

Territorial Impact Assessment, Cost Benefit Analysis and Do Not Significant Harms principle for sustainable works and plans design

Evaluación del Impacto Territorial, Análisis de Costes y Beneficios y principio de No Causar Daños Significativos para el diseño de obras y planes sostenibles

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ABSTRACT

Economic, financial, and spatial analytical models are known to be integral parts of large territorial works and plans. Cost Benefit Analysis (CBA) and, newly, Territorial Impact Assessment (TIA) and Do Not Significant Harms principle (DNSH) are required to support the decision-making and evaluation process underlying climate change, initial strategic investment confirmation and final reporting.

Looking at them from an economic-geographical perspective and drawing inspiration from ongoing experiences in Europe and Italy, methodological and operational guidelines are suggested in the paper to address this issue, so that both the environmental and social costs are reflected in the costs/prices/returns and in the mitigation of the public works impacts, creating a strong link between economy, territory, and environment, so that externalities can become internalities.

The underlying thesis is that, knowing the territorial impacts generated by the TIA and the sustainable consistency of the project with the DNSH taxonomy, it is possible to adopt compensatory and mitigation actions, including in the related CBAs; and, at the same time, to minimise the costs resulting from the lack of policy coordination in territorial action between regional and local plans, both horizontal and vertical, when large infrastructure projects come from top-down decision as in the case of Recovery and Resilience Facility plan.

RESUMEN

Se sabe que los modelos analíticos económicos, financieros y espaciales son parte integral de las obras y planes de diseño territorial. El Análisis de Costes y Beneficios (ACB) y, recientemente, la Evaluación de Impacto Territorial (EIT) y el principio "No causar un perjuicio significativo" (DNSH) son necesarios para apoyar el proceso de toma de decisiones y evaluación subyacente al cambio climático, la confirmación inicial de la inversión estratégica y la presentación de informes finales.

Mirando con los ojos de la Geografía Económica y inspirándose en las experiencias actuales, se sugieren directrices metodológicas y operativas en el documento para abordar esta cuestión, para que tanto los costos ambientales como sociales se reflejen en los costos/precios/retornos y en la mitigación de los impactos de las obras públicas, creando un fuerte vínculo entre la economía, el territorio y el medio ambiente, de modo que las externalidades puedan convertirse en internas.

La tesis subyacente es que, conociendo los impactos territoriales generados por el EIT y la coherencia sostenible del proyecto con la taxonomía DNSH, es posible adoptar acciones compensatorias y de mitigación, incluso en los ACB relacionados; y, al mismo tiempo, minimizar los costes derivados de la falta de coordinación política en la actuación territorial entre los planes regionales y locales, tanto horizontales como verticales, cuando los grandes proyectos de infraestructuras son top-down como en el caso del plan Recovery and Resilience Facility.



1. INTRODUCTION

Territorial planning¹/design work typically involves the use of economic, financial, and spatial analytical models. Cost Benefit Analysis (CBA) and, more recently, Territorial Impact Assessment (TIA) and the application of Do Not Significant Harms (DNSH) principle are required to support the decision-making and evaluation process underlying climate change, initial strategic investment confirmation and final reporting.

The field of economic geography has the potential to provide innovative and sustainable solutions to integrate these three separate instruments into a unique and coherent path. This aim is consistent with the Cohesion Policy objectives, the Green Deal Policy² and related New Bauhaus addresses (EU, 2023)³, in order to innovate and modernise the European approach to designing.

Indeed, if in the beginning, the CBA was only the monetary and financial evaluation of all the negative and positive impacts associated with a given large project, after the introduction of the Recovery and Resilience Facility (RRF) in national programmes under the Next Generation EU, it aims at integrating these aspects with social and environmental externalities⁴ (EC, 2019), highlighting advantages and disadvantages for the territory (employment, gender, regeneration, ...). To encourage and follow this direction, the European Green Deal (EC, 2020), the Commission roadmap for making the EU's economy sustainable, require more quality and innovation in the project.

This does not mean that socio-economic and environmental aspects are not evaluated, e.g. in SEA and EIA processes, but that economic and financial evaluation still does not take them into account as internalities. The European review of the CBA of large projects is moving in this direction (EC 2020c, 2021). This means that both the environmental and social costs are reflected in the costs/prices/returns and in the measurement of the impacts of the public works, and, looking through the eyes of Economic Geography (Prezioso, 2020b), externalities can become internalities creating a strong link between CBA, TIA and DNSH.

The paper discusses how to address this issue through methodological and operational guidelines, starting from the hypothesis that territorial evidence, as distinctive geographical character of TIA, is the relevant point of contact to achieve integration between the different instruments, based on a flexible and sustainability-oriented working method.

The underpinning thesis is that, knowing the territorial impacts produced by the TIA and evaluating the cohesive coherence of the project⁵ by the TIA and DNSH taxonomy, it is possible to adopt compensatory and mitigation actions, including them in CBA costs; and, at the same time, how this choice allows to minimise the costs arising from the lack of political coordination in territorial action (planning), both horizontal (spatial plan) and vertical (subsidiarity between plans). The scope is to introduce a new model to designing and planning, which, incorporating the just transition features, modifies both toward a more sustainable development. The TIA would serve as the glue that holds the entire assessment system together.

