



## COLLECTIVE ACTION AND REGIONAL RESILIENCE TO ADVERSE NATURAL EVENTS. THEORY BASED EVALUATION OF THE EMILIA-ROMAGNA RECOVERY PROGRAMME AFTER THE 2012 EARTHQUAKE

Alessandro Daraio<sup>1</sup>, Silvia Martini<sup>2</sup>, Caterina Brancaleoni<sup>3</sup>, Francesco Raphael Frieri<sup>4</sup>

### SOMMARIO

In May 2012, two major earthquakes hit Northern Italy and in particular Emilia-Romagna. The most affected area, which reported intense and widespread damages, is characterized by the presence of important industrial and agricultural districts, generating around 2% of Italian GDP.

In the earthquake aftermath a wide effort was performed to face the emergency and to plan and delivery the reconstruction, through a complex collective action designed to accompany territorial resilience. The action was led by the Emilia-Romagna Region within an effective multilevel governance institutional architecture including all levels of government and actively involving local stakeholders. The ultimate goal has been to avoid that the impact of the earthquakes hampers in a permanent way the territorial competitive advantage of the region, which is based on the combination of high density of integrated firms (industrial district model) coupled with a tight social cohesion and sense of community.

The paper, part of a wider evaluation effort coordinated by Nucleo di valutazione e verifica investimenti pubblici of Regione Emilia-Romagna, focuses on the conceptualisation of the programme theory behind the recovery programme and the presentation of the logical chain sustaining the programme. The objective is twofold: on one hand it is a way to compose and formalise the regional programme as emerging from a number of acts of different nature and timing, on the other one, it is a preliminary step for the assessment of what is working, why is working and for whom.

---

<sup>1</sup> Nucleo di valutazione e verifica degli investimenti pubblici (NUVER) Regione Emilia-Romagna, Viale A. Moro 30, 40127, Bologna, [alessandro.daraio@regione.emilia-romagna.it](mailto:alessandro.daraio@regione.emilia-romagna.it) (corresponding author).

<sup>2</sup> NUVER Regione Emilia-Romagna, Viale A. Moro 30, 40127, Bologna.

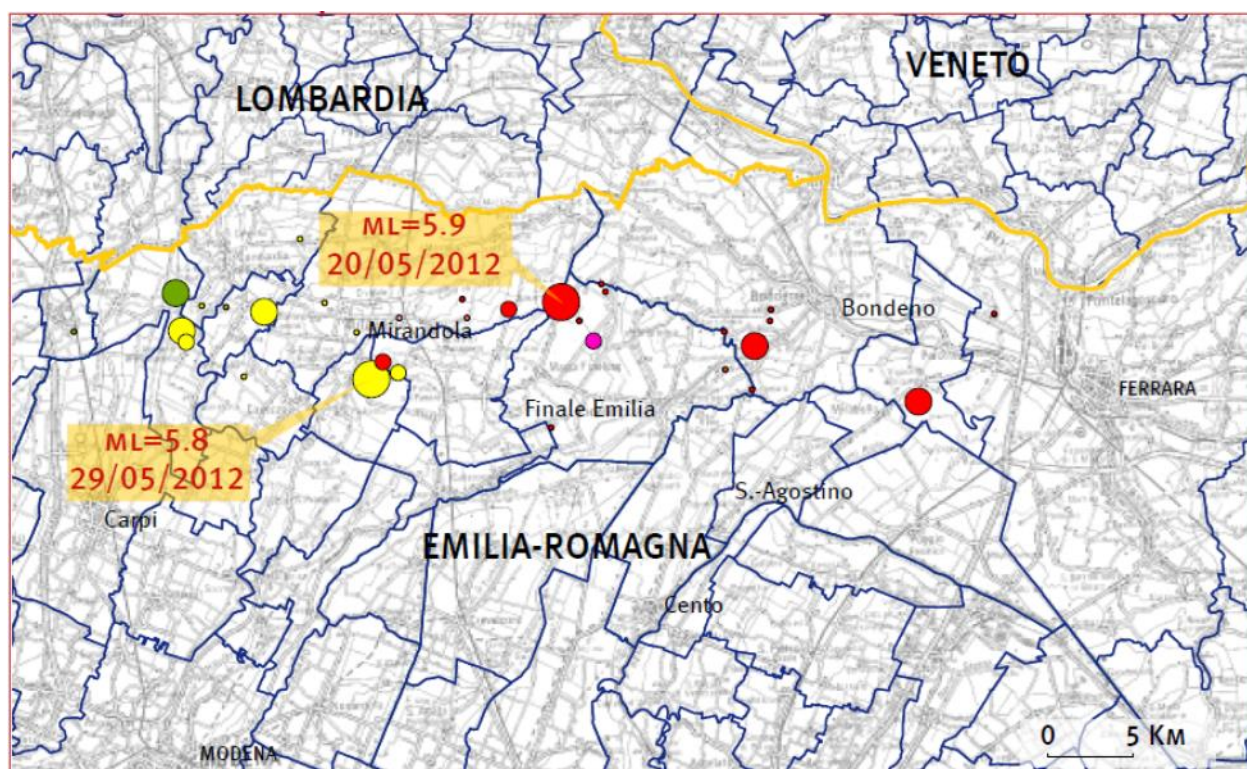
<sup>3</sup> NUVER Regione Emilia-Romagna, Viale A. Moro 30, 40127, Bologna.

<sup>4</sup> NUVER Regione Emilia-Romagna, Viale A. Moro 30, 40127, Bologna.

## Introduction

In May 2012, two major earthquakes hit Northern Italy and in particular Emilia-Romagna. On 20th May 2012, at 4:03 am, an earthquake with a local magnitude (ML) of 5.9 on the Richter scale struck the Po Plain. The epicentre of the main shock was in the province of Modena, between Mirandola and Finale Emilia, while the depth of the hypocentre was estimated at approx. 6.3 km. A large number of aftershocks were recorded the same day. Nine days later, on 29th May 2012 at 9:00 am, another strong 5.8 ML shock hit the Modena plain once again. The quake's epicentre was near Medolla, approximately 10 kilometres west of the main earthquake of 20th May, at a depth of approximately 10.2 km. In all, there were seven earthquakes of a magnitude above 5.0, the last of which occurred on 3rd June 2012.

The analysis of observed damage and effects carried out by the Department of Civil Protection-Seismic and Volcanic Risk and by the Italian Institute of Geophysics and Volcanology-QUEST group identified effects of VII-VIII on the intensity scale, classifying the largest shocks as very strong and destructive. Several geological effects connected with the earthquake were observed -mainly liquefactions related to overpressure in the aquifers hosted in buried sand layers- which amplified damages on buildings and infrastructures (Regione Emilia-Romagna, 2012).



Source: Regione Emilia-Romagna, 2012.

