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Territorial Impact Assessment for Coal Sites in Transition

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Abstract: This article describes a part of the POTENTIALS project promoted by the Research Fund for Coal and Steel (RFCS) of the EU, which, in general, has aimed to develop business models for the reuse of former industrial and mining sites in different European regions. The goal of this project focused on the creation of so-called eco-industrial parks to enable sustainable energy production and reduce waste and pollution on coal sites in transition. A key aspect was the development of a suitable territorial impact assessment (TIA), a new and complex policy tool for the assessment of the territorial impacts of EU policies and projects on territorial cohesion. Therefore, the special TEQUILA (Territorial Efficiency, Quality and Identity Layer Assessment) approach is used to describe the TIA for this case and emphasizes its application in assessing ex ante the impacts of the transition from a coal site to an eco-industrial park. It underlines the need for a differentiated understanding of the regional characteristics and potential impacts of transition policies or projects. Furthermore, the process and results of applying the TEQUILA methodology, a multicriteria analysis, in the context of regionalized impact models has shown how important it is to select well-defined, expert-based criteria, but at the same time, to establish a system that is flexible and adaptable to the needs of political decision makers and stakeholders considering the normative weights of the criteria. This has been illustrated by some examples.

Keywords: impact assessment; territorial analysis; post-mining planning; risks and opportunities; impact modeling; prediction; stakeholder management; transition

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1. Introduction

The European Union actively promotes research in the field of energy transition with large budgets—in particular, the associated transformation processes and the reuse of former industrial regions in transition [1]. The POTENTIALS project (Synergistic potentials of end-of-life coal mines and coal-fired power plants, along with closely related neighboring industries: update and re-adoption of territorial just transition plans), which has already ended (2021–2023), had the overarching goal of developing business models for the reuse of derelict land. This project was funded by the Research Fund for Coal and Steel (RFCS) and aimed to accelerate the 'Just Transition Plans' of the EU [2]. The expected outcome is the stimulation of new economic activities and job creation in coal regions in transition, along with sustainable and environmentally conscious approaches. The research conducted is primarily aimed at policy makers, industry professionals in the energy and mining sectors, environmentalists and researchers in sustainable energy and economic transition. The results of the project can be applied to developing sustainable business models, strategic planning for coal regions in transition, and integrating renewable energy and circular economy concepts. The innovative aspects of the work steps include forward-looking analyses to develop new business models that combine renewable energies, the circular economy and energy storage. In addition to the inclusion of stakeholders for surveys and the calculation of suitable scenarios for post-utilization integration, impact assessments were also carried out. In addition to social and economic analyses, this also included a territorial impact assessment [3].

The participatory research process throughout the used methods allows the following work steps and results to be presented in detail.

The project has identified, among several alternatives of business models, an eco-industrial park to be the most appropriate and exciting business model choice for the considered areas (Figure 1). To select the most suitable and feasible action for the specific areas, the following aspects were considered: Green Deal policies, technical criteria, Technology Readiness Level (TRL), European taxonomy, synergistic potential, circular economy and sector coupling. The main objective of such eco-industrial parks in former coal mining areas, along with closely related neighboring industries, is to provide sustainable energy generation technologies comprising solar and wind energy production. With energy storage and geothermal energy used for cooling as well as heating in the companies participating in the eco-industrial park, waste and pollution can be reduced by promoting short-distance transport and optimizing materials, resources and energy flows within the industrial parks. This concept of an eco-industrial park may be complemented by a green-hydrogen plant or biofuel production provided certain economic conditions are met. Sometimes, there are territorial development plans that determine specific industrial development in these areas [4].

