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Brief

The contribution of reconstruction and restoration interventions in the Italian regions affected by the 2016-2017 earthquake to the Sustainable Development Goals of the 2030 Agenda

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Abstract

FEEM Policy Brief

As part of the CITI4GREEN project, this Policy Brief intends to investigate the impact on the 2030 Agenda of reconstruction, repair, and restoration of public works in the Abruzzo, Lazio, Marche, and Umbria regions, affected by the seismic events of 2016 and 2017. By applying a methodology developed by the Eni Enrico Mattei Foundation (FEEM), we analyze the interconnections between the individual targets of the 2030 Agenda and the interventions of the ReSTART project “Resilience Territorial Central Apennines Earthquake Reconstruction” to understand how the reconstruction is contributing to the achievement of sustainability targets set by the 2030 Agenda.

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01

Introduction: CITI4GREEN project

In 2016 and 2017, part of the territory between the Marche, Umbria, Abruzzo, and Lazio regions - where 138 municipalities are located, and about 575,000 inhabitants reside - was severely hit by earthquakes that devastated individual areas, causing deaths, destroying and creating massive economic damage. Precisely for this reason, since 2017, the Central Apennine District Basin Authority has intensified its work in the regions affected, starting the ReSTART project (*“Territorial Resilience of the Central Apennines Earthquake Reconstruction”*) in the autumn of 2018. This project is financed by the 2014-2020 Cohesion Policy, which designs, implements, and promotes resource management and territorial risk mitigation interventions by reinforcing the enhancement of green actions and solutions as an optimal lever to support the rebirth of the economy and social cohesion and to avoid the abandonment of marginal, remote and mountainous areas affected by earthquakes.

The approach of the ReSTART project, the commitment of the District Basin Authority of the Central Apennines, in coordination with the Special Commissarial and Reconstruction Offices, aims at the development of an updated knowledge framework that supports the actions and interventions for the reconstruction and restoration, considering the particular historical, cultural, natural value and the

hydrogeological fragility of the areas affected by the 2016-2017 earthquake. The locations cover a territory as rich in eco-hydrological and environmental significance as it is fragile and vulnerable to seismic risk, floods, and landslides.

In continuity with the logic of restoration and sustainable development, in 2020, the CITI4GREEN project was born, funded under the EU DG REGION Cohesion Policy 2020. The project aims at collecting data and results from the ReSTART project of the Central Apennine District Authority, intersecting it with the UN Agenda, and engaging stakeholders and shareholders for a better understanding and co-assessment. First and foremost of sustainability tout court, and secondly, of the green and blue measures implemented for the social and economic protection, cohesion, and development of the areas of Central Italy affected by the earthquakes in the years 2016 and 2017.

Specifically, by co-assessment, we mean the set of actions and efforts coordinated and joint efforts of researchers, stakeholders, and citizens aimed at the shared awareness of the multiple benefits of actions inspired by the principles of the green economy and environmental sustainability to promote climate resilience and environmental, social and economic protection.

In addition, the project aims to evaluate, demonstrate and share the effects of the actions supported by the Cohesion Policy regarding environmental and social sustainability objectives, with specific reference to the Sustainable Development Goals of the 2030 Agenda.

This analysis focuses precisely on the restoration and development interventions of the Italian Regions affected by the 2016-2017 earthquake financed by the 2014-2020 Cohesion Policy, intending to investigate

the potential impact that the programmed resources may have on the 2030 Agenda.

The first section of this Policy Brief briefly introduces the 2030 Agenda and its Sustainable Development Goals. The second chapter focuses on the data collected and the methodology used for the analysis. Finally, the third chapter presents the model's results.

For details on the project and results, please refer to the online platform¹, specifically designed to give a more comprehensive view.

¹ <https://rpubs.com/A2030SD/CITI4GREEN>

02

The 2030 Agenda for Sustainable Development

In 2015, 193 member countries of the United Nations signed the 2030 Agenda for Sustainable Development, an action program for the people, the planet, and prosperity. The Agenda consists of 17 Sustainable Development Goals or SDGs (Figure 1) - and 169 targets or milestones. The SDGs are economic, environmental, social, and

institutional objectives to be completed by all countries by 2030; they are global in nature and universally applicable, considering national diversity, policies, and priorities. The adoption of the 2030 Agenda and the 17 Goals aims to change the dominant paradigm and show how unsustainable the current growth model is, highlighting the need for an integrated vision of the different dimensions of development.

