of the cafeteria entrance.

The two gathering areas assume other functions in a post-earthquake scenario. The space in front of the cafeteria entrance becomes the "aid plaza", or the place appointed for the aid system to drop the containers that bring further supplies or aid to the community. The deck could potentially be turned into the space in which the aid is coordinated and distributed to the ones in need, as a support area for the "aid plaza".

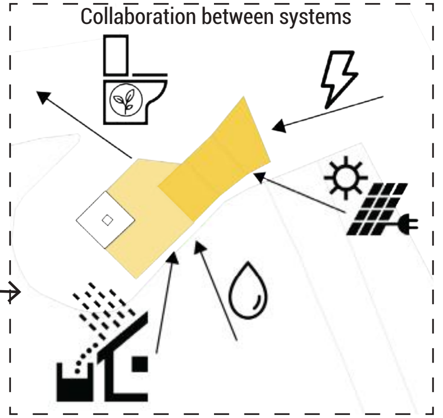




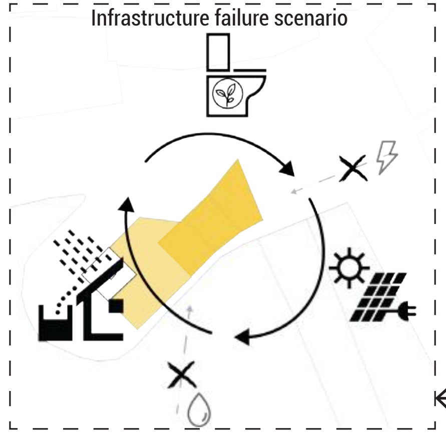
Daily life scenario plan

TECHNICAL SYSTEMS

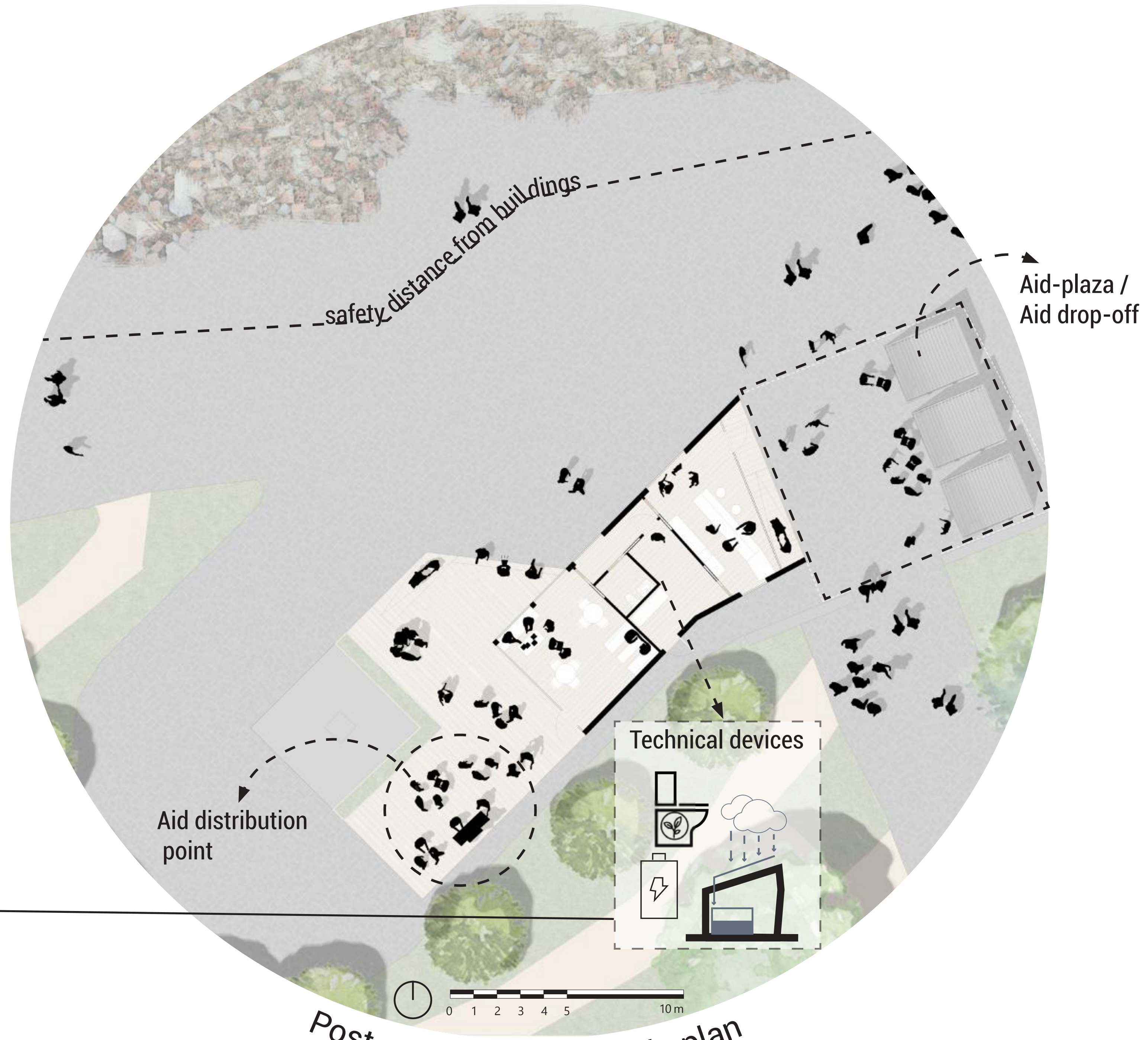
The building is equipped with two installation systems: one is the electricity and water supply from the city grid/infrastructure and the other consists of technical devices such as the compost toilet, the rainwater collection & purification system, and the pv panels + storage battery.