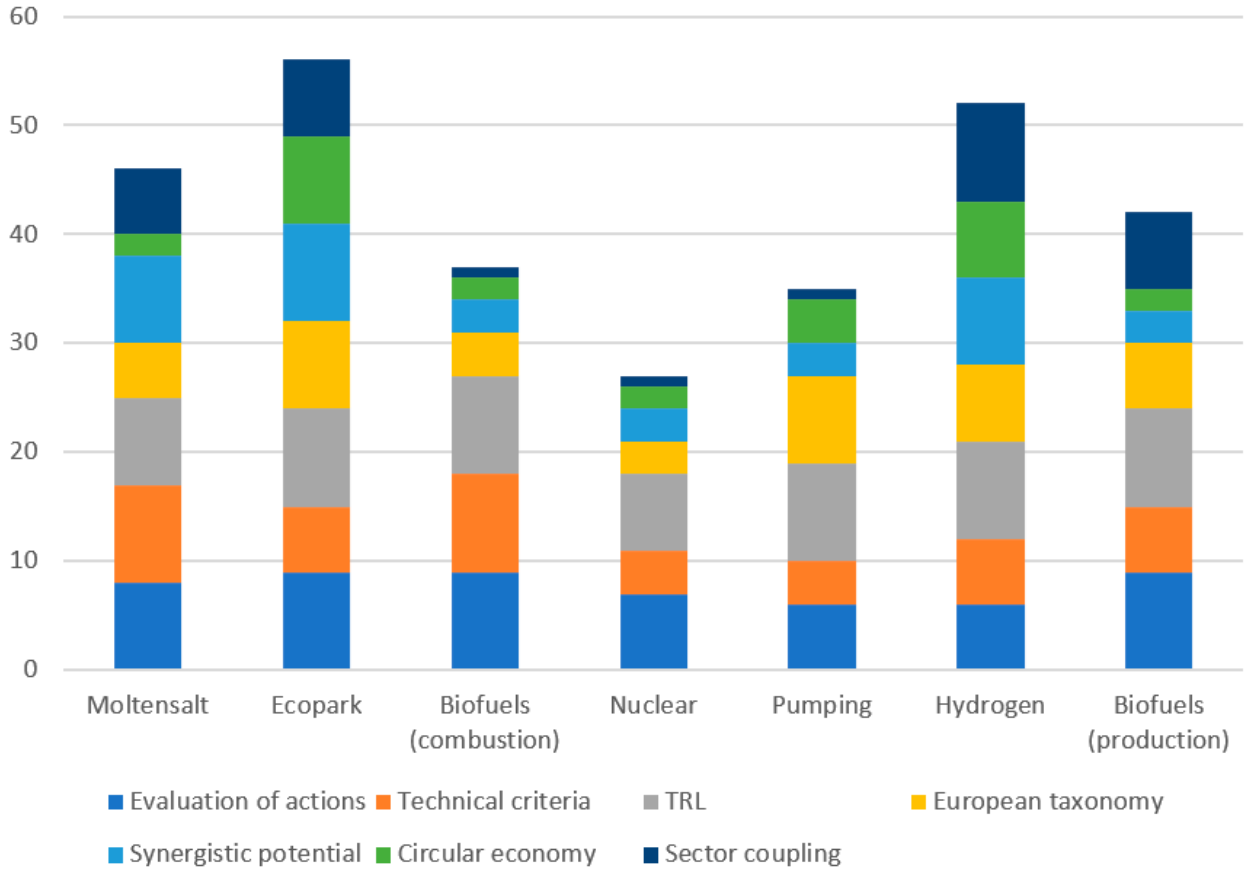

Figure 1. Identification of the most suitable business model in former mining areas [3].

Besides some special internal territorial aspects of the coal sites assessed in this project, there are external territorial impacts on the economic, social and ecologic environment of the respective locations, and outside in their affiliated regions, that have to be made the object of a comprehensive territorial impact assessment (TIA) before making definite political and commercial decisions. In the words of Eduardo Medeiros (2020), one of the protagonists of territorial impact assessments in the European scientific sphere and editor of the only handbook on this subject: "Territorial Impact Assessment (TIA) is a relatively "new kid on the block" of policy evaluation" [5]. Resting upon the holistic notion of territory, which encompasses multiple analytic dimensions (economy, society, environment,

government, spatial planning), TIA is the most complex, yet with the policy evaluation procedure, the largest potential to assess projects, programs and policies [5]". European and national legislations, directives and policies, as well as all the special projects based on these political measures, have different effects on territories, depending on their geographical and environmental characteristics, history, culture, demographics and socio-economic development [6]. The territorial impact assessment (TIA) aims to better understand these differences and support evidence-based policy and decision making [5]. Since the adoption of the *European Spatial Planning Document* (ESPD) in 1999, and the acknowledgement of Territorial Cohesion as a general EU objective in the Lisbon Treaty in 2007, TIA has gained more and more attention [7,8]. This has led to different understandings and various approaches to TIA.