Figura 1: The 17 Sustainable Development Goals



In summary, the SDGs:

- address all countries of the world, emerging, developed, and developing;

- adopt an integrated vision of sustainability, allowing to grasp the complexity of current crises and the links that cross them;

- have five key areas: people, planet, prosperity, peace, partnership;
- are oriented towards the search for innovative solutions for sustainable development.

As former UN Secretary-General Ban Ki-moon

put it: “The new Agenda is a promise from the leaders of all people around the world. It is an agenda for the people, to end poverty in all its forms – a program for the planet, our common home”.

03

Data and methodology

This analysis's geographic domain of interest is represented by the inter-regional territory of central Italy, which was severely hit by the earthquakes of 2016 and 2017. It includes 259 municipalities, 12 provinces, and four regions. The area has been the subject of significant government technical and financial efforts, which have supported reconstruction and social protection after the earthquakes. The actions include support for small municipalities, entrepreneurs, SMEs, farmers, and artisans and aim to protect and create jobs to avoid the abandonment of marginal areas.

In particular, the reconstruction, repair, and

restoration of public works in the Abruzzo, Lazio, Marche, and Umbria regions affected by the seismic events included in the analysis can be found in Annex 1 of the Ordinance n. 109¹ of December 23rd, 2020.

The methodology used for this study was developed by the Eni Enrico Mattei Foundation (FEEM) together with the Autonomous Region of Sardinia (RAS) (Cavalli *et al.*, 2020; Cavalli *et al.*, *forthcoming*). This approach aimed at creating a model for monitoring and evaluating the sustainability of the expenditure of the Sardinian Regional Operational Programs (ROP) co-financed by the EU as part of the

² In particular, the Ordinance no. 109 of December 23rd, 2020, contains the following:

- Approval of the extraordinary program for the reopening of schools in the territories of the Abruzzo, Lazio, Marche, and Umbria regions affected by the seismic events that occurred starting from August 24th, 2016;
- Approval of the first program of reconstruction, repair, and restoration of public works in the territories of the Abruzzo, Lazio, Marche, and Umbria regions affected by the seismic events that occurred starting from August 24th, 2016;
- Implementation of article 13 of the decree-law of October 17th, 2016, no. 189, converted with amendments by law 15 December 2016, n. 229, and subsequent amendments Reconstruction interventions on public and private buildings already affected by previous seismic events;
- Approval of the second program of reconstruction, repair, and restoration of public works in the territories of the Abruzzo, Lazio, Marche, and Umbria regions affected by the seismic events that occurred starting from August 24th, 2016;
- Approval of the 1st Plan of interventions on hydrogeological instability in the territories of the Abruzzo, Lazio, Marche, and Umbria regions affected by the seismic events that occurred starting from August 24th, 2016;
- Second public works program in the field of repair of public buildings susceptible to residential use;

Cohesion Policy concerning the 17 Sustainable Development Goals of the 2030 Agenda.

Thanks to the creation of two matrices to analyze the impacts, their entities, and their orientation, and a third product matrix, designed to detect the final contribution of investments to the SDGs, the model investigates the interconnections between the 169 targets of the 2030 Agenda and the Intervention Fields (IFs) proposed by the European Commission for the implementation of the 2021-2027 Programs of the Structural Funds and European Investment (SIE).

Here, a similar methodology is implemented to study the potential impact on the 2030 Agenda of the interventions identified in Annex 1 of Ordinance no. 109 of December 23rd, 2020. Therefore, the dimension of the ordinates is constant, with the 169 targets of the 2030 Agenda. On the other hand, the abscissa here refers to the 1278 interventions identified in Annex 1 of the Ordinance mentioned above. In order to simplify their evaluation and representation, the interventions have been organized into the following categories:

- Businesses;
- Cultural Heritage;
- Cemeteries;
- Hydrogeological Instability & Water Resources;
- Construction Activities;
- Schools;
- Social and Health Structures;
- Urbanization Works;
- Other Interventions.