2. WHAT IS BEING DISCUSSED

The complex and strategic nature of European finance after the 2020 period evaluation (Cohesion assessment 2014-2020, EC, 2020c) and the short timing to reach sustainable development goals (UN, 2017, 2019) have

1. The term "territorial planning" is used instead of the usual lexicon "spatial planning" to highlight the ongoing transition from a spatial approach to planning toward a more geographical and realistic one based on diversity, cohesion, geo-scales and territorialised variables. This is place evidence, too and a fundamental aspect of the Europeanisation process of planning (Prezioso, 2018).

2. https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

3. See New European Bauhaus Compass, 2022 available at https://new-european-bauhaus.europa.eu/system/files/2023-01/NEB_Compass_V_4.pdf

4. an externality or external cost is an indirect cost or benefit to an uninvolved third party, as, in a project, the air pollution on collectivity to whom the project brings benefit.

5. As it is known, the word "project" has a meaning in a broad sense, including not only the ideational phase but also the subsequent realization one.



led to consider fundamental other strategic methods and tools, e.g. the Analysis of socio-economic and environmental convenience, in supporting the sustainable territorial design solutions, that generally refers to green infrastructures⁶. By virtue of this orientation, the CBA has expanded financial and economic contents⁷.

To manage the socio-economic-territorial impacts of unplanned works in traditional current planning instruments before the RRF, also the need emerges to estimate the Social Discount Rate (SDR) and the Social Rate of Time Preference (SRTP)⁸, as well as the generated youth employment and the attention to the gender question. The reference is in the guidance document of the European Commission, which recommends a value of 5.5 % for SRTP including the environmental contribution estimation in relation to the large projects in the Cohesion Fund beneficiary countries and a value of 3.5 % for the other Member States' initiatives in general, and in any case in 2023 not less than 4%. The document (EC, 2020a), which refers to the 2014-2020 period of Cohesion Policy, has been updated to 2021-2027, maintaining this requirement.

The attention to employment and equal opportunity by the inclusive pillar is one of the main reasons why the TIA - which has been, since the early 2000s, at the heart of the debate on the adequacy of European policy in responding to the demand of citizens and citizenships - can be brought in to supplement the traditional CBA. Keeping in mind that TIA accompanies the policy maker in the choice but does not replace it, it is a common opinion that a 'good' TIA, looking at the geographical diversity, makes more sustainable regulation, investments, programs and projects (Medeiros, 2020).

Since TIA needs powerful data support (analytical, statistical and cartographic) it integrates ACB with qualitative-quantitative evaluations, associating different types of critical judgements in response to territorial, social and environmental questions for which assessment is required. As Evers noted (2011), what already made the TIA a "novel" is the coherence with a wide-ranging approach, that is territorial, even if its origins are linked to the impact of European sectoral policies such as agriculture, environment and transport (ESPON, 2010).

Shared by several authors (Hague, 2001; Camagni, 2006; Prezioso, 2005, 2006, 2006a, 2008, 2012; Radej, 2008; Evers *et al.*, 2009; Dijkstra, 2012; Farinos-Dasí, 2011, 2013), the sentence: *In the future, Territorial Impact Assessment should be a basic prerequisite* (ESPON, 2004, p. 428) is still relevant today before adopting a policy/program accompanied many public engagement activities. The close trans-scalar correlation between TIA and Strategic Environmental Assessment (SEA) was also clear within subsidiary planning (Fisher *et al.*, 2013; Prezioso, 2003, 2015), as well as the TIA favours the access to sustainable goods and services, to those of general economic interest (health, accessibility, education) and their localisation. Now it is confirmed by the "Do Not Significant Harm" principle (EC, 2020; EU, 2023a).

Indeed, whether creating sustainable projects is the aim of all European policies and their investments (EIB, 2020) in 2020-2021 period - with reference to: *Low Carbon and Circular Collaborative Economy, Biodiversity, Just Transition Economy, Green Infrastructure, resilience, restoration, risk*, in accordance with the *European Green Deal*, the *Biodiversity Strategy for 2030*, the *Strategy Zero Pollution Action Plan for Air, Water and Soil 2021* and the *new Climate Change adaptation policies* (Climate Pact) - confirming the usefulness of Sustainable Development Goals, the compliance with these guidelines in the three pillars of sustainability (economic, social, environmental) is ensured by the DNSH, which also acts as a glue for the estimation of the added value generated both in economic-financial and occupational-social terms. What leads back and affects the CBA.

The DNSH (EC, 2020) principle refers to the EU's new sustainable financial taxonomy (*Renewed Sustainable Finance Strategy*. EC, 2021), which helps to steer investment towards an innovative sustainable socio-economic approach, verifying the significant contributions of the project to one or more environmental objectives, coherently with the principle of "do not causing significant harm", promoting public and private investment in green and circular projects according to the objectives of the New Green Deal. In particular the following activities:

6. EC invites to include in the projects not only traditional "grey" infrastructures, but also the "green" ones, and mixed forms of «infrastructure gray/ green and blue» including land – sea ecosystem services.

7. E.g. in the calculation of Net Present Financial Value (VANF-C), Finance Rate of Return (TRF-C), Value of the Internal Economic Rate of Return (TIR-E), Economic Net Present Value (VAN-E)

8. The SDR and SRTP must be declared and adequately commented/justified in the CBA, as well as the B/C ratio (> 1).



- a) Climate Change mitigation;
- b) Adaptation to Climate Change;
- c) Sustainable use and protection of waters and marine resources;
- d) (Just) transition to a circular economy;
- e) Prevention and reduction of pollution;
- f) Protection and restoration of biodiversity and ecosystems;

are measured in quantitative (e.g. CO2 reduction) and monetary (cost of mitigations) terms.