The study of Gaugitsch et al., for the European Committee of the Regions/Commission for Territorial Cohesion Policy and EU Budget (COTER), on the state of the art and challenges ahead for territorial impact assessment, adopts a broad understanding of TIA and includes any methodology designed to assess territorial effects of legislations, policies and directives [9,10]. The selected variety shows the main advantages and limitations of TIA methodologies. The authors reviewed the three main methodologies currently used at the EU level for ex post assessments (LUISA (LUISA is a Territorial Modeling Platform established by the European Commission. Based on cross-sector integration, it is related to land function concepts and is used for ex ante evaluation in terms of policies creating any form of impact on territory [11]) and RHOMOLO (RHOMOLO is a model of spatial computable general equilibrium established by the European Commission. It is specified for policy impact assessments as it is able to conduct scenario analysis based on regional, sectoral and time results [12])). They also reviewed other TIA methodologies more useful for an ex ante approach, such as ESPON TEQUILA (ESPON is a program of the European Union providing high-quality expertise to public authorities responsible for the design of territorial policies. For this purpose, the TEQUILA model uses multi-criteria analysis to analyze territorial impacts [13]) or ESPON EATIA (EATIA (ESPON and territorial impact assessment) is examining different methods and tools to use for TIA through the use of interactive learning tracks and analytical work [14]), together with a discussion of the main obstacles and main opportunities [11–14]. Each tool is consistent with the EU Guidelines concerning impact assessment (SEC(2009)92) and has specific characteristics and, consequently, different scopes of application. Besides the use of distinctive methodologies or instruments, several European countries have introduced strategies and guidelines to encourage assessing territorial impacts during policy making processes and project development. Even during or after the policy-making phase at the EU level, a TIA can explore the potential impacts of choices made during implementation at the national and regional levels, as is the case with the Just Transition Mechanism for the transition of European coal regions and their affected locations. All these approaches have produced a useful richness of experiences and lessons learnt [15].

A younger, very extensive and prominent example of a TIA is the territorial impact assessment on Climate Targets of the European Committee of Regions in 2021 [16]. This paper is not the place to discuss this TIA in detail, but there have been some general conclusions that are relevant to the coal transition and the POTENTIALS project: multi-level governance determines failure and success in climate action, where winning and losing regions based on the climate targets of the European Green Deal are not the same (coal regions are losing if not targeted and sufficiently supported in their transition), and the distribution of know-how and funding among relevant actors is an important critical factor in this context [2,16].

This project's contribution is not embedded in the broader scientific discourse, as this is a specific problem and task within the POTENTIALS research project described. By focusing on the development of a suitable territorial impact assessment (TIA), niche research can be described and introduced. The requirements dealt with in this project serve as a framework.

2. Materials and Methods

Against this background, we proposed and developed a modified TEQUILA approach to TIA. All possible methods highlight different challenges and solutions for TIA related to the comprehensiveness, participatory approaches, data challenges and time perspectives of TIA. At the same time, TIA methodologies have to echo the growing political and societal interest in the use of more broad and holistic policies and project evaluation methods to assess the main impacts at all territorial levels. This is necessary in order to fulfill the ultimate goal of promoting, directly and/or indirectly, positive territorial development trends and, ideally, territorial cohesion processes.

The name TEQUILA is an acronym for Territorial Efficiency, Quality and Identity Layer Assessment, and this approach aims to evaluate ex ante the efficiency of a given European policy and the measures based on it to improve territorial cohesion, encompassing impacts across regions in terms of economic competitiveness, environment and climate change, land-use and society. The methodology was tested concerning Common Agriculture Policy and Common Transport Policy. A multi-criteria analysis and, if available, forecast models or specific science-based examinations, in combination with statistical values for comparison and aggregation, serve as a basis, by defining the most relevant indicators that help to measure the territorial impacts.