The affected area is defined by Law Decree (D.L.) n. 74, of June 06, 2012, and by the Decree issued on 1 June 2012 by the Ministry of Economy and Finance. It includes 106 municipalities, within 6 provinces belonging to 3 Regions: Emilia Romagna, Veneto and Lombardia. In addition to that, several other municipalities, located in the immediately surrounding area, have had some localized damages caused by the earthquakes. The area is characterized by the presence of important industrial and agricultural districts, generating more than 2% of Italian GDP. A large part of it just comprises small municipalities, which are characterized by good practices of local governance, internationally renowned, while larger cities (e.g., cities with more than 100,000 inhabitants) just occur on the edge of the affected area (Giovannetti e Pagliacci, 2016).

Twenty-nine people lost their life as a consequence of the earthquakes and 390 have been injured. Material damages have been severe -private and public buildings, infrastructure, businesses, industrial facilities, agriculture and to the important cultural heritage sector- and concentrated in eighteen municipalities.

In Emilia-Romagna the intense and widespread damage affected 54 municipalities (including Ferrara) and, in a smaller percentage, the three provincial capitals Modena, Reggio Emilia and Bologna which suffered damage to public and private property and to the productive sector. Overall a very large area of Emilia-Romagna (3,104.6 sq.km., namely 13.8% of the total area) was affected. The area is densely populated and has a developed economy, with a large variety of companies in terms of size and type of production, in some cases organized in industrial cluster of national and international level, often belonging to the strategic segments of supply chains and production networks at both local and national, and even global scale.

The most affected structures are sheds, old buildings mostly located in town centers and rural constructions.

Total direct damage in Emilia-Romagna was estimated at € 11.5 billion in a restricted area spreading across 33 municipalities. Almost one half (5.2 billion) are connected with the productive sectors, 3.5 to housing and more than 2.7 billion to cultural and historical heritage and public buildings (schools, universities, hospitals, etc.). The stop imposed to the productive activities lead to a loss of value added amounting to around 2% of the whole regional yearly gross domestic product.

Overall, in the first weeks after the earthquakes more than 40 thousand building have undergone viability assessment and 65% resulted unfit for use. More than one third of the unavailability cases showed severe damages that could not be resolved with light intervention. 31 thousand houses have been damaged, and almost one half reported severe damages. In several municipalities the share of unfit houses was above 25% of total housing. Around 19 thousand households (45,000 people) were displaced and in need of primary assistance. Much of the population has found independent accommodation while around 16,000 people have applied for assistance.

To cope with the large population requiring full care, in the first days priority was given to emergency housing solutions such as relief camps, hotels and other facilities. Relief camps and facilities were provided for an immediate and temporary solution with a tendency to decrease over time in favor of more appropriate and lasting solutions. At the same time accommodation was provided in hotels, through the establishment of agreements with leading associations of hotel chains and agritourism destinations, both in the provinces affected and throughout extra-provincial and other regional areas.

Around 400 enterprises had to stop their activities after the earthquakes because of the damages to the buildings, plants and machinery, and 34,000 people remained temporarily out of job and received income support. Most of the enterprises anyway have been able to get back into activity already after six months, also thanks to public support and solidarity among firms and workers.

Most important for the daily life of the affected communities, 570 schools were damaged and temporarily of definitively unfit for use (the earthquakes arrived close to the end of the school year). Thanks to an extraordinary effort made by the Regional Government, Local Authorities and the school districts, a solution (quick restoration or alternative buildings construction) was found for every school before the beginning of the next school year in September.

Also other public services were heavily affected, starting from health and social infrastructure even if the earthquakes only marginally impacted the largest cities of the region. More than 600 patients were displaced and several departments of six hospitals were closed.

Finally, the impact on cultural heritage and religious buildings has been severe, with 1,300 cultural assets damaged and 782 churches. The collapse of historical buildings opened deep wounds on the identity and feeling of the communities.



Source: Regione Emilia-Romagna

The regional evaluation unit (Nucleo di valutazione e verifica investimenti pubblici of Regione Emilia-Romagna) in cooperation with the Regional Agency for the reconstruction, is committed to an articulated evaluation appraisal that should contribute to answer the following assessment questions:

1. Has the Emilia-Romagna region, in its components of community and production system, been resilient to the 2012 earthquake?
2. How is the collective action for reconstruction contributing to the resilience of the communities / productive system? What role have the policy choices played?

The present work focuses on the advantages and challenges of an evaluation inspired to the theory-based evaluation methodologies, offering a first conceptualisation of the action to be investigated. The remaining of the paper is developed as follows: section 1 frames the theory based evaluation methodology in the disaster recovery processes; section 2 sketches the intervention logic of the Emilia-Romagna recovery programme after the 2012 earthquake; in section 3 preliminary elements for surfacing the programme theory are proposed; section 4 closes with intermediate synthesis considerations.

## 1. The evaluation of post disaster recovery: challenges and opportunities

It is generally accepted both in academic literature and in policy guidance the idea that evaluation is a crucial component of the policy making cycle. It plays a double role aimed at accountability and transparency about choices made, activities implemented and resources spent, on one hand, and on the other at fostering the learning process necessary to review and correct ongoing activities or better planning future ones.

In practice, the diffusion of evaluation is not homogenous among countries and policy fields; in addition, there is a high variability of the quality of the evaluation appraisals and lack of standardization of methodologies employed.

In a recent review based on 84 relevant international cases, Ryan et al. (2016) found a lack of evaluation of post-disaster recovery and, where evaluations have been conducted, a prevalence of process- rather than outcomes-based appraisals. Also in this domain, the discrepancy between guidelines and international management models and the reality is quite large. As the authors underline, despite the significant investment in post-disaster recovery programmes, there is little knowledge of their effectiveness and guidance on approaches and methods to evaluate it.

There are a number of reasons why evaluations may be limited in the disaster recovery policy field directly linked with the nature of the programmes, which are usually influenced by urgency and time compression, high political and humanitarian pressure and the extraordinary nature of the events itself.

Moreover, the wide variety and complexity of the programmes, deeply embedded in the local and national institutional and social systems, significantly hamper progress in the direction of a standardization of evaluation methodologies and practices. Since disasters are conceived by definition as extraordinary and non-recurring events, the focus of involved actors is more on immediate action rather than deep learning in order to improve future implementation of the policy or to better design future policies. Not surprisingly when assessment is performed it is promoted externally as a way to improve knowledge not ‘here and now’ but ‘somewhere else in the world and in the possible future’. Monitoring and evaluation are often treated in handbook and guidelines for recovery management issued by national and international organisations, but there is a lack of common understanding, definitions and standards. This is, at least partially, a direct consequence of the absence of a common planning and management framework for recovery action.

### *1.1. Theory-based evaluation and complex programmes*

There are a number of methodologies and approaches for programme evaluation that may be useful in disaster recovery processes. The family of theory based evaluation methodologies offer the interesting potentiality to link the planned action with short / mid-term outcomes and with long term results associated to the objective of the intervention.

