

Impact Assessment and Project Appraisal



ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/tiap20

Spa(tia) – a diffusion-oriented method of territorial impact assessment

Mikołaj Herbst, Agnieszka Pechcińska, Jan Hagemejer & Patrycja Artymowska

To cite this article: Mikołaj Herbst, Agnieszka Pechcińska, Jan Hagemejer & Patrycja Artymowska (12 Mar 2024): Spa(tia) – a diffusion-oriented method of territorial impact assessment, Impact Assessment and Project Appraisal, DOI: 10.1080/14615517.2024.2321547

To link to this article: <u>https://doi.org/10.1080/14615517.2024.2321547</u>

© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



d

Published online: 12 Mar 2024.

l	ß

Submit your article to this journal 🗹



View related articles



View Crossmark data 🗹



Taylor & Francis

OPEN ACCESS OPEN ACCESS

Spa(tia) – a diffusion-oriented method of territorial impact assessment

Mikołaj Herbst D^a, Agnieszka Pechcińska^b, Jan Hagemejer D^{c,d} and Patrycja Artymowska^e

^aUniversity of Warsaw, Centre for European Regional and Local Studies (EUROREG), Warsaw, Poland; ^bCASE – Center for Social and Economic Research, Warsaw, Poland; ^cUniversity of Warsaw, Faculty of Economic Sciences, Warsaw, Poland; ^dCASE - Center for Socialand Economic Research, Warsaw, Poland; ^eMinistry of Development Funds and Regional Policy, Warsaw, Poland

ABSTRACT

In this paper we consider the options for policymakers in performing territorial impact assessment (TIA) of various policies. Hybrid methods combining stakeholder involvement with systematic statistical analysis are a good compromise between the analytical capabilities of the tool and the required time and resources needed to use it. However, the existing hybrid methods focus on the direct effects of the intervention, while neglecting the territorial diffusion of the policy outcomes. To address this gap, we propose a new method, which uses a spatial proximity matrix to incorporate diffusion effects into TIA. We discuss an example application of the new method for the ex-ante evaluation of the 'European Funds for Western Pomerania' programme.

ARTICLE HISTORY

Received 21 March 2023 Accepted 10 January 2024

KEYWORDS Territorial impact assessment; hybrid TIA; Territorial Agenda 2030; Poland

1. Introduction: TIA in the service of public policy

Policy planning and decision-making are becoming increasingly difficult due to the complexity of the environment in which the policies are implemented, as well as the widening access to information and data from various sources (Howlett 2019). Therefore, evaluation at each stage of policy development - ex-ante, on-going and ex-post - is crucial for the quality of the policy. At the EU level, as well as in many Member States it has become common to use impact assessment (IA) analysis already at the conceptual stage (Radaelli et al. 2013). The European Commission argues that this analysis should be complemented by a territorial impact assessment (TIA), leading to a better understanding of the impact of a given policy on different territorial units. In this context, the preparation and implementation of any policy should be preceded by thinking about its implications in not only sectoral but also territorial terms (EU 2010). Applying TIA to evaluate the outcome of policies is also increasingly common in academic publications (Golobič et al. 2015; Medeiros 2017).

Territorial impact assessments allow one to develop a better understanding of the effect of strategies, policies and programmes on different territories and provide data useful for policy-making and decision-making (Camagni 2017; Medeiros 2019; Gaugtisch et al. 2020). They also help one learn how different sectoral policies affect the territorial cohesion, that is, as defined by the Territorial Agenda of the EU 2030,¹ 'a balanced and harmonious territorial development between and within countries, regions, cities and municipalities' (EU 2020). In order to provide a complete assessment, territorial impact analyses should not be limited to the territories directly addressed by the policy, but should also take into account the potential spillover – that is, a diffusion of the policy outcomes to territories not covered by the intervention (Angelucci and Di Maro 2016). In this paper we propose a new TIA tool, which uses a spatial proximity matrix to incorporate diffusion effects into TIA. We discuss an example application of the Spa(TIA) method to the territorial impacts of the 'European Funds for Western Pomerania (EFWP)' programme.²

Our work is part of the implementation of the pilot action 'Understanding how sector policies shape spatial imbalances through an in-depth Territorial Impact Assessment' performed within the Territorial Agenda (2020) and led by the Polish Ministry of Development Funds and Regional Policy with partners from Czechia (Ministry of Regional Development), Germany (Federal Ministry for Housing, Urban Development and Building; the Joint Spatial Planning Department of the Federal States of Berlin and Brandenburg), Slovenia (Ministry of Natural Resources and Spatial Planning) and the Netherlands (Ministry of the Interior and Kingdom Relations).