TEQUILA is a pioneering quantitative model for TIA, developed by Roberto Camagni, on the request to build an operational model m for the ex ante assessment of the territorial impact of EU policies, projects and regulations, and was originally addressed by Camagni directly to the ESPON (European Space Observatory Network) managing authority [17].

The core of the TEQUILA approach includes three summative macro-criteria (weighted by political preferences obtained from stated-preference surveys among experts) which are defined as territorial efficiency, territorial quality and territorial identity (all adding up to the concept of territorial cohesion as the output for policy evaluation):

- Territorial efficiency refers to resource efficiency with respect to energy, land and natural resources; competitiveness and attractiveness; and the internal and external accessibility of each territory.
- Territorial quality refers to the quality of the living and working environments (including ecological aspects); living standards across territories; and access to services of general interest, knowledge and other resources.
- Territorial identity refers to enhancing "social capital" by developing a shared vision of the future; safeguarding local specifications; and strengthening the productive vocations and competitive advantages of each territory.

Given the differentiated nature of geographic territories, a generalized assessment of the impacts of policies or projects on the overall EU territory does not make much sense. On the other hand, a truly territorial assessment looking at the specifications of a single region or area would be much more interesting and even crucial if it is able to take into consideration the following insights:

- The intensity of the policy (or project) application may be different in the different regions, or even nil.
- Its territorial impact is likely to be different in different regions depending on their geographical and socio-economic specifications.
- The importance of the single criteria in the assessment methodology is likely to be different in different regions: different development stages, different histories and cultures, and different shared values would determine different views concerning the relative relevance of impacts on growth, on the environment, on social wellbeing and on competitiveness.

Therefore, a regionalized territorial impact model was built for the assessment of policies, programs, projects and integrated schemes, keeping in mind the request for simplicity, operationality and transparency. In the case of the fully quantitative assessment, the central formula is

$$TIMr = \sum c \times Wc \times PIMr,c \times Sr,c \quad (1)$$

where TIM is the territorial impact (total or for each dimension: territorial efficiency, quality, identity); r is the region, c is the criterion or sub-criterion in the multicriteria analysis; PIMr,c is the potential impact of a policy or project (abstract) on the region r and criterion c; Wc is the weight of the criterion/sub-criterion c with $0 \leq Wc \leq 1$; $\sum c\ Wc = 1$; and Sr,c is the sensitivity of region r to criterion/sub-criterion c.

As Camagni explained, the rationale for the previous equation comes from the traditional risk assessment procedure, where risk = hazard (=potential risk) × vulnerability. Similarly, the territorial impact is seen as the product of a potential impact (PIM) times a sensitivity indicator S, expressing the specification of the region or the area and its preferences. Therefore, Sr,c is a set of regional or local characteristics, defining two main elements: the desirability D of the dimension/criterion in single regions/areas (technically, the territorial "utility function" indicating local preferences, measured by socio-economic indicators) and vulnerability V to impact (mainly geographic indicators):

$$Sr,c = Dr,c \times Vr,c \quad (2)$$

where Dr,c is the desirability of criterion c for region r, and Vr,c is the vulnerability of region r to the impact on criterion c.

The potential impact PIM is calculated through appropriate external quantitative models defining impacts on each criterion c and each region r, duly normalized as indicated above. D and V are designed as coefficients scaling the weight Wc and the PIMr,c of a given maximum percentage up and down, respectively.

The quantitative indicators to be used for the desirability regional coefficient, e.g., a regional GDP effect, are, in general, the same as those used for impact, in their status form and not in their change consequent to the policy or project implementation. The vulnerability coefficient is mainly present in the environmental (or specific socio-economic) dimension/criteria and requires ad hoc indicators.

Regional receptivity (in the case of positive effects of the policy or the project) could be quantified, linking it to the quality of government or project management, and utilized in case it is explicitly considered a plus in the allocation of funds; alternatively, due to experience, it could be set to 1 (neutral role).

The proposed "summative" evaluation procedure using the TEQUILA methodology (totally quantitative, totally qualitative or mixed) implies allowing compensation among criteria, namely that lower or even negative scores in one criterion may be compensated by higher or positive scores in another. Because this condition is not always socially accepted, non-compensatory multi-criteria approaches have also been developed that demonstrate the already proven flexibility and modifiability of the TEQUILA methodology [17].