In the post-disaster recovery field, the use of theory based evaluation and the associated logic models could be useful not only as a framework for evaluations, but also to support the planning process of the intervention.

#### *1.1.1. An overview of theory based evaluation (TBE)*

Theory based (or theory-driven) evaluation are a set of methodologies developed in the domain of impact evaluation. The goal of impact evaluation may be twofold: it can help explaining why an intervention produces intended and unintended effects, for whom and in which context or understanding whether an intervention produces the desired effects on some pre-established dimensions of interest (European Commission, 2013).

Theory-based and counterfactual evaluations are the two most important families of methodologies developed in this domain; with a very broad approximation the former is more suited to answer to the first goal, while the latter may serve better the second one.

TBE focuses its attention on the theories - intended as a set of assumptions and hypothesis logically linked together - behind the intervention logic of a policy. They should explain why a policy action, by allocating certain inputs, produces planned outputs through which intended results are expected to be achieved. The actual results will depend both on policy effectiveness and on other factors affecting results, including the context. An essential element of policy effectiveness is the mechanisms that make the intervention work. Mechanisms are not the input-output-result chain, the logic model or statistical equations. They concern amongst others beliefs, desires, cognitions and other decision-making processes that influence behavioural choices and actions.

*“Theory-based is an approach in which attention is paid to theories of policy makers, programme managers or other stakeholders, i.e., collections of assumptions, and hypotheses - empirically testable - that are logically linked together. These theories can express an intervention logic of a policy: policy actions, by allocating (spending) certain financial resources (the inputs) aim to produce planned outputs through which intended results in terms of people’s well-being and progress are expected to be achieved. The actual results will depend both on policy effectiveness and on other factors affecting results, including the context. An essential element of policy effectiveness is the mechanisms that make the intervention work. Mechanisms are not the input-output-result chain, the logic model or statistical equations. They concern amongst others beliefs, desires, cognitions and other decision-making processes that influence behavioural choices and*

*actions. Theory based evaluation explores the mechanisms which policy explores the mechanisms which policy makers believe make the policy effective and compares these with research based evidence” (European Commission, 2013).*

TBE has a double role: in the conceptualisation phase it allow to develop or to surface the policy or programme theory of programme, while in the empirical stage it tests if the theory worked as expected, i.e. if actual results are the one expected and the action played the role foreseen. It serves to track the steps along the route, i.e. to find out whether the theories on which the programme is based are realized in action.

Within the TBE family, realist evaluation is an approach which uses context-mechanism-outcome (CMO) configurations to understand the causal patterns underlying the success or failure of an intervention. CMO configurations explain how particular contexts (c) generate casual mechanisms (m) that produce an outcome (o) within an intervention (Pawson and Tilley, 1997)

Although Theory Based Evaluations are particularly relevant for policy makers, as they explain why an intervention works -or not- in a given context allowing for generalisation, they have not been applied much in for the evaluation of large socio-economic programmes. On the contrary the majority of existing literature refer to intervention on the social sector, referring to small and well defined actions (Birckmayer and Weiss, 2000). A partial exception is the growing diffusion of impact evaluation based on the theory of change within the international development policies, although the concrete application is often very simplified and centred on qualitative aspects. In recent years the European Commission promoted the use of TBE in Cohesion Policy, in search of a reinforcement of the result orientation of the programmes and the strengthening of the evidence base supporting policy adaptation (Riché, 2012).

#### 1.1.2. The use of TBE in recovery process

There are at least three important arguments in favour of the use of TBE in post disaster recovery, and in our specific case study.

First, TBE is a policy relevant evaluation, in the sense that it is not only assessing the "does it work" but also capturing the "why" and "how". It places specific attention to the role and interaction with the context and the implicit mechanism informing the policy making, which is highly relevant for post disaster action dominated by “speciality” and non-standardization. Moreover, this family of methodologies recognises the complexity of factors playing a role in the policy process going beyond purely rational and mechanistic relationships but taking into account real world social, political and psychological factors impacting the policy making. The importance of these factors is magnified in the planning process in the aftermath of a disaster.

Second, TBE provides not only evidence but also narratives explaining how the programme achieved its results, supporting policy understanding and communication to stakeholders. Therefore, TBE has an important formative and learning dimension.

Third, TBE is applicable also with policy or programmes fragmented and not formally and rationally designed. Indeed, in its conceptual dimension TBE allows to elaborate and make explicit the programme theory surfaced by sparse and disintegrated information and observation of the reality. This is specifically important in the case of Emilia-Romagna post-earthquake recovery, since the action has not been framed in a unitary and integrated rational plan.

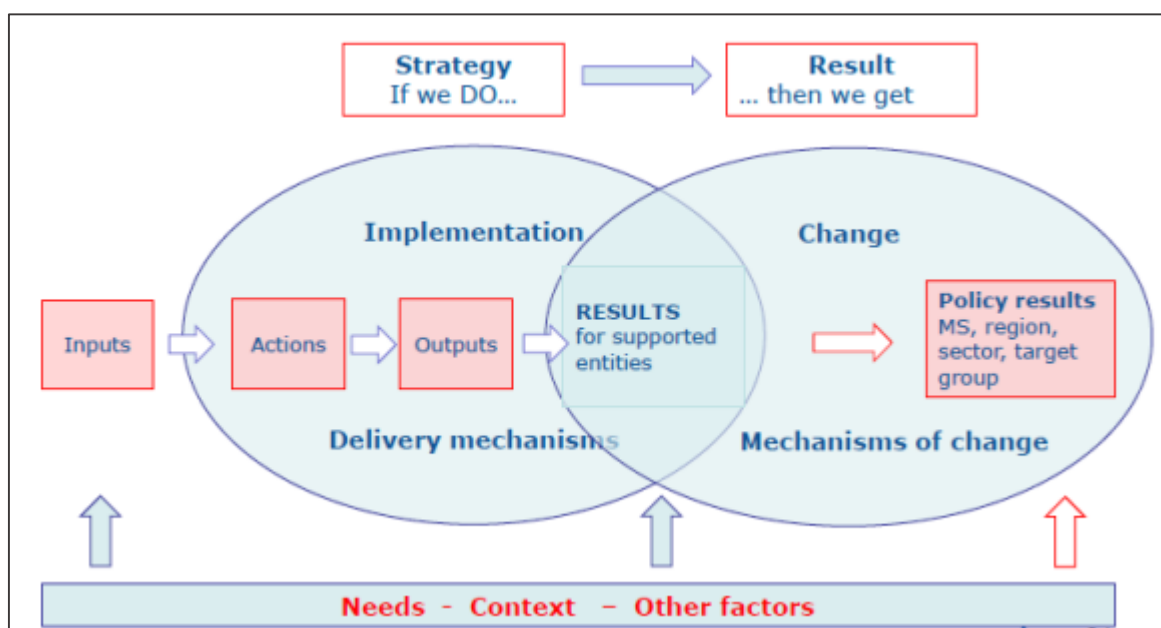
A program theory serves many purposes. It helps clarify how a program is expected to work, it helps focus the evaluation on key results, and it provides structure to the interpretation of results. In the end, whether or not the theory is right, it will have provided a framework for thinking about how the programme is working.