Then, a series of synthetic measures have been constructed to capture the aggregate impact of each intervention on the individual targets and goals and the 2030 Agenda as a whole. In short, for each intervention, the respective arithmetic average of the impacts on the targets belonging to the same Goal was calculated. Afterward, we calculated the sum of the individual impacts on the Goals. The higher the value obtained, the more the investment in the given intervention is beneficial for the Agenda.

After calculating the final coefficients, these have been multiplied by the resources planned for each intervention as specified in Annex I of Ordinance no. 109 of December 23rd, 2020.

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- Approval of the extraordinary program for the reopening of schools for the 2017-2018 school year;
 - Measures relating to the repair of public buildings susceptible to residential use.

04 Results

Before analyzing the relative contribution of the reconstruction, repair, and restoration of public works to the 2030 Agenda, it is appropriate to highlight how resources are distributed by category (Table 1 and Figure 2).

The reconstruction ordinances analyzed anticipate an allocation of € 1,618,591,378.88 for a total of 1278 interventions (Table 1). Of these, € 509,830,078.64 are reserved for 199 interventions concerning Schools; € 276,522,985.39 for the 196 “Other Interventions,” a category which includes the Municipal Offices, Police and Fire Stations,

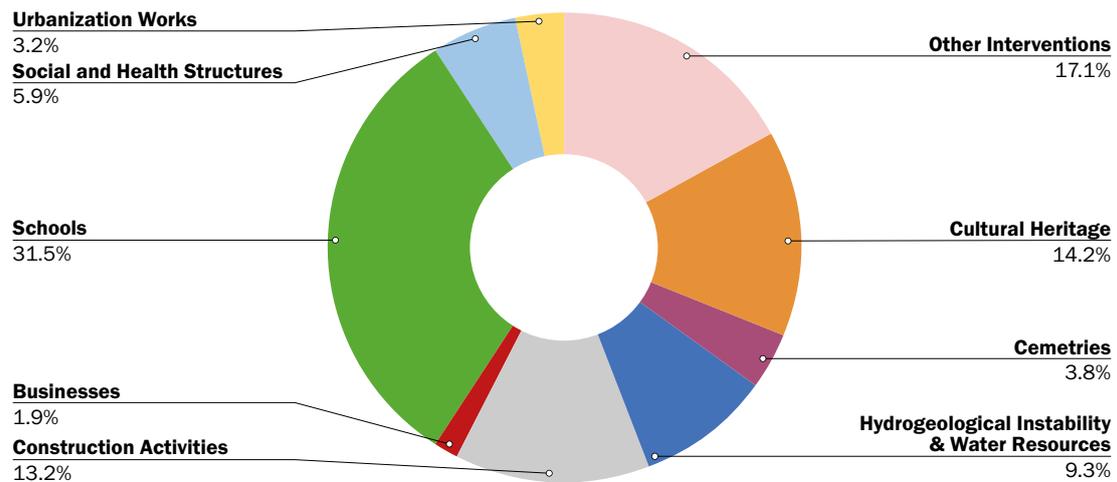
and Sports Halls, as well as generic buildings owned by the municipality; 230,024,709.93 € reserved for 186 interventions concerning Cultural Heritage; € 213,562,670.99 allocated for the 308 building interventions (public housing and other facilities); 149,729,271.14 € for the 147 interventions of hydrogeological instability, water resources; € 95,017,658.76 for the 34 interventions on the Social and Health Structures; € 60,837,480.90 for the 84 interventions on Cemeteries; € 52,592,858.04 reserved for 89 Urbanization works; € 30,473,665.09 for the 35 Production Activities.

Table 1: Distribution of resources by category, number of interventions, programmed amounts, and average amounts per intervention.

Category	N° Interventions	Total Scheduled Amount	Average amount per intervention
Businesses	35	30,473,665.09€	1,410,831.56€
Cultural Heritage	186	230,024,709.93€	1,236,691.99€
Cemeteries	84	60,837,480.90€	724,255.73€
Hydrogeological Instability & Water Resources	147	149,729,271.14€	1,018,566.47€
Construction Activities	308	213,562,670.99€	693,385.30€
Schools	199	509,830,078.64€	870,676.15€
Social and Health Structures	34	95,017,658.76€	2,561,960.19€
Urbanization Works	89	52,592,858.04€	2,794,637.02€
Other Interventions	196	276,522,985.39€	590,930.99€
Total	1278	1,618,591,378.88€	1,322,437.27€

In Figure 2, we can observe the percentage distributions of programmed resources between the categories of interventions.