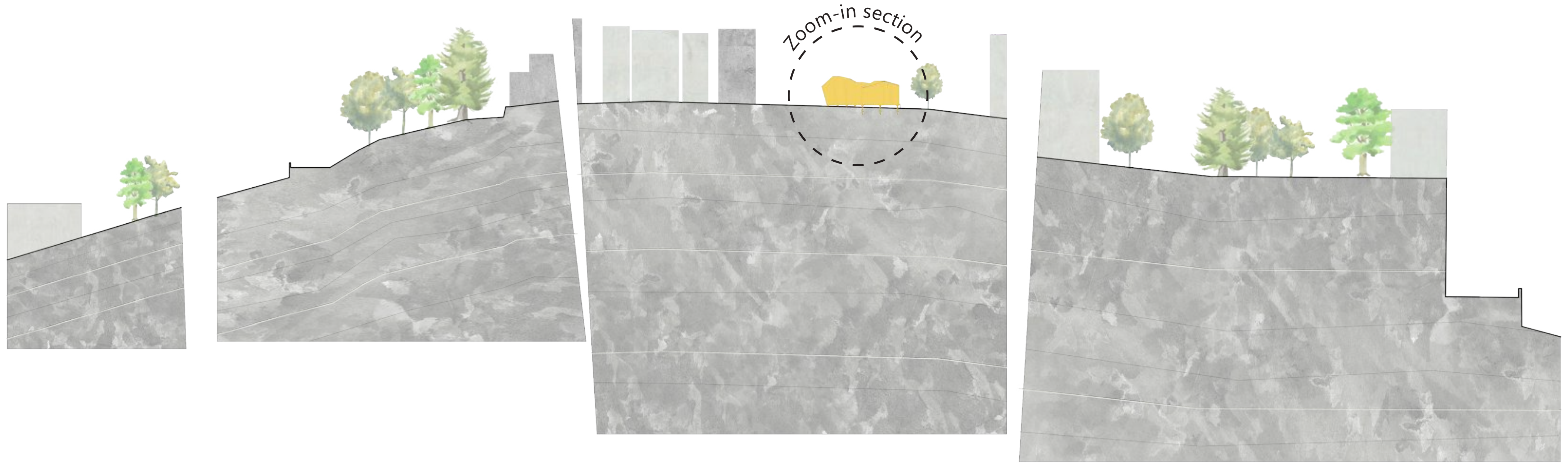
In a "daily life" scenario, the two systems work together.