In practise, it is not common that programmes are planned making explicit and sound reference to an explicit theory developed in the academic literature. More frequently, programmes are designed on the basis of a mix of experience, professional skills, intuition and beliefs embedded in people and organisations involved, influenced by the “trend”. Anyway all programs have a theoretical basis, no matter how weakly the assumptions are articulated.

In looking for such theories it is always crucial to make a clear distinction between implementation theory and programme theory. The former refers the mechanisms linking inputs to outputs and therefore is internal to the logical sequence of the programme. The latter focuses on the mechanisms and the contextual factors that contribute to translate the outputs in expected results, in terms of changes on relevant variables (see Figure 1 below).

Therefore, a TBE study should include a description of program implementation (process evaluation). Some programmes do not work because planned activities are not implemented correctly and timely or not implemented at all. Data on the processes of the programme are necessary to be able to distinguish between “programme failure” (the programme was not carried out well and therefore did not lead to the desired effects) and “theory failure” (the idea underlying the program was wrong, and therefore expected results did not materialize).

*Figura 1 Decomposition of programme theory*



Source: Ecorys

Against these advantages, the design of a TBE appraisal is challenging and demanding in terms of data collection and research efforts required. Given its comprehensive approach, it requires to clearly understand the theories of policy makers and the way they are determined by the socio-economic and institutional context, to have a full picture of the programme process, to monitor the implementation and the achievement of results, and finally to link this with the theory in order to explain success and failures and to formulate policy recommendations. In addition, complex programmes maybe be read as a collection of mini-programmes, each with its own theory to be investigated separately or jointly.

### *1.2. Challenges for a TBE of the Emilia-Romagna recovery programme*

It should be expected that in a post-disaster intervention the planning activity is highly influenced by urgency and political pressure, by the necessity to negotiate the amount of available resources, in absence of standard or parametric fixed criteria, and by the tension for the distribution of role and responsibilities along the multilevel institutional architecture.

Compared to an ordinary territorial development program, an action to tackle the effects of a natural disaster presents a greater degree of uncertainty, greater diversification of objectives and areas of intervention, higher mixing of time horizons (from emergency to very long term), a shorter planning time and less possibilities to

make preparatory work, a greater weight of emotional and irrational components. It may be expected that, in absence of a strong culture of preparedness to face the consequence of natural disaster (the other face of resilience), decision makers and organizations make more use of heuristic thinking and sedimented organizational routines to make the necessary choices.

To start a TBE of the case of Emilia-Romagna post-earthquake recovery action, preliminary steps are necessary.

First of all, the scope of the collective action under investigation should be defined, since its borders are quite fading and evolving over time. Then it should be verified if the overall collective action may be considered as a single programme with its own theory, or if different programme theories were coexisting during the design phase. From a different point of view it should be clarified if we can assume a unitary policy making or if different actors involved in the process followed different theories.

Indeed, the instruments of TBE may be useful to this purpose. The reference to a logical model of programming is useful to bring back in clear and recompose policy choices taken in a fragmented and evolutionary way, but guided by a unitary underlying orientation.

In general terms, the overall action that the Region has put in place for reconstruction can be read as a strategy that, taking into account the damage and the territorial context, pursues certain objectives through the achievement of some specific (expected) results. Each intervention put in place has its own rules for combining the inputs and mechanisms for reaching the targets, which may turn out to be more or less adequate and therefore contribute more or less clearly to the achievement of actual results.

In this sense, the recomposition of the logic of the programme makes it possible to assess whether the interventions concretely put in place have always been consistent with the strategy, and the choices of allocation of resources consistent with the needs and objectives. Moreover, the definition of a system of indicators to measure the outputs and expected results allows a solid monitoring, useful if not to adjust the programming (most of the interventions are in advanced stage of implementation) to highlight possible weaknesses to be addressed with additional actions.

Summing up, a theory-based evaluation applied to the regional action for the recovery after the 2012 earthquake

- requires a systematization according to a logical model of intervention of the set of choices and interventions put in place,
- allows to highlight the assumptions and expectations underlying the choices made,
- represents the preliminary step for a measurement and evaluation of the results achieved in relation to those expected or expectable on the basis of the assumptions made.

In a simplified version, the following four steps should be foreseen to undertake a realist evaluation:

1. Eliciting and surfacing the underlying programme theories
2. Mapping and selecting the theories to put to research (using the logic model)
3. Formalising the theories to put to test (a selection of)
4. Data collection and analysis

This methodology can be applied at different levels of granularity. In this paper we will focus on the action as a whole, looking at the fundamental policy choices that guided the set-up of priorities for action, the governance of reconstruction and the main strands of intervention.

Going down one level, the evaluation could be repeated with a different degree of depth, for each strand of action or for each of the main operational programs launched. In fact, there are sector specificities that guide the setting of individual programmes (the operational programme for cultural heritage, the programme for the reconstruction of homes or businesses, measures to support investments), each with its own more or less adequate and peculiar rationality.

## 2. The Emilia-Romagna recovery programme after the 2012 earthquake

In the immediate aftermath of earthquake sequence of May 2012, the Regional Government, in cooperation with all competent authorities and institutions, committed its effort to ensure security conditions for affected population, to provide for emergency assistance, to plan the activities to ensure the return to normal life in the shorter time possible and to set-up the long-term recovery.

The collective action for the recovery was not translated and organised in a formal unitary programme - detailing objectives, activities, typologies of intervention, resources and procedure - but it comes out integrating a number of individual acts, sectoral operational plans, guidelines and other documents approved.

The recovery programme in Emilia-Romagna focused on rebuilding physical infrastructure and on the economic support to buffer and improve the local economy. Nevertheless, the approach adopted was holistic and virtually all sectors of the public activities were involved, with specific reference to the social and environmental dimensions.

The programme presents a wide complexity linked to the intertwining of three elements:

- different time horizons: the urgency to ensure immediate answers to the needs of citizens and businesses, but at the same time the imperative to ensure effective long-term responses for the resilience of the territory;
- different sectors: the intervention must be multi-sectoral and comprehensive taking into account all areas of life -housing and the urban centers, economic system, public and private services, infrastructures- traditionally addressed separately by public policies;
- different types of action: in order to achieve satisfactory results, both structural physical actions and more soft and intangible interventions are needed (assistance to households, support to human capital, incentives and subsidies to SMEs, etc).