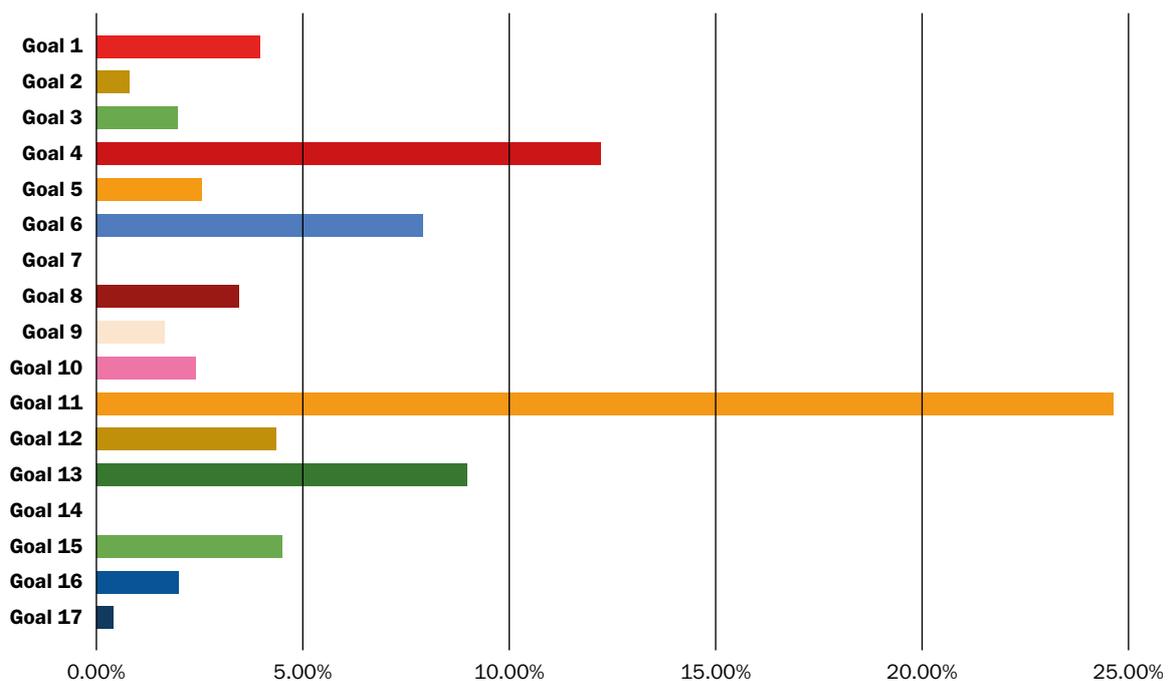
Figure 2: (percentage) Distribution of resources by category.



Focusing on the results obtained from applying the model mentioned above (Cavalli *et al.*, 2020; Cavalli *et al.*, *forthcoming*), we start by looking at the net of the investments and then at the results derived by multiplying the final coefficients with the programmed resources.

By analyzing the impacts of the 1278 interventions – i.e., without considering the actual allocation of money to each one – on the 169 targets of the 17 Sustainable Development Goals of the 2030 Agenda net of investments, we can observe how, on average, the interventions impact the 2030 Agenda before involving financial outlays (Figure 3).

Figure 3: Average percentage achievement per Goal, net of investments.



From the Figure, it emerges that the reconstruction, repair, and restoration of public works in the territories of the Abruzzo, Lazio, Marche, and Umbria Regions mainly contribute to Goal 11, “Sustainable cities and communities,” which, out of 1278 interventions, has an average realization of 24.62% per intervention. Goal 11 is mainly impacted by the Construction, Hydrogeological Instability, and Cultural Heritage categories. Goal 11 includes the target 11.1 “By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums,” to which the construction and reconstruction interventions contribute to public housing under the Construction category. Furthermore, target 11.4, “Strengthen efforts to protect and safeguard the world’s cultural and natural heritage,” is impacted by 97% of total interventions: on the one hand, interventions within the Cultural Heritage category satisfy the component of safeguarding the heritage culture of the target in question; on the other hand, the interventions of “Hydrogeological Instability & Water Resources” involve the aspect of protection against the natural heritage present in the target.