The TEQUILA methodology is rather comprehensive in assessing different perspectives of territorial cohesion. It uses predominantly statistical calculations and professional judgements given by external researchers. Although this provides detailed results, the outcomes are not always easy to interpret by policy makers and by the public, in particular, due to the use of normalized scales and summative macro-criteria.

Therefore, it is possible that further deliberations are necessary to simplify this approach for the political manageability of project plans. In synthesis, the TEQUILA model introduces and applies a tailor-made version of a consolidated methodology, namely multi-criteria analysis, in its simplest form, able to build both an analytical and synthetic ("summative") form of an ex ante territorial impact assessment of EU policies, programs, measures or projects in European regions.

Its flexibility, simplicity and transparency allow its utilization for differentiated policies or projects, utilizing, at best, the present availability of quantitative policy assessment studies in specific fields and integrating qualitative expert judgement (or being substituted by it, if necessary) in a consistent way. It sometimes requires a bit of creativity in connection

with deeper sectoral and regional analysis in order to devise the appropriate indicators, especially for the quality or immaterial dimensions of the territorial realm.

TEQUILA is especially designed and equipped for comparative analyses and assessments of the impacts of policy interventions and policy-supported projects, when the interest of administrations—from the European to the regional level—is "to have a picture at a glance" regarding the relative impacts, both specific and summative, on a wide array of regions or for the selection of one project or more with different alternatives and territorial implications [17].

For the purpose of the TIA in the POTENTIALS project, we developed a modified TEQUILA approach to establish a pragmatic tool that is as simple, applicable and employable as possible for decision makers and stakeholders and, importantly, for its integrality in territorial just transition plans. Of course, the central idea and basic framework of the TEQUILA methodology must be implemented in some way, namely the division of the three dimensions of territorial cohesion (territorial efficiency, territorial quality and territorial identity) by the above-introduced macro-criteria. These dimensions are represented by the weights Wc in the formula TIMr c = $\sum$c $\times$ Wc $\times$ PIMr,c $\times$ Sr,c. (1) and are all assigned the same weight of one third (33%) or, as a number in the formula, 0.333. This is in accordance with most examples of the TEQUILA methodology in practice and reflects the politically and societally acknowledged equality of these three dimensions for territorial cohesion. Theoretically, it is possible to change these weights and give different weights to certain macro-criteria due to political priorities.

More discussion is necessary about the sub-components and sub-criteria of each macro-criterion of the assessment model. The sub-criteria represent different and measurable aspects relevant to the assessment and the intensity of the impacts, or, in other words, the sensitivity component of the formula Sr,c. The selection of the sub-criteria and the numbers assigned to them, representing the weights assigned to single sub-criteria, are the most sensitive elements in a multi-criteria analysis. They may be defined in multiple ways: through internal discussion among experts, through open discussions with policy makers and stakeholders or through Delphi procedures. Inside the model, the weights should be flexible in order to guarantee interactivity, and, in all cases, they have to be perfectly transparent. Tests with changing weights allow for the assessment of the sensitivity and stability of the outcome [17].

At first, the experts of the POTENTIALS project partners set up an extensive list of 17 "direct result indicators" for the relevant scenario outputs. In further discussions about the application of the TIA, this list of indicators was condensed by the authors to the measurable sub-criteria of the TEQUILA approach and their affiliated sub-weights. These collected sub-criteria and their sub-weights representing the sensitivity component are a proposal and can be changed by planning institutions, policy makers, stakeholders, or based on alternative expert judgements, in interactive meetings without posing a methodological problem, if new or better insights into specific regional and territorial project circumstances call for another selection, assignment and weighting. Hence, in each case, four sub-criteria remain for the three macro-criteria, appropriately explained in the following way:

Territorial efficiency

- Value added: The value added reflects the economic efficiency relating to the return on investments (considering CAPEX, OPEX and profits) as well as salaries, interest and rental income generated by an action; it is an essential economic indicator of territorial efficiency and is assigned, based on internal expert judgement, a sensitivity sub-weight of 0.4.
- Introduction of process/product innovations: The sub-criterion process/product innovation reflects the contribution of a specific action to technological progress or to efficiency through dynamic interpretation, and can be measured as mentioned by specific patent applications, with a metered sub-weight of 0.3.