In this context, the TIA appears as an economic-geographical approach capable of highlighting place evidence (Prezioso, 2006; Schön, 2009), that is also the asymmetric impacts due to the geographical diversity, expressed by different territorial cohesion, administrative or political levels (national, regional or local), types of the region or sectoral dimensions such as cross-border, rural or functional areas such as: macro-regions, river basins, labour market areas, service areas, metropolitan areas; or still give by ongoing changes: land use, the gap between rural and urban areas, trends towards polycentrism, and so on. Using time series and appropriate indicators is crucial (Prezioso, 2008; Camagni In ESPON, 2010; Böhme *et al.*, 2015).

TIA is transformed into a “coordination mechanism” (Eser & Böhme, 2015) and, as Farinos (2013) rightly observed, TIA (and SEA) is strongly integrated processes that can be applied to the planning, programme and project scale, ex-ante and ex-post.

The public policy question - shoved precisely in relation to the ex-ante evaluation which the CBA and DNSH cannot solve because they are both linked to a single project and a sectoral objective – can have a solution using the TIA ex ante and ex post, which allows, on the contrary, to constantly reshape strategic choices and decisions. It demonstrates “structural flexibility”, to which the character of the territorial interdisciplinary treatment is added, which also serves to measure the levels of territorial cohesion generated by a project in time and space (Prezioso, 2015, 2020a).

3. METHODOLOGICAL REFLECTION BETWEEN OLD AND NEW SENTIMENT

The new European guidelines and case studies⁹ do not establish a single reference methodology for CBA and TIA, as they apply to different objectives and are measured against specific performance requirements for each type of project. On the contrary, clear specific requirements have been provided for the application of the DNSH principle (EU, 2023).

Relying on the CBA method used to evaluate the Cohesion Policy 2014-2020 – extended to 2021-2027 - comes in handy, because costs of climate mitigation measures and adaptation are included in the final evaluation of investment, drawing them from DNSH.

In the STeMA TIA model (Prezioso, 2006, 2011, 2011a, 2020, 2020a)¹⁰ both these elements are already included in the evaluation of the territorial cohesion (table 1). They are also found in part in the DNSH contents (table 2).

However, the inclusion of the Territorial Impact Assessment alongside the CBA in the phase of the global project and the choice of alternatives is still problematic to close the circular relationship that unites them to DNSH.

Anyway, some common points can be highlighted (table 2).

9. Tha A. refers to the Italian experiences of large infrastructure projects financed by National Resilient and Recovery Plan under the Ministry of Infrastructures: High Speed Railways, Highways, Ports, etc.

10. For a detailed knowledge of this methodology, the A. referred to the relevant bibliography.



Table 1. Declination of the Next Generation EU Strategy according to STeMA-TIA.

Policy	Programming Objectives	Design Actions
Smart and Digital Growth		Technological and innovative design Support for territorial and municipal, institutional cooperation Use/development of zero impact technologies Certification and quality mechanisms
		Support to BAT Circular economy
	Services networks development	Services networks development Development of sustainable energy networks Increasing accessibility to services
Sustainable Growth	Competitive and Economic Development	Support for local production activities New business and service tools Rate control
	Efficiency in the use of natural resources	Use of renewable resources Active protection of natural resources Lower consumption of natural resources and soil Prevention of natural hazards
	Climate Change	Energy Policies Climate Active, CC Adaptation and Mitigation, Carbon FootPrint
	Biodiversity	Green infrastructures Eco-services
Inclusive Growth closer to citizens	Wellness	Inclusion of elderly people Leisure Social inclusion Protection of children Poverty reduction Cultural integration
	Employment	Homogenization of the enterprise cost Support for the creation of businesses Support for worker mobility Support for equal opportunities Youth and gender employment
	Public Health	Financing of social programs Safety Urban regeneration

Source: elaboration on Prezioso, 2018, p. 38.

Table 2. Hits between CBA, TIA, DNSH.

	CBA	TIA	DNSH
Climate change mitigation and adaptation to climate change; prevention and reduction of pollution measured in quantitative (e.g. CO2 reduction) and monetary (cost of mitigations)	X	X	X
Loss of biodiversity: protection and restoration of biodiversity and ecosystems		X	X
Sustainability of resources in public works	X	X	X
Creation of cohesive and resilient local communities toward (just) transition to a circular economy, safeguarding the landscape and cultural heritage	X	X	X
The introduction of advanced and low-impact technologies and techniques		X	X
Use of renewable building materials (bio-based) and supply of low-impact material		X	X
Adoption of modular and flexible design forms		X	
Sustainable use and protection of waters and marine resources		X	X

Source: author elaboration.



Making the three methodologies coherent means creating an instrumental integration, which allows for a more effective management of the transition to a green and blue economy, against which individual tools are unable to estimate the consistency and the horizontal subsidiary relationship.

For this purpose, simply integrating the CBA with the Sensitivity Analysis¹¹ in the Multicriteria phase – as the EU directive suggests in the post 2020 – is not useful because it increases the separation between the three approaches, making CBA self-referential. It should also be noted that, among the different methodologies developed to determine the monetary value, landscape ones (measured in €/ha) and the Contingent Evaluation Method (CVM)¹² are now widely recognised and usefully applied for the monetary quantification of the damage caused to certain categories of “non-marketable” environmental goods referred to data from official statistical sources. Landscape, wellness and immaterial goods are an example.