In second place in terms of impact, we find Goal 4, “Quality education,” thanks to the 199 interventions on Schools that lead the list with an average achievement of Goal 4 of 74%, touching most of the Goal’s targets. This translates into a 12.22% average achievement of Goal 4 per intervention in absolute terms.

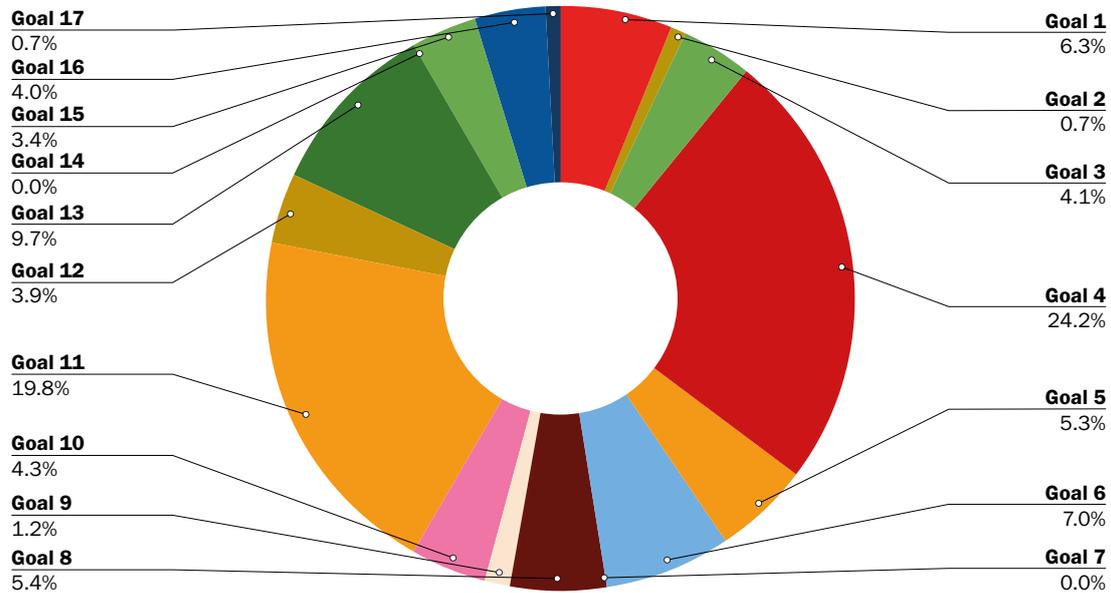
Goals 13, “Climate Action,” and 6, “Clean water and sanitation,” follow with an average achievement of 8.98% and 7.91%. Both are

driven by the category of “Hydrogeological Instability & Water Resources,” which obtains, respectively, average achievement of 20% and 62%. In particular, the most impacted targets are 13.1, “Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries,” 6.1, “By 2030, achieve universal and equitable access to safe and affordable drinking water for all,” 6.4, “By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity,” 6.6, “By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes,” and 6.b, “Support and strengthen the participation of local communities in improving water and sanitation management.”

As for the less impacted Goals, we find Goal 14, “Life below water,” and Goal 7, “Affordable and clean energy.” In particular, the result relating to Goal 14 is not unexpected. It is, in fact, an Objective that refers to maritime or coastal areas, while the reconstruction interventions analyzed here mainly refer to mountain areas. Goal 7, on the other hand, surprisingly, was affected by only two interventions: the hydroelectric plants of Castel Sant’Angelo in Lazio and Arquata del Tronto in the Marche.

We can now turn to the results derived from the multiplication of the final coefficients with the programmed resources. Figure 4 shows the new distribution of impacts on the 2030 Agenda considering the financial amounts.

Figure 4: The contribution of investments related to the restoration interventions on the 2030 Agenda.



While Figure 3 considers the impacts on the Agenda in absolute terms, Figure 4 shows the impacts on the 2030 Agenda multiplied by the amounts scheduled for each intervention. The product of the qualitative results of the methodology for the financial resources allows to concretize the distribution of resources on the Goals, showing how the weights of the interventions on the Goals change once the amounts associated with them have been considered.