- Recycled waste: One of the purposes of the POTENTIALS project is to provide specific options in the circular economy and support the reduction in waste, which can be measured in "tons" of recycled waste (lower waste, more value), with a metered sub-weight of 0.2.
- Space required to develop the option: For a TIA and the dimension territorial efficiency, it is important to assess how much of the space of a location is used again in a productive matter and how much space is freed for other options (less space, more value), measured in square meters of usable ground; this criterion is assigned a metered sub-weight of 0.1.

Territorial quality

- Estimated low GHG emissions during the lifetime of the applied technology: Because it is the aim of all projects connected to the European Green Deal (and thus, the POTENTIALS project) to pave the way for climate neutrality in the European Union and its territories, it is evident that the reduction in GHG emissions, measured in tons of CO_2 equivalent, is now a must-have and a very weighty criterion for territorial quality, with a metered sub-weight of 0.4.
- Reduction in (other) environmental impacts: The territorial quality reflected by aspects of the environment is not restricted to GHG emissions, but has to encompass all other environmental impacts of an action on the territory outside the location, especially in the context of environmental life cycle assessments (LCAs); it may be concentrated in this context on the pollution of air and water, because other environmental aspects are recorded by other sub-criteria and can be measured using officially available indicators. It has to be taken into account that former coal activities have to already be in accordance with European legal standards for environmental impact. This criterion is assigned a metered sub-weight of 0.2.
- Environmental impact in the place of operation: Environmental impacts are not restricted to the territory outside of the location, but could also happen in the place of operation. This is especially the case for soil in the place and its corresponding indicators. This criterion is assigned a metered sub-weight of 0.2.
- Quality of offered services within the project, especially stability of energy supply: Besides the environmental dimensions, the territorial quality is determined by the quality of offered services for the stability of the energy supply. Above all, regarding the contribution to the stability of the power supply for the surrounding industrial and/or residential areas, this could be measured by the specific SAIDI (System Average Interruption Duration Index). This criterion is assigned a metered sub-weight of 0.2.

Territorial identity

- Capacity for renewable-energy production: A central question for establishing the territorial identity of a former energy-producing area, such as an area of (end-of-life) coal mining and coal power generation, is the question of the capacity for new energy production using renewable energies, measured as the power generation capacity in MW (Megawatt). It must be taken into account that the new capacity for more sustainable energy production on the same territory will be lower than the old capacity for coal energy because of the lower energy density of renewable energies such as wind and solar power. This criterion has a metered sub-weight of 0.3.
- Energy users connected to the smart grid: Of similar importance to the capacity for renewable-energy production for establishing the territorial identity of an area of energy production is how many energy users and what magnitude of users are connected to the smart grid under the new operations and their services to the grid. This criterion has a metered sub-weight of 0.2.
- New jobs created by the operation (full-time employment): Fundamentally important to establishing territorial identity and the subject of territorial cohesion in the affected region of closed coal mines and power plants is how many new jobs are created by

the new operations in the location, measured in full-time equivalents. This criterion is assigned a metered sub-weight of 0.4.

- New (full-time) researchers: Besides the new jobs in (commercial) operations for energy production and services, the application of new added innovative technologies will require research and development and thereby the establishment of some new specific job opportunities for researchers, which should be recorded separately because of their special quality, but also measured in full-time equivalents. This criterion is assigned a metered sub-weight of 0.1 [5].

At last, for assessing the potential impacts of all sub-criteria in the region/territory (the component PIMr,c, in the TIM formula TIMr,c = $\sum$c $\times$ Wc x PIMr,c $\times$ Sr,c) by impact value, it is necessary to transform the presumed impact of each sub-criterion into value scores normalized to a common interval through a value function that should, for practical purposes, be assumed to be linear. The value scores can be determined by expert judgements or the same assessment procedures as used for the weighting of the sub-criteria.