In order to cope with complexity, great reliance was given on the governance system able to draw on the resources of the dense institutional and social fabric of the affected territory and of the wider regional community (all levels of government, the innumerable intermediate institutions in different fields, voluntary work and organizations of active citizenship, self-help of citizens and businesses). A governance system suitable to ensure both coordination of action and decentralized autonomy / protagonism makes it possible to transform the multiplicity of actors and interests involved from a potential further element of complexity into a management tool.

The objectives of the reconstruction program take into account the framework of the strengths / weaknesses and threats / opportunities of the territory and the elements of complexity mentioned above. In particular they take into account the distinctive features of the area, which hosts few among the most developed and competitive clusters of the regional productive system (biomedical, machinery, tiles, fashion, agrifood) with high level of concentration and integration of firms.

Therefore, **the final aim behind the regional program was to avoid that the impact of the earthquakes hamper in a permanent way the territorial competitive advantage of the region which is based on the combination of high density of integrated firms (industrial district model) coupled with a tight social cohesion and sense of community.**

In the words of the first Deputy Commissioner for Reconstruction (Commissario Delegato per la Ricostruzione) and former President of the Emilia-Romagna Regional Government Vasco Errani “...*from this great tragedy we will be able to draw an opportunity to grow: in seismic safety, in environmental protection, in energy saving, in research, in the quality of work, in the protection of legality. And to achieve this, we have put at the center of our commitment two values that are extremely pervasive, which have enabled us to do quickly and well: solidarity and a sense of community. That sense of community that has manifested immediately in the school emergency, and allowed those schools in the earthquake zones to reopen with all the others in the region. Pupils are back in class, with their classmates and their teachers, to overcome the*

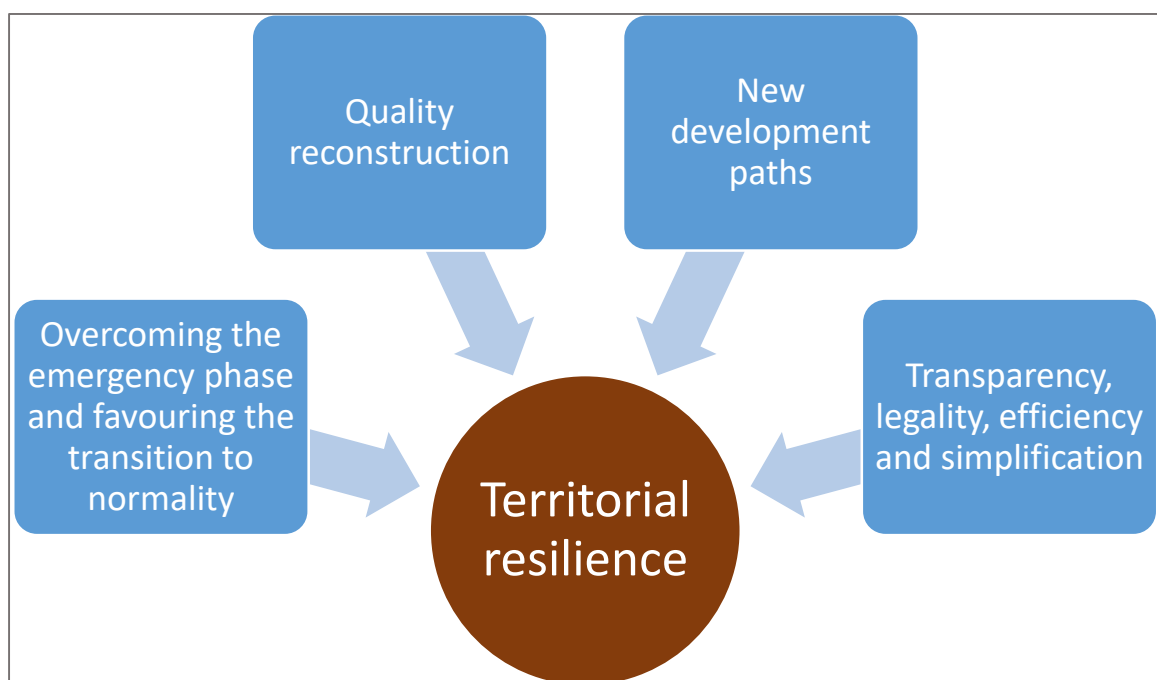
*trauma together even beyond the family context. [...] We have always worked together with the mayors; with the precious collaboration of the civil protection system, with the associations of companies and workers, with the help of thousands of volunteers and emergency professionals we have faced and passed this phase. We are now rebuilding. [...] The Government has understood that helping us would help the economic recovery of the country. And it substantially corresponded, even in a phase of great difficulty, to our expectations ....”*

The fundamental view is fully endorsed by the new Deputy Commissioner for Reconstruction (Commissario Delegato per la Ricostruzione) and current President of the Emilia-Romagna Regional Government Stefano Bonaccini. In his words: “... *our concern has been having continuity between emergency and reconstruction, to manage urgency and transition having already clear the design of the post-earthquake, setting goals and clear principles: no new towns, no new urban centers scattered in the rural territory, yes to the rebuilding of historical and cultural heritage, of our identity. Of what we are, the land of Emilia. Continuing with the intuition of Vasco Errani, and thanking him for his commendable work as Commissioner, so that people return to live, work, study, pray, meet, where they did before the terrible shocks of four years ago.*”

The overall objective, shared by the Region, the local authorities and the associations and representatives of civil society, is to accompany the resilience of the territory affected by the earthquake, ensuring a high quality reconstruction with the improvement of safety standards and territorial quality, avoiding phenomena of weakening and unravelling of the social and economic fabric.

The global objective is therefore declined in different specific objectives:

1. Overcoming the emergency and favouring the transition towards a complete return to normality by restoring the essential conditions for resuming the life of local communities (security, home, work, services);
2. To plan a quality reconstruction
3. To foster the ability to discover and undertake new paths of development
4. To promote the principles of transparency, legality, efficiency and simplification in all phases of the programme.



Each objective is transversal to the sectors and areas of intervention (housing, productive system, infrastructures and public heritage), in a holistic vision that requires to consider all aspects of the life of a local community at the same time.

Instead, they have a different temporal horizon, which is measured in days and weeks for the first objective, for the transition phase in months, and in years for the proper reconstruction. The concern has been to conceive a continuity between the emergency, the transition and the reconstruction phases. This implied the effort to manage the different phases having already depicted a post-earthquake design.

In the framework of the theory-based evaluation approach, we propose the following description of the programme intervention logic in order to describe, in a stylised way, the logical sequence connecting the desired objectives, with the set of activity necessary to meet them and the input (resources) available for their implementation.

If read from the opposite point of view, the intervention logic, given a certain starting condition and available resources (input) describes the activities (operations) to be performed and the output they should/can produce, in order to generate the expected outcome (results and impacts), which meet the targets set by the initial desired objectives.

The table below shows, for each specific objective, a list of the main actions implemented for their achievement. As a further step, results and indicators will be associated to objectives and actions within the ongoing monitoring and evaluation effort.