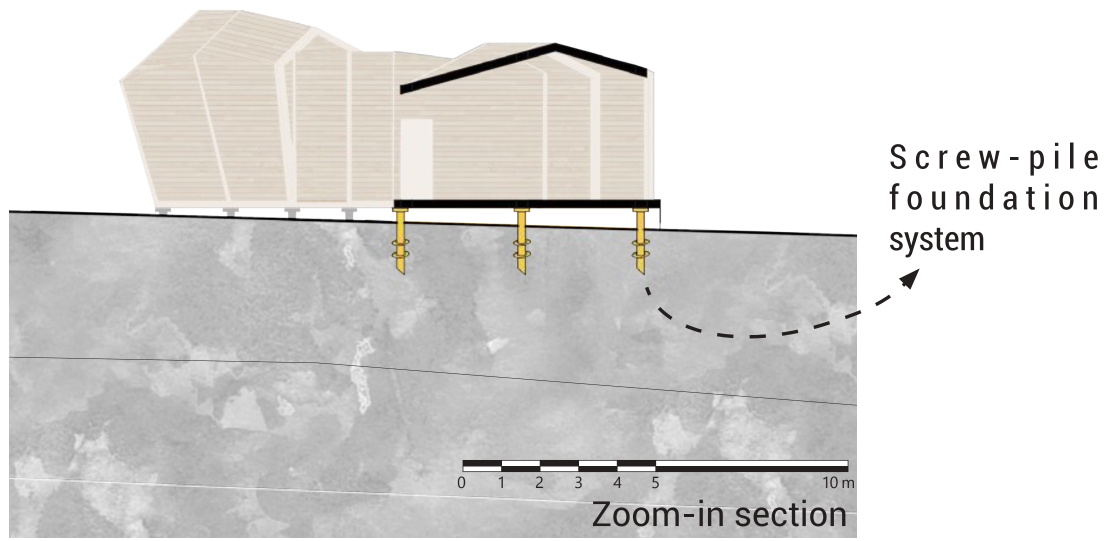


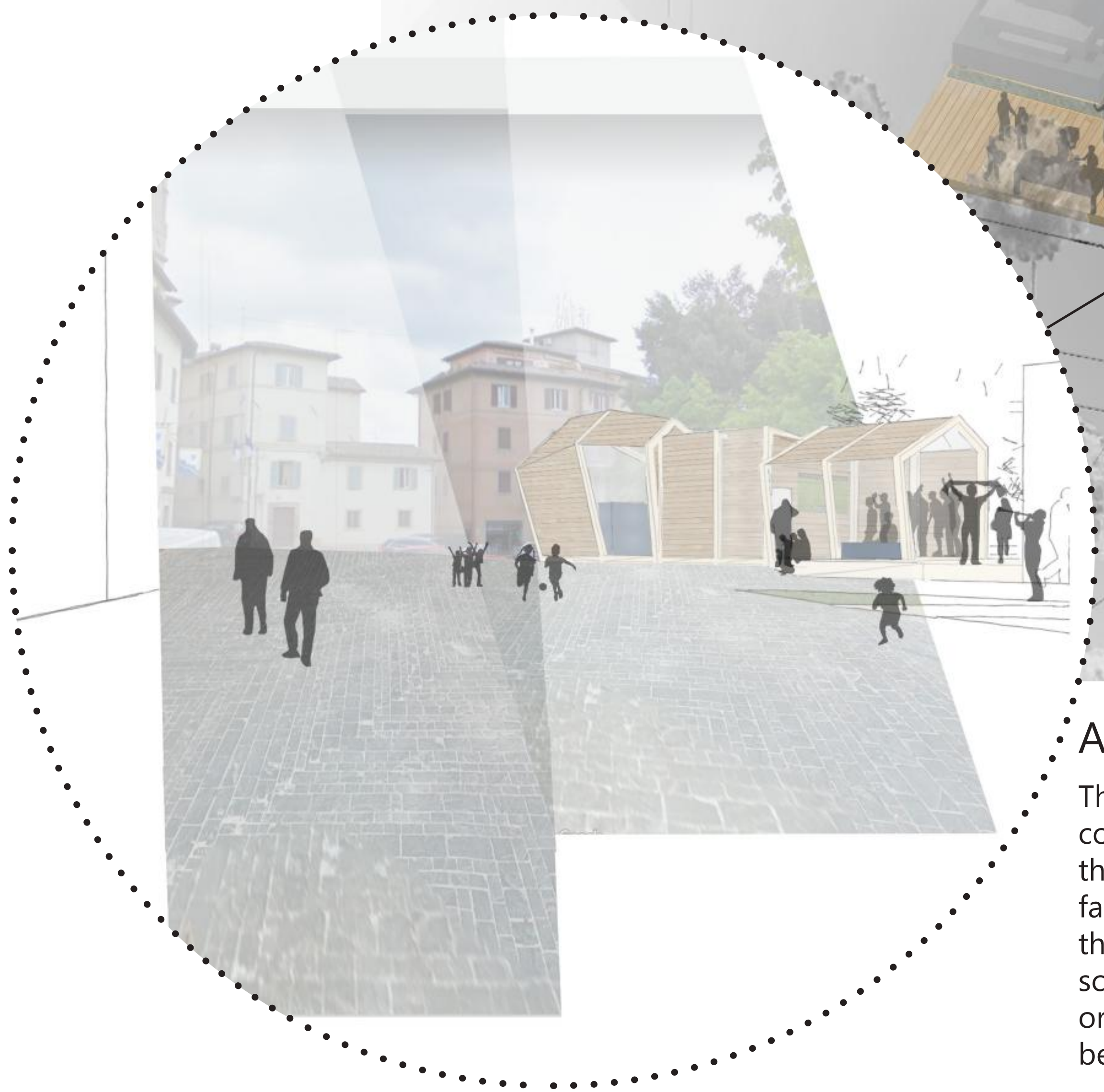
In a "post-earthquake" scenario, in case of a failure of the city infrastructure, the building becomes self-sustained, thanks to its technical devices.