So far, CBA, TIA, and DNSH experiences have allowed us to highlight the close relationship between these approaches in designing sustainable works financed by the EU and the National authority (RRF, Complementary Funds, Development and Cohesion Funds, Budget Laws, etc.).

4. MOVING FROM THEORY INTO PRACTICE

The various adjustments and operative guidelines introduced by the EC from 2021 today require, necessarily, to be complied with the practice of sustainability adopting a new taxonomy and an ex-ante/ex-post evaluation (Regulation C/2023/111) also including investments (figure 1).

Resourcec and Funds									
Vulnerability								Funds used	
Level of intervention in innovation and knowledge				Level of intervention in sustainability					
Competitive innovation		Human Capital		Sustainable		Quality of life			
Spending on research and development	Spending on economic development and competitiveness	Spending on employment	Spending for professional training	Spending on sustainable development	Spending on transport and the right to mobility	Spending on youth policies, sport and leisure	Spending on social right, social policies and the family	Cohesion funds used in project	Rate of cross border and transnational cooperation

Figure 1. Example of Logical Tree about Resources and Funds by STeMA-TIA matrix before the introduction of RRF. Source: Prezioso, 2020 p. 52

Since 2014 and in 2020, the EC has demanded that the financial analysis contained in the CBA of major projects include an assessment of the financial profitability of the investment and the equity capital used - national, public and private - (financial resources invested in the projects net of EU subsidies and, today, of the RRF), in order to determine the appropriate (maximum) level of the contribution of funds and to verify the financial sustainability of the project.

The project’s internal economic rate of return (IERR), therefore, had to be greater than or equal to the social discount rate (SDR). This was not consistent with the cohesion objectives of the Green Deal. Quantitatively

11. However, the CBA should contain a risk analysis, which can be replaced by a sensitivity analysis where it is not possible to draw it up.

12. It is an economic technique for the valuation of non-market resources, such as environmental preservation or the impact of externalities like pollution. For a more in-depth look at Ann-Chyi, Sheau-Ting, 2024.



expressing the project's impact on people's quality of life is not required while it is crucial in the short-medium- and long-term scenarios.

At present, after numerous attempts, two are the main domains that integrate the CBA with the European Directives on sustainability for large works financed - by different Funds:

1. Quantification and mitigation of greenhouse gas emissions (climate change) by DNSH criteria;
2. The Analysis of socioeconomic convenience/effectiveness (and sensitivity) by TIA.

Regarding point 1), after several tentative tests (as in the Italian RRF large infrastructure projects), it has been integrated into the CBA, treating as externalities both the cost of greenhouse gas emissions and the cost of climate change adaptation and mitigation measures, relating to a Sustainability Report (figure 2) and the DNSH principle.

This has been possible because, in the EU RRF plan, the CBA adopts (with a view to a general sustainable report) criteria for monetising costs and benefits of large works recognised and applied in transnational European contexts, to estimate the economic, social, and environmental value, also with the help of appropriate "conversion coefficients", strengthening the quality of the declared and pursued project objectives.

About point 2), the CBA has been integrated with both a TIA and an Analysis of socio-economic and environmental convenience to make more robust the calculation of the costs of mitigation related both to productive activities (on SMEs, using data e.g. from the regional Social Accounting Matrices-SAM, which anticipate the NAMEA ones. Table 3), and to the young people employment (24-35 years) and gender, regarding the job supply. For this purpose, updated general and/or sectoral and specific CBAs are often used¹³.

Sustainability Report - Relazione di Sostenibilità

- the **assessment of the socio-economic impacts of the infrastructures**, with specific reference to
 - the promotion of **social inclusion**,
 - the **reduction of inequalities** and territorial differences
 - Improving the **quality of life** of citizens
- the assessment of any significant contributions to at least one or more of the following **environmental objectives**, as defined in the context of the same regulations, taking into account the life cycle of the work to
 - **climate change mitigation**;
 - **adaptation to climate change**;
 - **sustainable use and protection of water and marine resources**;
 - **transition to a circular economy**
 - **prevention and reduction of pollution**;
 - **protection and restoration of biodiversity and ecosystems**;

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Guidelines
for the elaboration of the technical and economic feasibility project to be considered at the base of public work tenders of the PNRR and PNC

Linee guida
per la redazione del progetto di fattibilità tecnica ed economica da porre a base dell'affidamento di contratti pubblici di lavori del PNRR e del PNC

(Art. 48, comma 7, del decreto-legge 31 maggio 2021, n. 77, convertito nella legge 29 luglio 2021, n. 108)

Luglio 2021

13th September 2023

Mario Tartaglia, Franco Stivoli, Chiara Ravagnan, Arianna Fittipaldi | An integrated approach for the territorial impact assessment of high-speed railways

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Figure 2. Example of Sustainable Report based on the Italian Guidelines. Source: Tartaglia *et al.*, 2023.

13. For further information, please refer to the European directives from 2015 to the present, which can be found in the References section.



Table 3. Possible representation of the Matrix of Social Accounting.

	Productive factors (inputs)	Institutions	Productive policy sectors	Capital accumulation	Wider economy	Total income
Productive factors						
Institutions						
Productive policy sectors			MATRIX OF SECTORAL INTERDEPENDENCIES			
Capital accumulation						
Wider economy						
Total expenses						

Source: Maiolo & Prezioso, 2021.