A large amount of resources, accounting for around 9 billion euro in different forms (grants, loans, guarantee schemes, tax credit, etc.) have been made available. The bulk of the funds came from national government and allocated with two special laws dedicated to the Emilia earthquake. According to a recent report the national resources made available for the reconstruction in Emilia-Romagna and the Po plain amount to EUR 8.4 billion, compared to EUR 17.5 for L'Aquila and EUR 14.7 for Central Italy (Senato della Repubblica, 2018). They have been enriched with complementary funds gathered by the Regional Administration or directly by local institutions from different sources.

Roughly, limiting the analysis to Emilia-Romagna, we may identify the following main typologies/sources of funds:

- EUR 6,000 million for the reconstruction made available through loans reimbursed by the National Government
- EUR 1,300 million for the Fund for reconstruction
- EUR 670 million from the European Solidarity Fund
- EUR 320 million of European Structural and Investment Funds (ERDF, ESF, EAFRD)
- EUR 100 million from solidarity measures, charities and people donations (in addition to in kind contribution from several organisations and enterprises)
- EUR 260 million for new productive investments, work safety, research and development, new employment
- EUR 137 million for income support to temporarily jobless people and “safety net”.

The blending and summing up of resources from different sources allowed to significantly increase the amount of funds available compared to the basic government allocation. At the same time this integration increased the complexity of the action coordinated by the Regional Administration, since each category undergoes a different set of rules for expenditure and reporting.

Table 1: Simplified description of the recovery programme intervention logic

Global objective	Specific objectives	Actions
To accompany the resilience of the territory affected by the earthquake, ensuring a quality reconstruction with the improvement of safety standards and territorial quality, avoiding phenomena of weakening and unravelling of the social and economic fabric	Overcoming the emergency and favouring the transition towards a complete return to normality by restoring the essential conditions for resuming the life of local communities (security, home, work, services)	Temporary works
		Securing and restoring the functionality of hydraulic works for soil protection
		Tent camps, other shelter facilities, hotel hospitality for displaced households, monetary subsidy for autonomous housing, availability of housing for rent
		Building of temporary housing solutions (for medium term use) in urban centers and rural areas
		Income support for temporary unemployed people
		School restoration or building of temporary solutions to ensure the regular begin of school year 2012/2013
		Operational programme for Municipal Buildings, to ensure the availability of safe places for local administrative centers
		Restoration of social and health service facilities, aiming at maximum continuity of health care and social assistance services
		Temporary relocation of small commercial facilities ensuring the reopening of shops and service offices
		Restoration of sport and cultural facilities
		Restoration of priority religious buildings (at least one in each community)
		Public grants for the reconstruction of buildings, plants, stocks (light damages) and/or temporary relocation of productive activities
	To plan a quality reconstruction	Rules and instruments to plan an effective reconstruction process (regional law, urban plans, etc.)
		Public subsidies, rules and procedures for housing restoration and rebuilding (including a special programme for public housing)
		Special programme for urban historic centres
		Funds and direct action for restoration and rebuilding of cultural heritage
		Public subsidies, rules and procedures for restoration and rebuilding of productive facilities
	To foster the ability to discover and undertake new paths of development	Open call to enterprises for safety and risk prevention interventions
		Open call for grants promoting R&I activities within business
		Building of a new public technopole in the framework of the regional high technology network (ERDF ROP)
		Support to productive investments of firms (ERDF ROP)
		Support to productive investments and modernisation of agriculture firms (EAFRD)
		Public intervention for the enhancement of environmental and cultural heritage
		Creation of a fund for favourable credit access for business
		Tax credit for business for restoration interventions and for new employment
		Creation of tax free areas in urban centers
		Intervention for education and training, human capital, access to employment and social inclusion (ESF ROP)
	To promote the principles of transparency, legality, efficiency and simplification in all phases of the programme	Memorandum of understanding on legality for the reconstruction of the areas affected by the earthquakes, and cooperation protocol with all competent authorities at national, regional, local level
		Operational tool to avoid criminal infiltration in the reconstruction process
		Market and competition protection
		Operational tools for simplification of procedures and improved accessibility by citizens and business

### 3. Collective action and regional resilience: preliminary evidence

After having reconstructed the logical framework it is possible to try to bring out the programme theory that guided the setting of policy choices and programming.

The effort to surface programme theory can be addressed at three different levels:

1. the highest technical / political decision-making level that has set the framework of the rules and the initial amount of the financial resources in which the regional action is framed. This refers in particular to the initial phase of negotiation between the Central Government and the Regional Administration for the assumption of the special laws for reconstruction, the distribution of responsibilities and the appointment of the Delegate Commissioner;
2. the level of planning and programming of the regional action in its wide articulation, relying not only on the extraordinary resources made available to the Commissioner but also on resources and complementary programs functional to the achievement of the objectives;
3. the level of the individual lines of intervention, which in many cases take the form of operational programmes, put in place to address the various challenges and problems.

In this paper we focus on the second level, although in some cases it is closely related to the first one for the definition of the general lines. The fundamental choice made upstream with the Government and the Parliament was to identify in the Regional Governments the barycentre for reconstruction collective action.

This choice recognizes the effectiveness of the regional administrations of the area affected by the earthquake, and the greater capacity - compared to the central level of government - to read local needs and mobilize the informal resources of the communities. It was a non-automatic choice in the Italian context, which experimented different models both before and after the 2012 earthquake.

Combining data gathered through the analysis of the documents, interviews, direct observation of ongoing process, we identify the following essential elements of the programme theory underlying the regional action:

- the resilience of the territory does not depend only on the restoration of the physical capital damaged by the earthquake, but is linked to preservation and strengthening of the institutional, organizational and social capital that characterize the local system (community of people, businesses, institutions). It follows that the action for reconstruction in addition to criteria of effectiveness and technical efficiency must be set to strengthen the institutional and social cohesion in the crater area, both in the short and in the long term;
- the territorial capital is closely linked to the availability of job opportunities and essential services for the life of the community (of which housing availability is a basic component). Therefore, after ensuring the availability of temporary housing solutions, the priority of the reconstruction is on the essential services for citizens life (in our case, the school in particular) and safeguard of employment levels;
- the various components of the territorial capital have a different degree of volatility and mobility. The entrepreneurial component is the most mobile one and therefore is the one driving the overall dynamics. It follows the urgent need to ensure the resumption of productive activity and the rooting of production chains in the territory, to be supported with all available means, even reorienting the programmes ongoing;
- in the elaboration and implementation of complex programmes of change, the substantial context - social activation of processes of cooperation, sharing of knowledge, effective communication and sense of community - is at least as important as the formal rules and procedures put in place. This leads to i) opting for inclusive and democratic governance settlements that are as close as possible to ordinary architecture, ii) decentralization of implementation and strengthening of all the Administrations involved, iii) policy approaches geared towards mobilization and the protagonism of all the actors;

- the emergency situation generated by the earthquake makes the local system vulnerable to the risk of infiltration of illegal or otherwise privatistic interests, distortion of the decision-making process, absence of rationality of choices. From this awareness derive the choices regarding legality, transparency and openness of the reconstruction procedures and use of public resources.