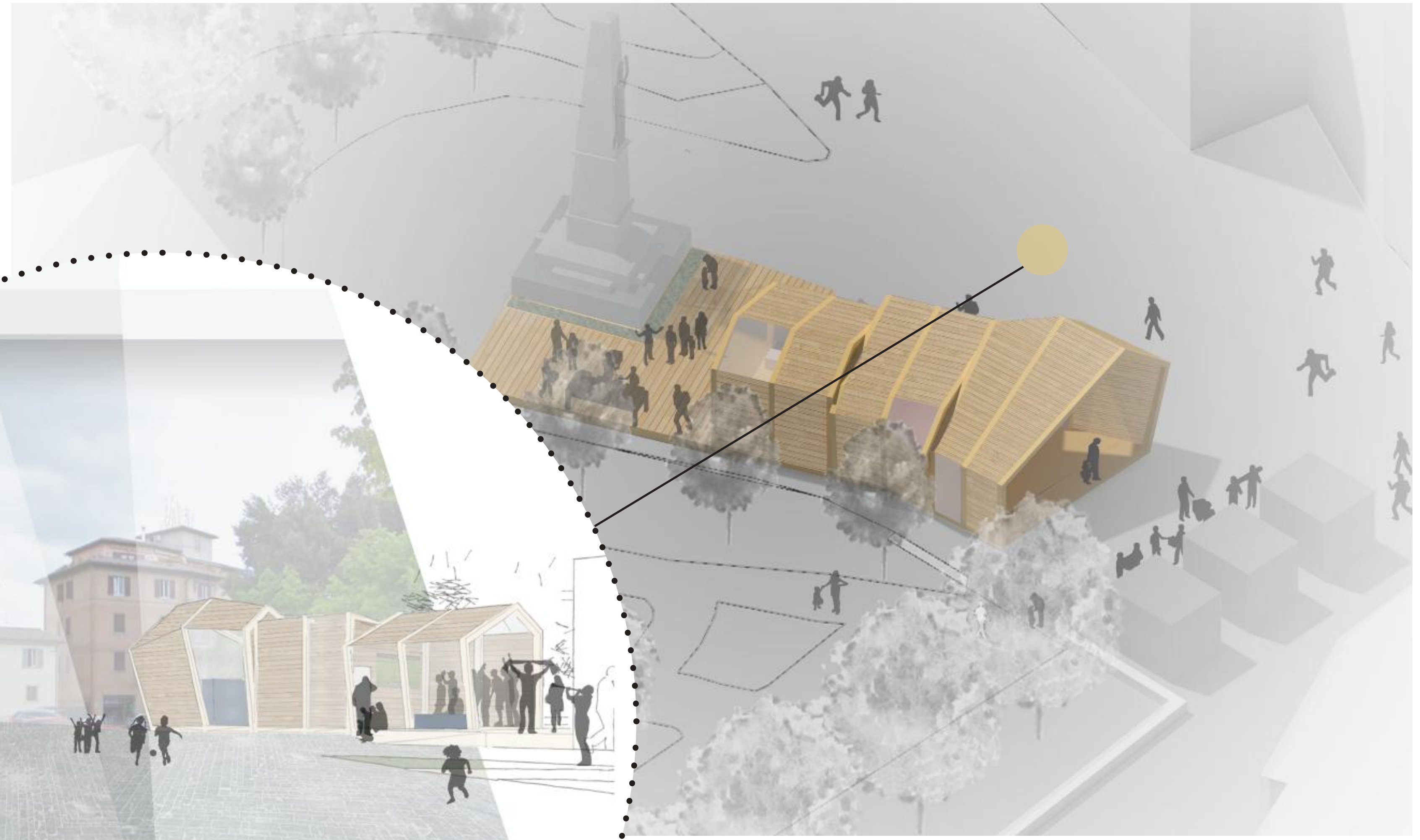


Post-earthquake scenario plan



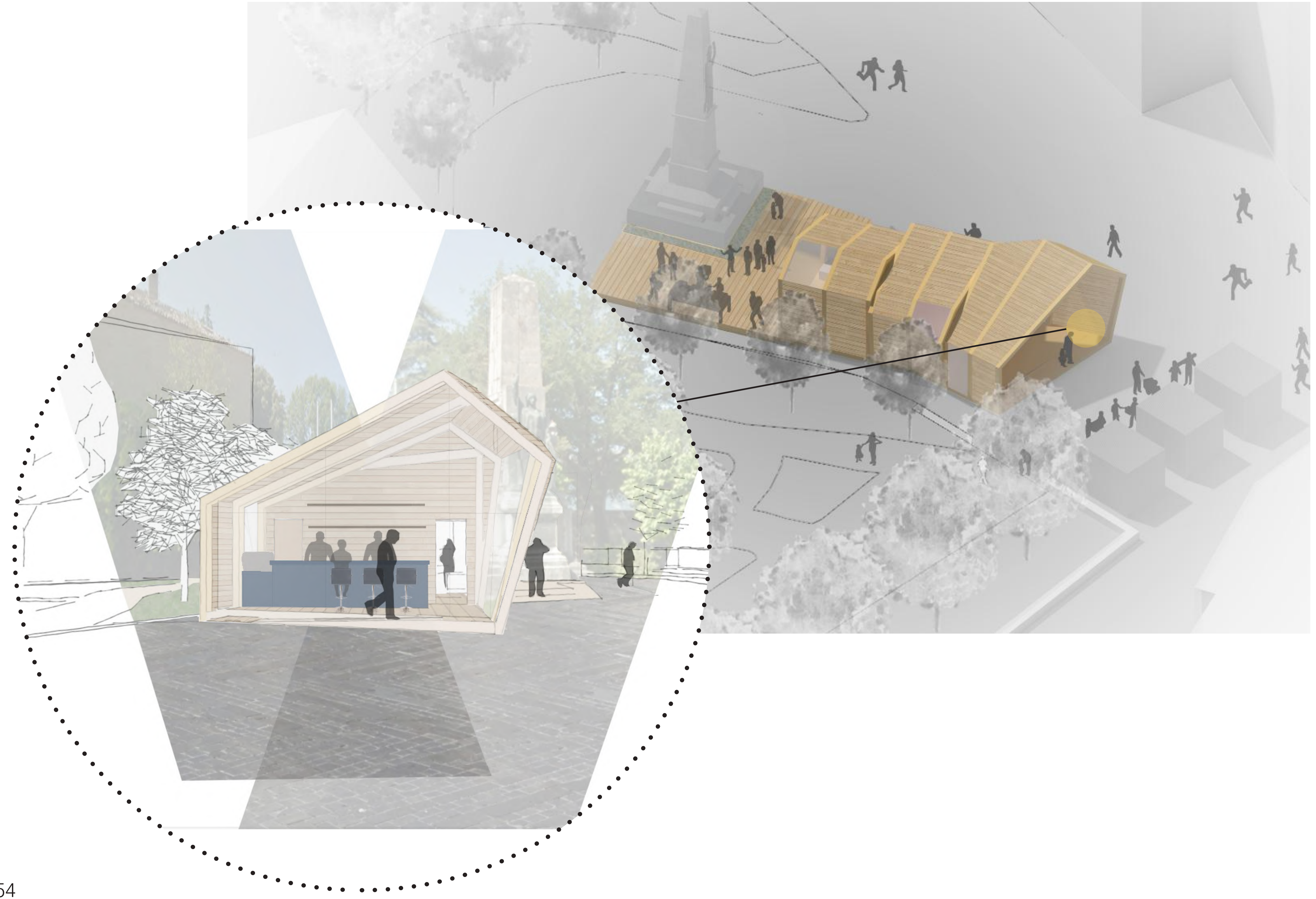


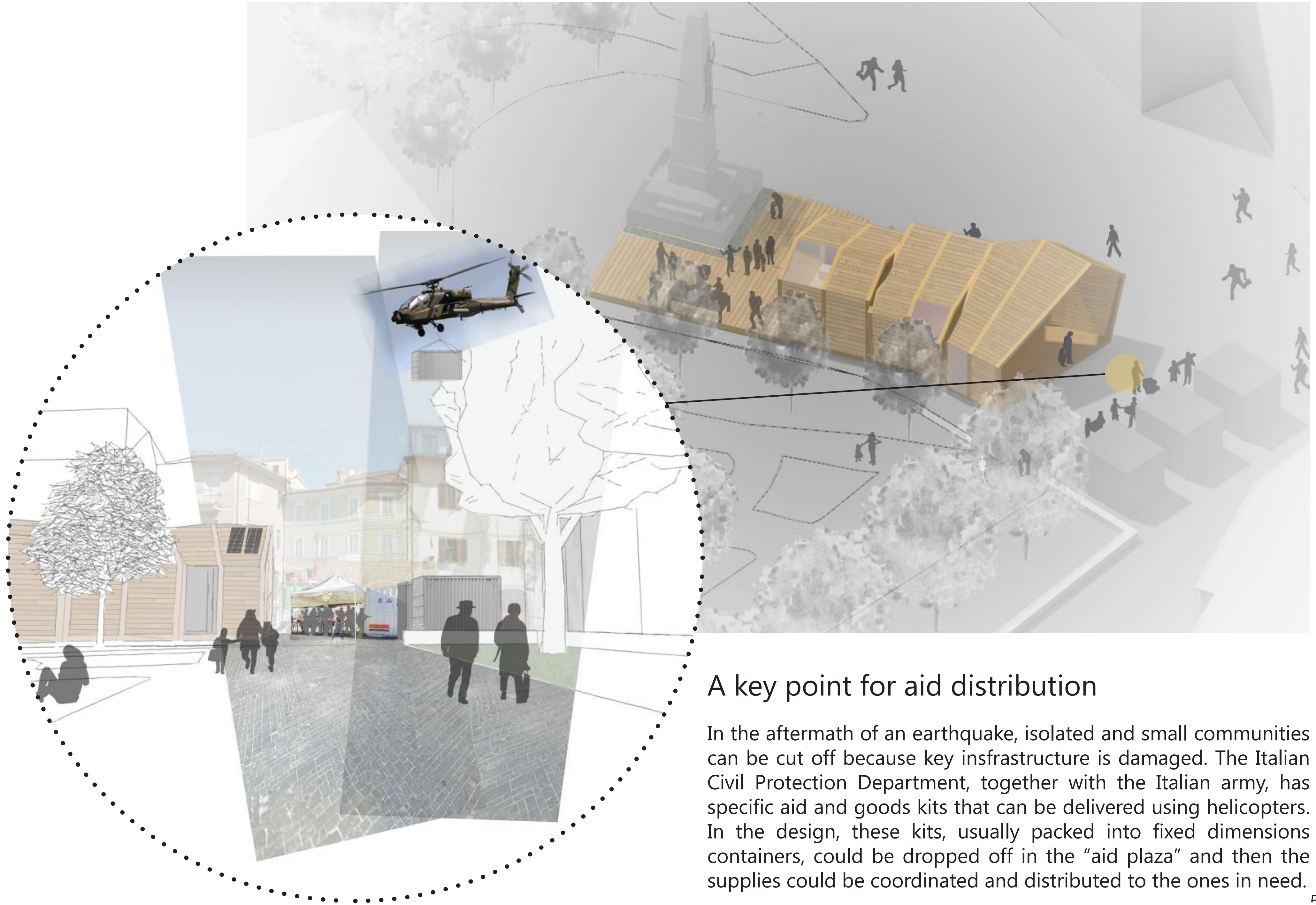




A safe and familiar place

The intervention should be, ideally, present in the daily life of the community it is placed in. So, it could become a reference point for the population and add values to the square or public space it is facing. If the unit can enhance and maintain the social practices of the community, it can assume a big role in case of an emergency scenario. It could become the first place where people head to in order to feel safe (both because they are familiar with it, but also because they know it will stand strong against the earthquake).