While in absolute terms, Goal 11, “Sustainable cities and communities,” is the one with the highest average achievement, once the financial allocations are considered, the most

impacted Goal becomes Goal 4, “Quality education.” As seen in Figure 1, the Schools, the main drive of Goal 4, are awarded 31.5% of the total financial resources provided by the Ordinances for reconstruction. Consequently, Goal 4, “Quality education,” obtains first place with 24.2% of the total impacts on the 2030 Agenda. Goal 11, “Sustainable cities and communities,” remains in a good position, taking second place with 19.8% of total investments. Then follow Goal 13, “Climate Action,” and Goal 6, “Clean water and sanitation,” driven by investments for “Hydrogeological Instability & Water Resources,” with respectively 9.7 and 7% of financial resources contribute to the Agenda.

05

Final remarks

This Policy Brief explores the contribution that the reconstruction, repair, and restoration interventions in the Abruzzo, Lazio, Marche, and Umbria regions have in relation to the Sustainable Development Goals of the 2030 Agenda.

The first chapter briefly introduced the CITI4GREEN project, which aims to: i) engage citizens for a better understanding and co-assessment of sustainability and green and blue measures implemented for social and economic protection, cohesion, and development of the areas of Central Italy hit by earthquakes in 2016 and 2017; ii) assess the effects of the actions supported by the Cohesion Policy regarding the environmental and social sustainability objectives, making specific reference to the Sustainable Development Goals of the 2030 Agenda.

The methodology, described in the second section, involved the creation of a matrix that analyzes the interconnections between the 169 targets of the 2030 Agenda and the 1278 interventions present in Annex 1 of Ordinance no. 109 of December 23rd, 2020. The analysis and categorization of the interventions were also possible thanks to the support of the ReSTART project group “Territorial Resilience of the Central Apennines Earthquake Reconstruction” of the Central Apennine

District Basin Authority, which implemented the technological platform providing a framework with updated information on the territories of the four regions of central Italy affected by the 2016-2017 seismic events.

Finally, in the last chapter, the results of the application of the model were presented. Firstly by looking only at the impact and direction of the interventions, and secondly, considering the financial outlays. Taking the latter into account, we have shown how the reconstruction and restoration interventions in the Abruzzo, Lazio, Marche, and Umbria regions mainly contribute to Goal 4, “Quality education,” Goal 11, “Sustainable cities and communities,” Goal 13, “Climate Action,” and Goal 6, “Clean water and sanitation.” The least impacted Goals are Goals 14, “Life below water,” and Goals 7, “Affordable and clean energy.”

The analysis shows how the three pillars of sustainable development - environmental, social, and economic - emerge fully in the results. It is important to underline how the methodology used manages to capture the impacts that an intervention directly exerts on a specific target and the indirect effects, emphasizing the interconnected nature of the three spheres and, therefore, of the 2030 Agenda.

Environmental sustainability is driven by Goals 13, “*Climate action*” and 6, “*Clean water and sanitation*,” mainly as a result of the interventions of “Hydrogeological Disruption, Water Resources.” On the other hand, Goals 14, “*Life below water*” and 7, “*Clean and accessible energy*,” are the least impacted by investments. This conclusion highlights how environmental sustainability is oriented toward the rebuilding and resilience of the natural heritage rather than focusing on the energy transition.

Social sustainability is expressed in the outcomes of Goal 4, “*Quality education*” - the most influential in achieving the 2030 Agenda (Farnia *et al.*, 2019) - thanks to the interventions on Schools, and Goal 11, “*Sustainable cities and communities*,” thanks to investments in Construction and Cultural Heritage. Both contain creation and restoration of public places fundamental for local communities, such as churches, theaters, and sports centers, the main drivers for social cohesion and development.

Finally, the economic dimension of sustainability is included in the results of Goal 8, “*Decent work and economic growth*,” and, indirectly, in Goal 1, “*No poverty*.” The verdict is a lower presence of entrepreneurial and industrial investments. Fewer investments are oriented toward innovation, responsible consumption and production, and sustainable tourism. These aspects will need different financial instruments and sources and other policies that include all players in the area to ensure a more integrated sustainable development.

To conclude, we remark the importance for the different territories to develop strategies that consider the directives of the different levels of *governance* to coordinate the policies and tools to identify, integrate, implement and achieve the Sustainable Development Goals of the 2030 Agenda. The Agenda is a guide to rebuild, not just to restore the *ex-ante*, but also to guide the transition towards a more resilient, green, and inclusive society, prepared for present and future challenges.

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