Mostly applied in the TEQUILA methodology and also proposed here is an ad hoc scaling method defined by a relatively simple scale, for example, as used here, in an interval of value scores of 0–5, which is easier to manage in operational terms and only introduced a slightly higher level of subjectivity in the procedure compared to more complex scaling methods. Against this background, here, we simulate an impact scale for the assessment of impact value scores for PIMr in the interval 0–5, expressing impacts with the following meanings:

0. No;
1. Low;
2. Medium–low;
3. Medium;
4. Medium–high;
5. High impact.

The higher the value score, the higher the quantified positive impact on the respective dimension of territorial cohesion: the sum TIMr,c of all weighted (by macro-criteria times sub-criteria) value scores represents the whole (positive) impact on territorial cohesion, which can be also be considered in a differentiated way in each of the three dimensions (territorial efficiency, quality and identity) depending on the selected sub-criteria. Of course, the collection of sub-criteria is tailor-made for the purpose of TIA in this project and guided by political priorities, but this is carried out in a fully transparent and understandable modus operandi and open to sensitivity analysis of each component of the result [18].

3. Results

After having conducted the conceptual preparatory work, the application of a TIM via the proposed modified TEQUILA approach with two examples of business model scenarios identified in the POTENTIALS project will be demonstrated. Both focus on a model of an eco-industrial park, with one example combined with hydrogen production (Example A) and one example combined with biofuel production (Example B).

Here, value scoring is performed only for the purpose of exemplification and comparison in abstract cases. These are no definite assessments representative of the POTENTIALS project partners, because the recommendation is that these assessments, with respect to the value scoring, are conducted for real projects in just transition plans by selected circles of experts and/or the political and commercial decision makers and their stakeholders in the relevant region, knowing all the concrete conditions, specific circumstances and details of the plan in the targeted locations [19].

Tables 1 and 2 show the procedure and the results of the scoring for both examples.

Table 1. Example A: Eco-Industrial Park with Green H_2 Plant [18].

Macro/Sub-Criteria	Weight (Macro)	Weight (Sub)	Value Score (Sub) 0–5 ($PIM_{r,c}$)	TIM (Sub) (TIM_c)
Territorial Efficiency	0.333			
Value added		0.4	3	0.40
Process/product innovations		0.3	4	0.40
Recycled waste		0.2	1	0.27
Space required		0.1	3	0.07
Territorial Quality	0.333			
Lower GHG emissions		0.4	3	0.40
Reduction in other environmental impacts outside the location		0.2	5	0.33
Reduction in environmental impacts in the place of operation		0.2	5	0.33
Quality of offered services		0.2	5	0.20
Territorial Identity	0.333			
Capacity for renewable-energy production		0.3	3	0.30
Energy users connected to smart grid		0.2	1	0.07
Employment (number of jobs by operation)		0.4	3	0.40
New jobs for researchers		0.1	2	0.07
$TIM_{r,c}$				3.24

Table 2. Example B: Eco-Industrial Park with Biofuel Production [18].

Macro/Sub-Criteria	Weight (Macro)	Weight (Sub)	Value Score (Sub) 0–5 ($PIM_{r,c}$)	TIM (Sub) (TIM_c)
Territorial Efficiency	0.333			
Value added		0.4	2	0.27
Process/product innovations		0.3	4	0.40
Recycled waste		0.2	1	0.07
Space required		0.1	2	0.07
Territorial Quality	0.333			
Lower GHG emissions		0.4	2	0.27
Reduction in other environmental impacts outside the location		0.2	3	0.20
Reduction in environmental impacts in the place of operation		0.2	4	0.27
Quality of offered services		0.2	3	0.20
Territorial Identity	0.333			
Capacity for renewable-energy production		0.3	4	0.40
Energy users connected to smart grid		0.2	1	0.07
Employment (number of jobs by operation)		0.4	4	0.53
New jobs for researchers		0.1	3	0.10
$TIM_{r,c}$				2.85

Due to the value scores in these examples, the positive territorial impact (TIMr,c) and therefore the contribution to territorial cohesion are considerably higher in Example A (Eco-Industrial Park with Green H_2 Plant), with a total value score of 3.24, than in Example B (Eco-Industrial Park with Biofuel Production), with a total value score of 2.85. The difference of 0.39 TIM points in this TEQUILA model results from varying differences in the three dimensions. This can be shown by direct comparison of the TIMs in each macro-criterion (Table 3):

Table 3. Dimensional differences [8].