During the next phases of the evaluation, each of the elements will be further detailed and formalised in testable sentences and linked with specific activities and indicators associated to the logical frame. The following figure shows the examples of activities and governance choices deriving from the first assumption listed above.



#### 4. Conclusions

Since the evaluation exercise has not yet been completed, there is not enough evidence to draw conclusions or recommendations. Nevertheless, some considerations can be proposed for reflection and to orient the design of the testing phase of the evaluation.

Concerning the first evaluation question ("Has the Emilia-Romagna region, in its components of community and productive system, been resilient to the 2012 earthquake?"), partial analysis have been already

promoted by the Regional Administration and other stakeholders during the past years (see for example Bigarelli, 2013; ERVET, 2014). Our partial collected evidence is in line with their finding and lead to an answer that is overall positive, although with different emphasis cross socio-economic dimensions and clusters of municipalities.

From the demographic point of view, there is no significant impact of the earthquake in the area of the extended crater. The impact is appearing focusing attention on the municipalities closest to the epicentres:

- in these Municipalities there was a decrease in resident population both in absolute terms (4,372 residents less in 2016 compared to the end of 2011), with a growth rate that from 2012 onwards has always been negative and weaker than the regional average. The impact is particularly strong in 2012 and 2013, showing signs of slow settling in subsequent years;
- almost 40% of the demographic decline concerns foreign citizens, who have weaker ties with the municipality of residence (starting from the house property) and show greater sensitivity to shocks. In any case, three quarters of residency transfers remained within the crater, demonstrating the solidity of local cohesion.

The stability of the labour market certainly contributed to avoiding the risk of depopulation of the affected territory. Official estimates of key labour market indicators (activity rates, employment, unemployment) are not available at municipal level but at most at the local labour system (LLS) level. The area of the crater is made up of several LLSs, some of which are affected as a whole (Carpi, Mirandola, Guastalla) while others only partially. There is no clear impact of the 2012 earthquake, distinguishable from medium-term economic difficulties:

- the Carpi district shows a performance worse than the regional average both before and after the earthquake; the district of Mirandola since 2013 records a performance even a better than the regional average, unlike what happened in previous years;
- the LLS of Guastalla has very large annual fluctuations with respect to the region but without a clear direction linked to the earthquake (but it consists of municipalities of the outermost layers of the crater).

As regards the production system, reference is made in particular to the data on local units and employees coming from the ISTAT's ASIA database, which, however, registered a methodological interruption in 2011, making it difficult to compare the period before and after the earthquake.

Even in this area, however, there are no negative consequences on the statistical indicators that can be connected to the earthquake. On the contrary, in general in the municipalities of the crater and also in the more internal ones, in the years following the earthquake there were better trends than the regional average both for the number of local units and for employees. Minimal signs of falling in 2012 are seen only for employees in the municipalities of epicentres, but the recovery is evident as early as 2014.

The trends are not homogeneous among the productive sectors. If you look at the retail trade for example, in the municipalities closest to the epicentres in the years following the earthquake there was a greater contraction compared to the regional average - especially the smaller local units - while in the second and third band of municipalities the trend was even better than the regional average.

Exactly the opposite happens for the construction sector, directly involved in the reconstruction, which in a context of constant contraction at regional level in the crater resists more and in the most internal municipalities shows an increase in employees of almost 6% in three years.

From the point of view of public services for the population and businesses, the data have yet to be elaborated in detail, but preliminary analyses did not find out signals of significant reductions in service supply and presence of facilities.

In particular, with regard to the school, despite the enormous damage suffered by school buildings of all orders and degrees, the population of students remained substantially unchanged. Compare the 2014/15 school year and the one before the earthquake (2011/12), the only reduction that is registered concerns the students enrolled in the secondary school of the first degree in the innermost municipalities of the crater, but this is a

consequence of the reduction of the resident population, since the number of schools active in the municipalities has remained unchanged.

Coming to the second question ("Have the collective action for recovery contributed to the resilience of the communities / productive system?"), the answer at this stage can be even more preliminary.

However, it is clear that the regional reconstruction action has mitigated or compensated for the damage caused by the earthquake and its negative impact, being able to counterbalance them in some cases. A few examples already can give an idea:

- despite the interruption of activity in thousands of production units following the earthquake, there was no evident shock in employment levels. In fact over 40 thousand workers in more than 3,700 local units have benefitted of social protection measures, remaining formally employed although not working for a shorter or longer period. Within two years the CIG linked to the earthquake has practically exhausted;
- as a result of the earthquake more than 40 thousand people had to abandon their houses at least temporarily and have resorted to one of the forms of assistance made available by the commissioner's structure. However, the decrease in the number of residents in the area has been limited to just over 5 thousand people - almost all in the municipalities closest to the epicentres - and partly depends on the more general demographic slowdown that affected the region outside the main capital cities;
- starting from 570 on 1,041 schools unfit for use after the earthquake, of which 160 permanently unusable, thanks to the timely effort of the operational program for schools all pupils were able to start the school year 2012/2013 regularly.

Beyond the strict causal chain input-output-results, there are broader considerations that would deserve further investigation and research:

1. The first consideration concerns the very nature of the intervention in response to a natural disaster. In the Region's approach, it was a broad interpretation of the intervention programme, which was tapered and integrated into the broader framework of territorial development policies. This is a useful lesson in the debate on post-disaster policies, often set up according to models that are too specialized and disconnected from the rest of (ordinary and extraordinary) territorial development plans.
2. The second consideration concerns the governance model adopted for the reconstruction action, that was centred at the regional level and inclusive both with respect to local authorities and with respect to economic and social forces. It was a precise political choice - although probably emerged in a heuristic way - where consensus and institutional cohesion are factors to deal with complexity and uncertainty, compensating the impossibility to set up rational planning.
3. The third consideration, which derives directly from the previous one, concerns the importance of long processes of learning and accumulation of institutional capital, which become decisive in the processes of resilience following unexpected shocks. The concrete use matters at least as much as the formal attribution of powers and competences. The regional action for reconstruction benefits from decades of institutional cooperation and economic-social concertation. In more recent years, the different instances of investment planning (primarily ESIF regional programmes) and the several tools for "negotiated programming" and public-private partnerships, have been unreplaceable occasions for capacity building and learning by doing.
4. Looking beyond public policies, the resilience demonstrated by the territory after the earthquake confirms the solidity of the "Emilia model" of local development brought to light in the eighties, despite globalization, technological changes, demographic transformation and the long recession followed by the 2007 financial crisis (on the specific case of biomedical district see interview reports in Bigharelli, 2013).