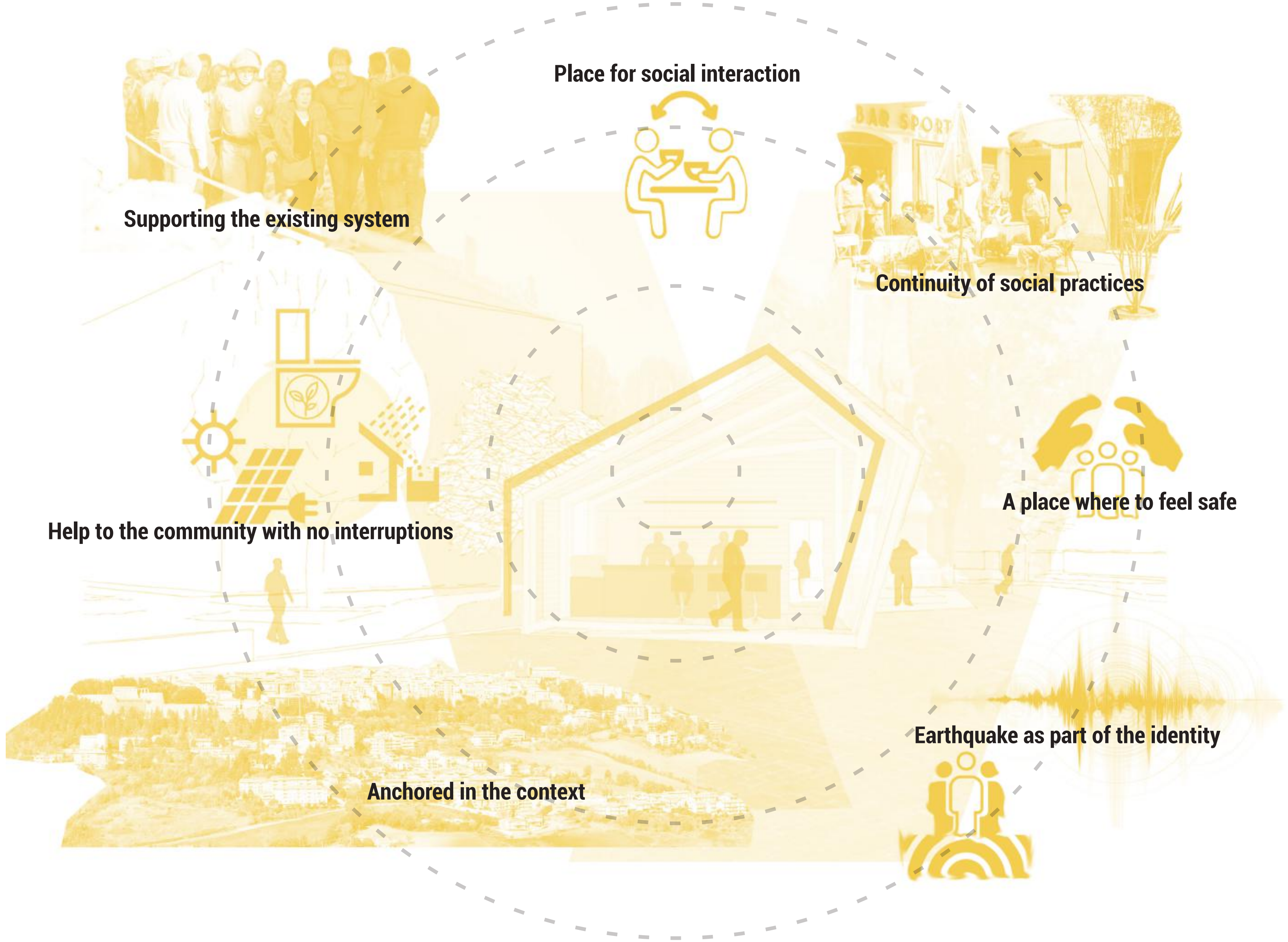




A key point for aid distribution

In the aftermath of an earthquake, isolated and small communities can be cut off because key insfrastructure is damaged. The Italian Civil Protection Department, together with the Italian army, has specific aid and goods kits that can be delivered using helicopters. In the design, these kits, usually packed into fixed dimensions containers, could be dropped off in the "aid plaza" and then the supplies could be coordinated and distributed to the ones in need.

CONCLUSIONS / OPEN DISCUSSION



In conclusion, this project aims to be a small contribution to a bigger discourse of how architects can help the zones affected by an earthquake to increase their resilience towards this type of natural events. In the case of this thesis work, the social practice of the cafeteria in small Italian villages was found to be a possible driving force for an architectural intervention that supports the community. Of course, this is one solution, but questions that can arise from this are whether other social practices could work for the same purpose or social practices could be enough to bring support to communities in such situations.

There are many theories and lines of thought about how to act and intervene in zones and urban settlements that have been affected by earthquakes.
This work is aligned with the one that believes that in a post-earthquake scenario, we should work to "build back better" (Humanitarian Leadership Academy, 2018) and bring the people back to the old towns as fast as possible, rather than aiming to construct new towns and move the whole population there, forgetting about the old towns and their historical, cultural and, mostly, emotional importance.

So that is why the Stand Strong units are thought to be placed inside the old towns and not in the "temporary" ones (that often become permanent). With the hope that these units could **stand strong** through the earthquake, be the symbol or the starting point for the reconstruction of those towns, and the return of the communities to their homes.

Units that are rooted in the community, keep their social practices going, and help people and towns to be more resilient towards earthquakes.

A resilient present for a more sustainable future.