However, to realise an integrated evaluation process, the most important innovation comes from the introduction of TIA, which both elaborates scenarios (ex-ante, ex-post and ex-post territorialized) for the measure of environmental and social convenience and allows the works to be adherent to the Next Generation EU Strategy, distinguishing the Green Deal policies (smarter, sustainable, inclusive, digital, close to citizens) with respect to programming and planning (table 1) to implementation and management, according to the updated EC Guide from 2020 onwards and the European Commission’s Innovation Scoreboard.

The new EU Cohesion policy (EC & DGRegio, 2021), Territorial Agenda 2030 (BBR & ESPON, 2020), Urban Agenda/Chart of Leipzig (Informal Council of Ministers responsible for Spatial Planning, 2016) and specific Recovery and Resilience Plan funds have made clear and (re) launched TIA as an instrument able to (re) orient the project’s scope towards sustainable design, making effectiveness the expenditure of funds in different territories.

Rethinking the TIA approach and its methods as related to territorial dimension in the framework of project instruments (CBA, Social convenience analysis, DNSH, etc.) introduces an important and innovative challenge to go over obstacles in ensuring efficient sustainable design and spending.

Given the complex nature of the large projects financed by RRP (and Complementary Funds), it is also recommended that, among the three types of CBA (financial, economic, and socio-environmental), the analysis is thorough in function of:

- the public interest;
- the objective of maximising social welfare, according to the criteria of efficiency and economic effectiveness;
- the use of price/cost values, which must be reasonable, plausible, commensurate, detailing, and quoting the relevant sources, any cost increases¹⁴.

In the CBA of the chosen design solution (generally downstream of a Multicriteria analysis), the economic value of the work (full cost) is therefore also given by the sum of environmental costs (externalities in which social costs are also included) the cost of capital and operational costs. The latter makes up the “industrial cost”.

14. Note that the National Statistical Institutes data (quarterly, half-yearly, annual) of the approval period of projects are crucial for this purpose.



5. THE STEMA-TIA CONTRIBUTION IN COMBINING DIFFERENT EVALUATION APPROACHES

Paying attention to the territorialised analysis of policy impacts and to the socio-economic activity, the TIA can consider territorial systems and design functionalities in a coherent cohesive perspective. For this reason, experimental methods include participatory approach, too, and consider stakeholder perspectives.

As contained in the 2030 Climate Target Plan (EC, 2020a), the design objectives must be related to cost/benefit-effectiveness of the project (e.g. energy transition, climate neutrality...). TIA process can also absolve to this scope because it adapts policies to the territorial diversity, no referring to a single action or solution but to a mix of choices¹⁵. Starting from the principle that all parts of a process are interconnected (systemic approach), considering the Communication "Fit for 55" (EC, 2021), and reminding all regulation proposals should be sustained by an ex ante Impact Assessment, TIA can play the role of assessing the policy mix required from the EC, creating a right equilibrium between objectives, planning, prices, design, societal standards, adaptation/mitigation and geographical diversity. In brief: between economy, society, environment, and cultural needs, meaning to make more cohesive choices.

The General Theory of Systems applied to Impact Assessments, allowed the interaction between models and indicators in a coherent and synchronic way in the Sustainable Territorial environmental/economic Management Approach (STeMA), in order to organising the Territorial Impact Assessment process by "closed" and "open" cycle phases, allowing the co-existence of cognitive, project, regulation, managerial procedures. The selection and description of indicators and objectives give the results a fundamental weight in the territorialised assessment.

Comparing different methodological approaches has been possible to describe three moments or fundamental phases:

- Territorial component analysis and attribution of sensitivity value include phases of territorial description driven primarily by thematic categories, factors, and indicators, which are divided to determine the initial territorial value (ITV).
- Final territorial value (FTV) determination for each design action in a policy.
- Choice of the best policy solution and impact mitigation through corrective adoption.

The shared objectives are to initially determine territorial values related to an index (ITV) that is associated with the scenarios being considered. Representative methods make visible analysis and evaluation results, to answer to the transparency and objectivity needs as requested in all TIA studies.

Once the ex-ante territorial quality value is defined, the territorial quality decreases are individuated for each solution, determined in relation to the gravity of the impact compared to the indicator.

For impact determination, policy/design actions will be defined, and matrices of indicator-policy/design action relation and indicator of the prime order impact will be built. The main parameter is represented by the gravity as a decrease of initial territorial quality.

Combining two main approaches used in TIA studies, the *quantitative approach* (as the multi-criteria analysis) and the *systemic-qualitative one* (Prezioso, from 1995 today), STeMA has proposed a mixed method.

Using a systemic quali-qualitative approach, heterogeneous dimensions can be related. Each one of them has a specific task and carries out functions in a relatively independent way; the interaction between different territorial components is realised by an information system in a cyclical, dynamic, continuous process, which transforms quantitative values into qualitative weights.

The aggregation of all territorial parameters is defined through a macro-systemic vision, where different disciplinary fields like economy, climate, water, natural resources, public health, noise, cultural heritage contribute as components and from them, a series of reference subsystems come.

15. The new targets were discussed during the 26th United Nations Climate Change Conference of the Parties ('COP26') that took place in Glasgow in Nov. 2021.



Paying attention to the most recent legislation and experience on the subject, which oblige the construction of a general frame of reference, a critical reading of the territory is essential for defining sensitivity and programme alternative choices (of planning/design) concerning technical, territorial, and economic parameters.