	Example A (Eco-Industrial Park with Green H_2 Plant)	Example B (Eco-Industrial Park with Biofuel Production)	Difference in TIM in Each Macro-Criterion
Territorial Efficiency	1.14	0.81	0.23
Territorial Quality	1.26	0.94	0.32
Territorial Identity	0.84	1.10	−0.26
Total TIM	3.24	2.85	0.39

Through this comparison, we see the largest difference in the dimension territorial quality and the smallest in the dimension territorial identity, with the dimension territorial quality almost exactly in the middle.

4. Discussion

A TIA may be helpful and even necessary to fulfill the official requirements of the European Court of Auditors (ECA) in its Special Report on EU support to coal regions. The ECA Special Report provides an insight into the role of EU cohesion funds for the period 2014–2020 in the socio-economic and energy transitions in regions where the coal industry is declining. In this period, the EU cohesion policy funds provided EUR 12.5 billion to support the socio-economic and energy transition of seven audited European coal regions. The central conclusion of this report is that the regional support in the studied time period "achieved little for climate transition" and had only "limited focus and impact on job creation and energy transition and that, despite overall progress, coal remains a significant source of greenhouse gas emissions in some Member States" [20]. Because the Just Transition Fund created in 2021 alone made EUR 19.3 billion available over the period of 2021–2027 to the regions and sectors most affected by the transition, the auditors of the ECA "therefore call for the new Just Transition Fund to be used effectively and efficiently to alleviate the socio-economic impact on coal regions" [20]. Hence, the intended contribution of the POTENTIALS project to the mechanism and the measures of the EU Just Transition Fund, and especially the TIA concept in this project, could be helpful in fulfilling these requirements [1]. The importance of tools such as TIA and the modified TEQUILA approach for the transition of coal sites may even increase in the years to come based upon the EU's intended 2040 climate target and the goal of climate neutrality by 2050. Achieving this target will require a number of conditions, of which one will be, as confirmed by the European Commission, a greater focus on just transition that leaves no one and no region behind [21].

5. Conclusions

The proposed approach allows us to make comparisons of all elements and, at the same time, conduct a professional discussion on aspects ranging from the selection of the sub-criteria and their sub-weights to the value scoring. Of course, in this study, a comparison of the two examples is not taken into account (for example, if there is a site with neighboring industries that have a relatively high demand for hydrogen and a low

demand for biofuels; a local/regional industrial demand structure that is the other way around; or very special circumstances and requirements for infrastructure favoring one option or another, which would naturally make a crucial difference in the assessment). This makes clear that the territorial impact assessment of actions and projects, as in the POTENTIALS project, must be site-specific, and the results depend less on the methodology and more on the conditions in reality. Because of this, every TIA approach and the modified TEQUILA model developed, presented and recommended here should be accompanied by a thorough inventory of the local/regional conditions and influencing factors, as well as special investigations of critical factors.

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Data Availability Statement: Every step of this research, the related analysis conducted and the results are available on the official website of the POTENTIALS project: https://potentialsproject.uniovi.es/ (accessed on 15 February 2024).

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

CAPEX	Capital Expenditures
COTER	European Committee of the Regions/Commission for Territorial Cohesion Policy and EU Budget
CO_2	Carbon dioxide
ECA	European Court of Auditors
ESPD	*European Spatial Planning Document*
ESPON	European Space Observatory Network
GHG	Greenhouse gas
H_2	Hydrogen
LCA	Life cycle assessment
MW	Megawatt
OPEX	Operational Expenditures
PIM	Potential impact
POTENTIALS	Synergistic potentials of end-of-life coal mines and coal-fired power plants, along with closely related neighboring industries: update and re-adoption of territorial just transition plans
RFCS	Research Fund for Coal and Steel
SAIDI	System Average Interruption Duration Index
TEQUILA	Territorial Efficiency, Quality and Identity Layer Assessment
TIA	Territorial impact assessment
TIM	Territorial impact
TRL	Technology Readiness Level

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