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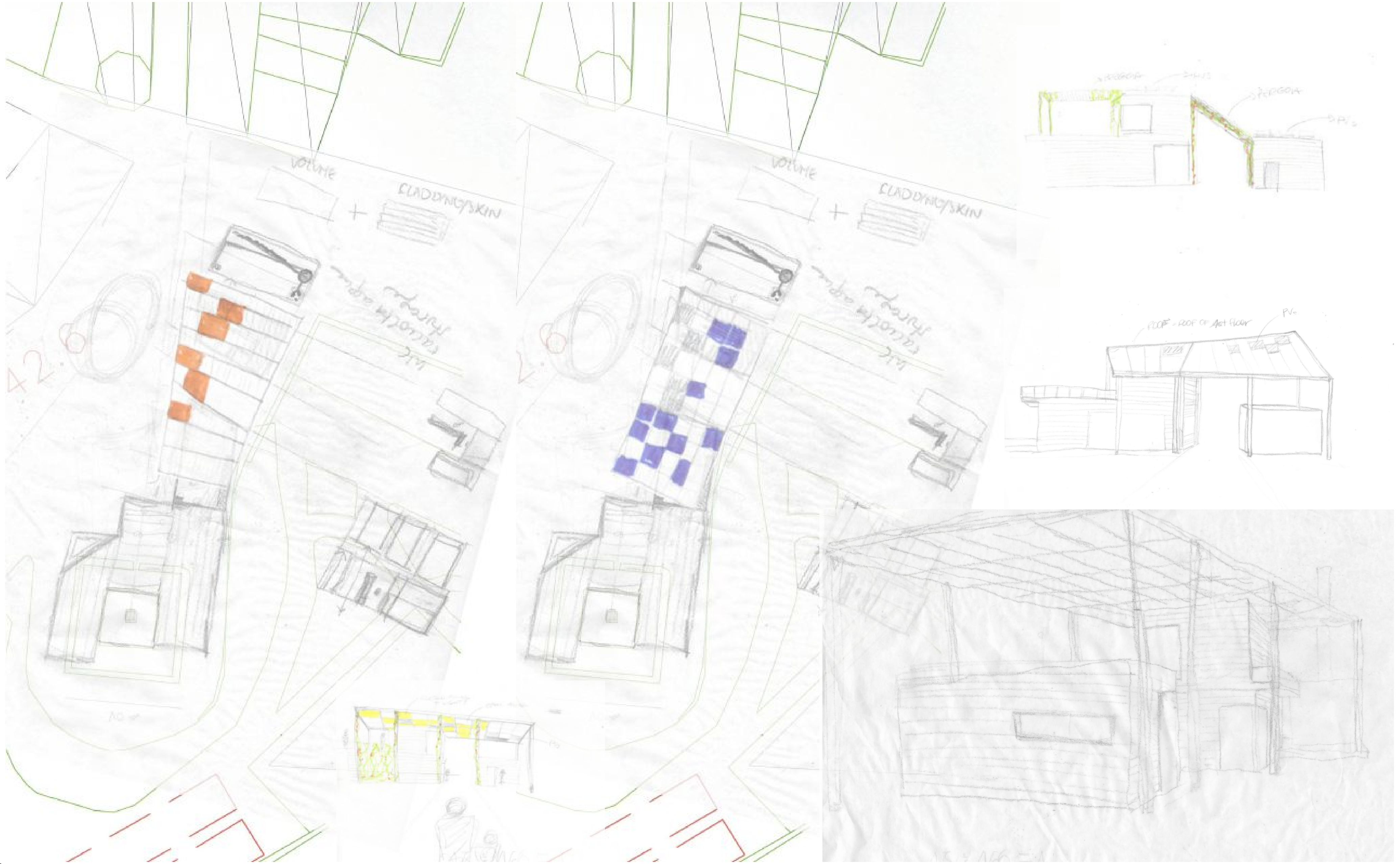
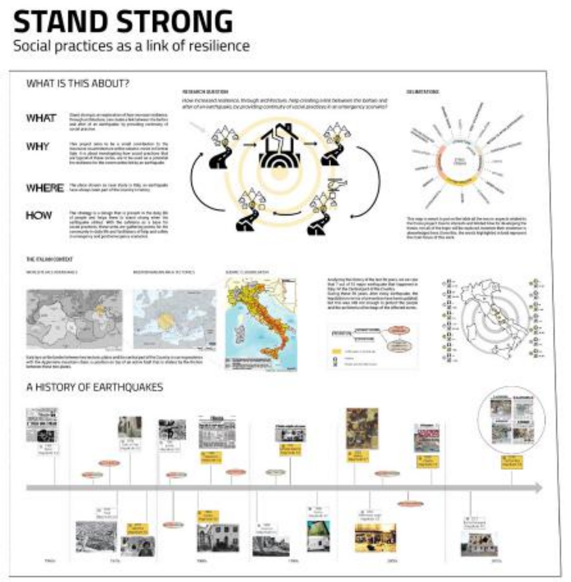
APPENDIX

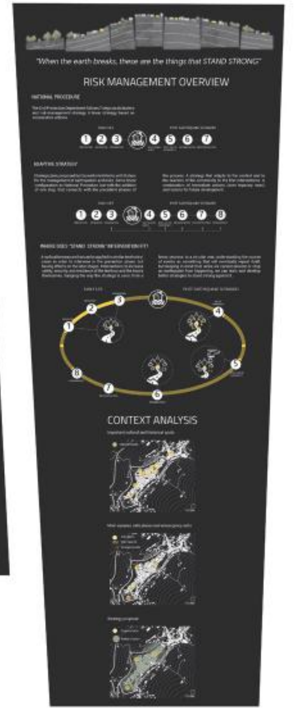
In-process sketches

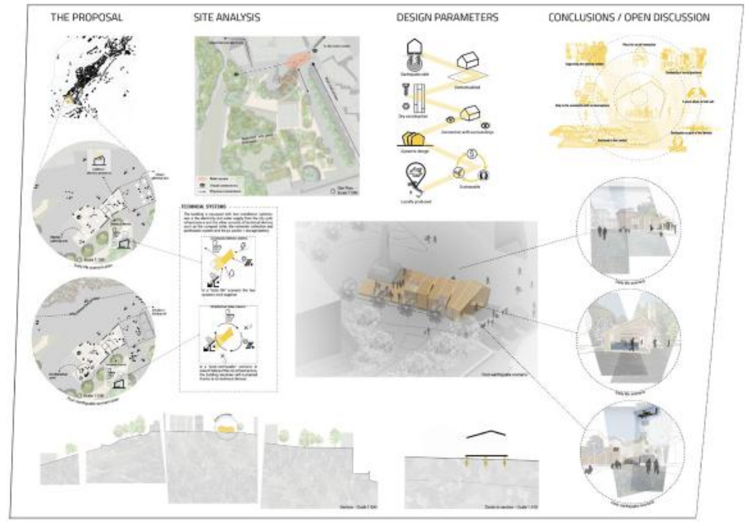


In-process sketches

Open seminar exhibition posters







Open seminar exhibition layout