The TIA procedure needs several steps to build the relationship with the CBA and the application of the DNSH criteria; by following a common philosophy, a logical methodological approach can be created: i) identify ex-ante the main scenarios and options for achieving the objective; ii) analyse their likely ex-post impacts on the economic, environmental, cultural, and social fields. It outlines the advantages and disadvantages of each option and examines possible synergies and trade-offs based on the real territorial context.

TIA is an immediate and appropriate regulative instrument for introducing the territorial dimension and Climate Change into the RRF Strategy.

To obtain the integration of different tools, it is necessary to work within a systemic vision (from Von Bertalanffy General Theory, 1969; to Saaty analytical hierarchy process, 1980; to analytical planning, 1985), pursuing its application into economic-territorial analysis and planning choices (Prezioso, 2020a).

It means Geography matters, because a simultaneous use of TIA, DNSH and CBA involves: i) to know before the effects of policies, programmes, and planning on territorial status quo by indicators; ii) to measure both the degree of risk of overtaking the carrying capacity threshold and the performance's improvement of investments; iii) to build scenarios for funds allocations and management, according to the addresses provided by the Territorial Capability Framework (or ex ante sensitivity) in sustaining impacts.

The ex ante and ex post *territorial evidence* in TIA by mapping is the relevant point of contact to achieve integration between the different instruments, based on a flexible and sustainability-oriented working method.

In particular, the extensive screening and evaluation of large projects has allowed, through the territorialisation of Impact Assessment, to discuss new options for the development of intelligent, sustainable, and inclusive endogenous creative solutions based on innovation and knowledge.

Therefore, since TIA is also a tool of localization of impacts (per se and in the DNSH application) and a measurement of the increasingly complex and interrelated planning dimension, it links the response of regional and local socio-economic systems to the changes induced by projects, without losing the added value offered by statistics in combining the available data within different territorial "geometries". The reference is to the different territorial typologies (metropolitan areas, urban centres, rural areas, low or high endowment of services, etc.) that in the STeMA-TIA system have the property of making the statistical data adherent to the project context (Prezioso, 2020a). The development of known geographical techniques as STeMA-GIS in the TIA management, that couple different type of images: coordinate (Vector maps), grid (raster maps) and smooth (variation maps), has represented a concrete help in relaunching the role of political support of the Economic Geography in Europe by this instrument (Prezioso, 2020).

The issue of geographical target indicators and their mapping is an additional element of innovative contact between TIA, DNSH and CBA. Still rarely discussed, it is fundamental in the territorialised comparison between indicators applied to all the regions and the European provinces through the RRF projects (high-speed rails, motorways, aqueducts, ports, EC, 2019, 2021) an experience still ongoing which is proceeding for successive approximations at least until 2026.

The contributions of Bass & Blanchard (2011) have proved to be fundamental a posteriori to address in a new way the dominant concepts of the present RRF scopes: cohesion, competitiveness, employment, resilience, accessibility, etc., identifying and mapping various and significant power values that have invested the most disparate themes in the projects being implemented: cities, urban-rural, convergence, GDP, unemployment, inland areas, climate change, energy risk, migration, infrastructures and services; giving space to new approaches in a "euro-geographical logic".

6. DISCUSSION

Beyond the climate question and the review of infrastructure investments in the period 2021-2027, the European Commission Communication "Technical Guidelines" (2021), promoted the integration of DNSH



with SEA and EIA. Extension to the TIA, considered among the “alternative approaches to the assessment of vulnerability and climate risks”, seems logical and appropriate (see JASPERS programme 2023).

The new EU sustainable financial taxonomy orients investments towards a sustainable and innovative socio-economic recovery (Renewed Sustainable Finance Strategy and Green public procurement) and legislative package ‘Fit for 55’ (EC, 2020c, 2021).

Starting from the logic of political mediation between means and objectives, the evaluation privileged functional parameters, to justified productivity investment choices (e.g. in the matter of water, accessibility, energy, etc.).

Income, employment, and GDP were principal limit indicators in the evaluation of the economic and financial budget of Member States in front of the RRF plan, whose conditions (capability and financial efficiency indexes) are reflected on the contrast between alternative projects and project alternatives, that is on the choices of sustainability. Creating priority lists, the best economical solution was chosen, limiting the territorial knowledge of the place where the work will take place only to the technical aspects relating to hydrology, morphology, and geology.

Also, plans and large projects follow this logic. Separated from the impact evaluation process, generated by related predictive contents, the relation between research goals for a general and partial equilibrium has been lost, in favour of policy makers and practitioners coherently with the equilibrium predictions of more standard classical economics¹⁶.

To contrast negative political effects, the economic/financial analysis (CBA) reached the capability to formulate and suggest evaluation criteria of project investments, not only in terms of compatibility and economic income, but also in social and environmental benefits (sensitivity analysis); adjusting the cost/benefit and cost/efficiency (CEA) analysis to the new emergent necessities, allowing world economic politics responsible (BEI, Monetary Fund, World Bank, etc.) to establish the best allocation for limited financial resources and, in the meantime, to verify the income of several “combined” and standardised project solutions, in respect both to different alternatives and possibilities of not act.

The limit of these settings derives from the fundamental hypothesis for the new approach: to no answer only to global market conditions, planning in a not-undifferentiated space, and the lack of a reference scale in the absence of a common methodology. Also, technical, and handmade solutions are not so helpful when facing the necessity of project elements for which the monetary esteem is limited and strongly linked to local contests (e.g. landscape, cultural heritage, life quality), making indispensable the use of methods and esteem instruments indirect and substitutive.