## 5. Acknowledgements

The present paper has been drafted in the broader framework of an evaluation project carried out by the Evaluation Unit of Regione Emilia-Romagna as part of the Regional Evaluation Plan 2014-2020. Support has been provided by the Agenzia regionale per la Ricostruzione - Sisma 2012, also through the LASDR (Support to Libyan Local Actors to improve Services Delivery and to better manage the Reconstruction efforts) project.

## 6. Bibliography

- Banca d'Italia (2013) Bollettino economico n. 72, <http://www.bancaditalia.it/pubblicazioni/bollettino-economico/>
- P. Bianchi (2013) Riflessioni sul terremoto dell'Emilia: scuole, istituzioni e comunità, Studi organizzativi, n. 1, 2013
- P. Bianchi, S. Labory (2014) The role of governance and government in the resilience of regions: the case of the 2012 earthquake in the Emilia-Romagna region in Italy. Incertitude et connaissances en SHS : production, diffusion, transfert, June 2014, Nice, France. <halshs-01166138>
- Bigharelli D. (a cura di) (2013) Distretto Biomedicale di Mirandola. Gli effetti del sisma e della ricostruzione sulle strategie delle imprese della filiera biomedicale, <http://imprese.regione.emilia-romagna.it/entra-in-regione/documenti-di-programmazione/studi-e-ricerche>
- Birckmayer J. D. and Weiss C. (2000) Theory-based evaluation in practice. What Do We Learn?, Evaluation Review, Vol. 24 No. 4, August 2000 407-431
- G. Boselli (2017) L'agricoltura rinasce dalle macerie del terremoto, in Rivista Agricoltura, anno 45 n. 5-6 maggio-giugno, <http://agricoltura.regione.emilia-romagna.it/archivio-agricoltura/2017/maggio-giugno-2017/maggio-giugno-2017>
- ERVET (2014) La ricostruzione post-sisma: contesto economiche e misure di intervento, in Unioncamere Emilia-Romagna e Regione Emilia-Romagna, Rapporto 2014 sull'economia regionale
- European Commission (2013) Evalsed sourcebook: method and techniques, [http://ec.europa.eu/regional\\_policy/sources/docgener/evaluation/guide/evaluation\\_sourcebook.pdf](http://ec.europa.eu/regional_policy/sources/docgener/evaluation/guide/evaluation_sourcebook.pdf)
- E. Giovannetti, F. Pagliacci (2016) Natural disasters as stress-test for a socio-ecological system. Assessing resilience through the distribution of damages to residential buildings, paper presented at the XXXVII Conferenza italiana di scienze regionali
- M. Guagnini, R. Righetti, R. Giardino (2012), Gli effetti economici del sisma in Emilia-Romagna, in Unioncamere Emilia-Romagna e Regione Emilia-Romagna, Rapporto 2012 sull'economia regionale
- M. Mariani (a cura di), 2016, Sisma Emilia 2012. Dall'evento alla gestione tecnica dell'emergenza, Edizioni Pendragon, Bologna
- E. Martinelli, G. Tagliazucchi, G. Marchi, 2015, Disastri Naturali e Dynamic Capabilities nel Commercio, DEMB Working Paper Series N. 66
- OECD (2013) Policy Making after Disasters: Helping Regions Become Resilient – The Case of Post-Earthquake Abruzzo, OECD Publishing
- Pawson, R. and Tilley, N. (1997) *Realistic Evaluation*, Sage
- V. Piazzini, F. Pagliacci, M. Russo, 2015, Analisi cluster delle caratteristiche socio-economiche dei comuni dell'Emilia-Romagna: un confronto tra comuni dentro e fuori dal cratere del sisma, DEMB Working Paper Series N. 61
- Regione Emilia-Romagna, 2012, A sei mesi dagli eventi del 20 e 29 maggio 2012: i danni del terremoto e le politiche messe in campo per affrontare l'emergenza e la ricostruzione, mimeo

Regione Emilia-Romagna, 2012a, Terremoto 2012: geologia, rilievi agibilità, analisi dei danni, Edizioni Labanti e Nanni, [www.regione.emilia-romagna.it](http://www.regione.emilia-romagna.it)

Regione Emilia-Romagna, 2013, I danni del terremoto e le politiche per la ricostruzione. A 9 mesi dal sisma del maggio 2012, mimeo

Regione Emilia-Romagna, 2013a, A un anno dal terremoto, mimeo

Regione Emilia-Romagna, 2014, A due anni dal sisma. Il racconto di cosa si è fatto e di cosa si sta facendo, mimeo

Regione Emilia-Romagna, 2014a, Ricostruire l'emergenza. Cronologia della gestione istituzionale del terremoto in Emilia e sintesi tematica, <http://territorio.regione.emilia-romagna.it/paesaggio/pubblicazioni/ricostruire-emergenza>

Regione Emilia-Romagna, 2015, La ricostruzione di un territorio. Tre anni di lavoro dopo il terremoto, mimeo

Regione Emilia-Romagna, 2016, L'Emilia dopo il sisma. Report su quattro anni di ricostruzione, mimeo

Regione Emilia-Romagna, 2017, 2012-2017. L'Emilia dopo il sisma. Report su cinque anni di ricostruzione, mimeo

Regione Emilia-Romagna e Comune di Mirandola, 2017, Fare Scuola. Ricostruzione innovazione comunità, <https://www.iltempodellascuola.it/pubblicazioni/>

Regione Emilia-Romagna e ERVET, 2015, Area del sisma 2012. Monitoraggio degli investimenti per la ricostruzione attivati con il contributo di solidarietà delle Regioni del Centro-Nord, mimeo

Riché M. (2012) Theory Based Evaluation: A wealth of approaches and an untapped potential, [http://ec.europa.eu/regional\\_policy/sources/impact/evaluation/conf\\_doc/helsinki\\_mri\\_2012.pdf](http://ec.europa.eu/regional_policy/sources/impact/evaluation/conf_doc/helsinki_mri_2012.pdf)

Senato della Repubblica Italiana, 2017, Terremoti. L'Aquila, Reggio-Emilia, Centro Italia: politiche e risorse per ricostruire il Paese, Documento di analisi n. 7 a cura di L. Iannetti e F. Lambiase, [www.senato.it/ufficiovalutazioneimpatto](http://www.senato.it/ufficiovalutazioneimpatto)

Senato della Repubblica Italiana, 2018, Ricostruire. L'Aquila, Reggio-Emilia, Centro Italia: politiche e risorse per per l'Italia post terremoto, Documento di analisi n. 21 a cura di L. Iannetti e M. Boschi, [www.senato.it/ufficiovalutazioneimpatto](http://www.senato.it/ufficiovalutazioneimpatto)

Unioncamere Emilia-Romagna e Regione Emilia-Romagna, 2013, Rapporto 2013 sull'economia regionale,