From a scientific point of view, impacts’ analysis and assessment become objects of interest for economic-territorial planning from the beginning of ‘80 years, although in a fragmented way and still conditioned by the empirical experience of traditional design, in the field of studies of natural environmental and anthropic relation and human community, to the scope of finding a synthesis between territorial and spatial processes.

This is the starting point for systemic attempts to represent the territory and the environment in the RRF large projects, including geographical indicators study alongside economic and financial ones to understand and explain the influence on sustainable change.

Then: if the DNSH serves as a unifying factor for the estimation of the added value generated in both financial-economic and employment-social terms, previously calculated by CBA alone; If the DNSH does this by referring to the new EU sustainable finance taxonomy (Renewed Sustainable Finance Strategy. EC, 2020d, 2021 and Fit for 55), only the TIA ensures that the DNSH-CBA pair provides territorially cohesive solutions by using an economic-geographical and policy approach that highlights place evidence.

In this framework, the contribution of TIA aims to create:

16. Paul Krugman (1994) and Amartya Senn (2000) already noticed the renovated perspective offered from the Economic Geography to the classic economic models (divided between Schumpeterian and neo-Keynesian ones) and from related instruments as the Impact Assessment, to relaunching those vantages “first nature” (climate, natural sources, geographical position) and “second nature” can exist.



- the balanced synthesis between CBA and DNSH;
- the management of common expressions and values.

In a parallel way, the concept of relaunching a territory by National RRF Plans is made possible by individualising specific adaptive solutions, where methods and techniques of local characteristics are adopted. To this scope, the territorial basis in TIA can be so used, in both the natural environment field, and the historical heritage one to maintain their initial value.

At the technical level, the procedural phase of estimating territorial impacts has still been aimed at developing methodological, practical and simplified criteria for the design of environmental sensitivity maps, setting out in advance a principle, fundamental impact assessment result: the sensitivity of the sites should be measured not only to the values of quality and natural environment (e.g. flora and fauna), but also to the viability of ecosystems and individual biotypes, that is to say to their biological capacity (biodiversity preservation) to withstand any damage, in both space and time, and to mitigate the effects. The ensemble of these contributions to the impact assessment in the field of the economic-territorial-social speculation have been applied to planning, starting a new technical-cultural model to draw up IV generation sustainable, competitive, cohesive, plans (Prezioso, 2020b).

In the global framework of the sustainable development, the new cultural model increased and diversified processes able to produce and to distribute goods and services on regional scales focusing and stressing the inter-disciplinary nature of project contents. These last supplies an appropriated answer to the sustainable demand, considering geographical diversity of contexts.

Hence the conviction that the economy and the territory are critical points for an organisation, based on the circulation and the human organisation at every scale of his acting, so it is good to regulate it with a prospective act of direction: planning/design.

Different interpretations produced different models of spatial planning and designs in Europe (BBR & ESPON, 2020) and in the world, paying attention to new and more precise geopolitical orientation of the European Union, based on cohesion, sustainability, and subsidiary' principles.

The direct, formal, and substantive relationship of these principles with possible economic choices forces us to experiment with new planning solutions on the territory. These solutions are a series of different and priority knowledge actions, diverse by the nature of their contents (environmental, territorial, economic and social), by sector (facilities, transport, services), by purpose (conservation, management, development), by scale (local, urban, municipal, metropolitan, provincial, regional), even political-administrative.

It is not easy to transform these principles into ordinate elements of an integrated design methodology, like it is not easy to rule a plan or a project, able to sustain (not limit) the autonomous action of institutions and citizens into limits imposed by the sustainable principle.

Several invitations to change and innovate the structure highlight the necessity of political-territorial and organizational models, helpful for the integration between states and regions, using intense cooperation in intra and inter-regional forms in a systemic vision.

This thesis also began to be developed in some countries as e.g. Italy, in the context of the consolidated principles of geo-economic and geopolitical culture and relative experimentation about economic-territorial planning, in the field of new federalism debate, concretised in a unique and complete experience: the General Provincial-Territorial Plan of the Province of Rome, drawn up and adopted in the period 1999-2003 (Prezioso, 2003)¹⁷.

Many in-depth investigations and experiments are needed to achieve a more balanced economic territorial acting to achieve new external economies of scale useful for the development of all citizenship.

Nowadays, the Impact Assessment is considered a strategic policy factor. It isn't in a very balanced position between economic and territorial vision because it focuses very complex questions in the European territorial development.

17. This Plan is the first example of integration between planning and assessment in Italy.



Following a macro (spatial) vision, applying the proposed integration of instruments could provide solutions to important political questions:

- To what extent can sustainability, competitiveness and cohesion policies influence the expected economic development (competitiveness, cohesion, cultural integration, etc.) in regions and States.
- How could policies' influence be measured in terms of trends and perspectives on European territories.
- How could this measurement become a capitalising factor for European integration and cohesion. In this case, basic data (indicators) are linked at the administrative level (NUTS)
- Following a meso and micro (territorial) vision, the integration of the instruments could give solutions to practical (planning/design) questions:
 - How could this measure suggest appropriate development solutions for different types of territories through targeted analysis based on user demand (bottom-up approach).
 - How could the output measure help policymakers and practitioners make their decisions. In this case, indicators are linked to the geographical scale and should always be designed (geo-referenced).
 - In a parallel way, the Impact Assessment suggests another question:
 - Which tools and territorial indicators are needed to create an appropriate Territorial Impact Assessment scientific platform

In this second case, the difference between the spatial (statistical, administrative) and territorial approach also returns.

In fact, measures of TIA, CBA and DNSH are common and can be aggregated, through indicators/indices belonging to four main areas such as:

1. General socio-economic-environmental indicators (like population, GDP, labour force, employment, and CO2 emissions),
2. European strategies like New Green Deal (indicators of sustainable growth and job creation) and Climate Change Strategy (impacts of CO2 emissions, hazards, and risks),
3. Territorial cohesion phenomena (e.g. balance, polycentrism, accessibility, opportunities for development and territorial cooperation, etc.),
4. Territorial Quality indicators (e.g. accessibility, R&D, energy, etc.), and more in general, the effects measure of the 2021-2027 five EU policy objectives.

Supported by the Author's experience¹⁸ with the results of various thematic projects and applying of EIA, SEA, and TIA as well as through the results of spatial development follow-up based on the use of key indicators, EU documents and case studies, this measurement process refers to important monitoring databases and indicators.

Therefore, this measurement should combine separate traditional and innovative approaches to measures of sustainability, competitiveness, and socio-economic cohesion.

In each case, TIA exceeds the real difference between the CBA approach and DNSH principle application, that is their geographical scale of work and related indicators.

Recent experiences in Italy propose TIA as a support for an integrated vision of the development dimension of RRF policy; by endowing themselves with new ex-ante and ex-post evaluation methods, policy makers could use policy choices in relation to Europe's territorial development objectives.

Finally, adopting an integrated mechanism of evaluation including TIA, DNSH and CBA seems the most efficient way to get results both scientifically honest and politically useful.

18. At this stage the A. refers to the assessment of the Italian RRF large infrastructure projects, too.



7. REMARKS

Economic geography is the field of observation that can best provide innovative and sustainable solutions for renewing the design of large-scale works in Europe as required by the Recovery and Resilience Plan, making convergent separate instruments in a unique, coherent path, which is consistent with the Green Deal Policy and related New Bauhaus addresses.

The paper developed some reflections and suggestions based on both reviews, assess, choice/mix impact assessment models and methods, to make them updated, collecting, analysing, and synthesising the most important information necessary to answer the aforementioned questions in Italy and European Union facing the Recovery and Resilience Facility demand to design sustainable works and plans.

In the field of sustainable design, CBA, TIA and the DNSH principle are now considered tools for implementing the *European Just Transition Policy* and the qualitative-quantitative capacity for estimating climate change resilience. With reference to RRF projects, they are also essential references in the perspective of the development of urban, peri-urban, and rural areas; therefore, they are considered capable of increasing ecosystem and human values as required by the Territorial Agenda 2030 (2020) and Urban Agenda-Leipzig Charter (2016-2019).

Specific indicators (accompanied by metadata) were mentioned in the document. These are already widespread in Europe in the context of the TIA for the evaluation of the employment, socio-economic and environmental aspects that contribute to the realisation of the expected results in which the new course of planning/designing (New Bauhaus) is inserted with a view to a more complete measurement of sustainability.

RRF projects require solutions that are not only dedicated to human capital but also to natural capital in terms of less resource use. The measure of the sustainability objectives (DNSH) refers to the circular economy for this scope, both in the building phase and at full operating capacity in the medium-term perspective (7-10 years), also using public/private funding and partnerships (PPP). The new sustainable financial taxonomy of the EU (Renewed Sustainable Finance Strategy) helps to direct investments towards this sustainable socio-economic approach, measured through the CBA, which also uses Green public procurement.

The sustainability of cross-border, trans-regional and interregional cooperation in linear infrastructure is clearly demonstrated in RRF projects. This includes switching from a Smart Specialisation Strategy (S3) and technology to a Sustainable Smart Specialization Strategy (S4) in 2027-30.

In making the geographical framework in which the work is inserted, an approach coherent with integrated European Development Plans needs¹⁹. They required as well as the support of stakeholders, citizens, practitioners, and decision-makers for diffusing the commitment to place-based sustainable economic change, as required by the Just Transition Economy in the perspective outlined by the Next Generation EU Strategy and the reinforced dimension of the territorial cohesion.

The Territorial Agenda 2030 (2020) is a concrete reference for the integration of the three tools in the competitive processes to which RRF works are ascribed, protecting the territorial dimension as a determining factor for the success of projects, and, at the policy level, the adaptation of local ecosystems to new needs through effective mixed policies as the Green Infrastructure model suggests.

The insertion of the TIA, partly transposed by the legislation under the so-called Better Regulation, has this purpose, as well as the analysis of the Added Value (AV) increasingly used in the EU to replace locally the concept of GDP, "widening the gaze" to those who are considered the most consolidated principles of "project". This is the scope of the economic, environmental, and social convenience analysis to be included in the CBA to highlight the aspects deemed "indispensable" to the design solution offered to the evaluation even with mechanisms of mitigation of different impacts. The financial infrastructures and market will be able so to integrate the environmental externalities in the measure of the costs to the equal of how much happens for the economic and social conveniences, considering how much emerged from the Territorial Impact Assessment of the work.

19. such as TAP (Territorial Action Plan), LAP (Local Action Plan), CLLD (Community-Led Local Development), ITI (Integrated Territorial Investments), ...



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Conflicts of interest

The Author declares no conflict of interest. She undertakes to disclose any existing or potential conflict of interest in relation to the publication of their article.

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