The remainder of the article is structured as follows. Section 2 discusses the methods present in the literature and provides an overview of the features of different approaches to TIA. Section 3 presents the basics of the proposed Spa(TIA) method including the notions of territorial sensitivity, exposure to policy and diffusion, while also outlining the roles of stakeholders. Section 4 describes a pilot application of the method for the

CONTACT Jan Hagemejer 🖾 jan.hagemejer@case-research.eu 🖃 CASE - Center for Social and Economic Research, ul. Zamenhofa 5/1b, Warsaw 00-165, Poland

© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (http://creativecommons.org/licenses/bync-nd/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

assessment of the territorial impact of the EFWP programme in Zachodniopomorskie voivodeship. Section 5 summarizes the findings and provides recommendations for conducting TIA using either SPA(TIA) or other TIA tools.

2. Existing TIA tools

The existing literature on territorial impact assessment offers a wide range of approaches to territorial impact assessment. They differ in their philosophy, the complexity of their tools, the depth of technical knowledge required, their reliance on external experts and also the detail of the results obtained and their ability to tackle a wide range of policies. Another issue is the timing of the analysis. In general, the tools required for ex-ante impact assessment of policies where the focus is placed on expert expectations and/or simulation modelling differ from those used in ex-post evaluations, where counterfactual statistical tools can be applied supported with expert judgment. In this paper we focus mainly on the ex-ante analysis. The choice of method involves trade-offs, i.e. there is no single method that can tick all the boxes.

The main trade-off in the process of territorial impact assessment is between the analytical capabilities of the tool and the effort required to perform the analysis, combined with the requirements for specialised technical knowledge. In general, methods range from those where results are primarily based on expert knowledge and stakeholders' engagement – for example EATIA (Fischer et al. 2015), territorial foresight (CoR 2011), and rural proofing (Gaugtisch et al. 2022) – to those in which formalised theories and models are used to simulate the impact of a policy – RHOMOLO (Lecca et al. 2018), TEQUILA (Camagni 2020), and STeMA-TIA (Prezioso 2020). Other methods, which we will refer to as hybrid, combine input from stake-holders with statistical analysis. This is the case with the ESPON TIA TOOL and ESPON Quick Check (ESPON 2011, 2020), Urban TIA (Glickman 1980), and TARGET_TIA (Medeiros 2014b, 2020).

Figure 1 provides a summary of a systematic literature review of TIA tools. It illustrates the aforementioned trade-off between accessibility to a wide range of potential users and analytical capabilities. By this latter term we mean the ability of a tool to provide a quantified, formal assessment of the territorial impact, one that takes into account both the existing characteristics of the territories and the complexity of the policy under consideration. For example, we consider the analytical capability high if the results of the assessment can be mapped using GIS software, if they can be used as an input in further statistical analysis, if the tool allows for separate assessment within different threads of the considered policy, and if it allows users to test different scenarios of policy implementation.

A hybrid approach, combining qualitative methods, stakeholder participation and quantitative analysis, seems an attractive path to follow. However, there is no one-fits-all territorial impact assessment tool. Some methods may be more suited to a particular case than others, and the availability of resources to perform the research is certainly not the only factor that matters. For example, if in addition to assessing the territorial impact of the planned intervention, the supplementary goal behind conducting TIA is to consolidate the group of stakeholders and stimulate their engagement in further



Figure 1. Selected available TIA methods. Source: own elaboration.

policy implementation, then it may be more suitable to use a qualitative method based primarily on stakeholder interaction rather than performing extensive statistical analyses. On the other hand, assessing the impact of complex policies may require a more quantitative approach if the outcomes of TIA are to be useful for improving the policy.

The main common idea behind the whole class of hybrid TIA methods is to combine concepts of the exposure of a territory to the policy, this territory's sensitivity to the intervention, and the expert judgment on the direction and strength of the policy impact. The notions of exposure and sensitivity were first defined and used within the ESPON Assessment of Regional and Territorial Sensitivity project (ESPON 2013). Exposure reflects the intensity of the policy implementation in a given territory (in the simplest approach it may just refer to the amount of the allocated funds), while sensitivity stems from the endogenous characteristics of a territory that can affect the policy impact. The above terms are commonly used in the tools established by ESPON, while TARGET_TIA uses a similar concept of policy intensity (together with regional sensitivity) and predefined dimensions of policy impact (e.g. short term, long-term, exogenousendogenous, multiplier-substance; see Medeiros 2014a).

TIA methods also differ in the ways they can be employed by end-users. The most user-friendly method is definitely the ESPON TIA Tool based on a web interface, where users can perform most of the tasks related to the preparation of data, analysis and producing the results and their visualisations. The tool uses the ESPON database as a backend and therefore many indicators are available for use while additional ones can be uploaded by the user. The main disadvantage of the method is that it forces analysis at the NUTS3 level (a sub-regional level of territorial division used in the EU), while many indicators are only available for the NUTS2 level (corresponding to regions in EU terminology). Moreover, as ESPON will not anymore invest in developing the tool, the availability of indicators is unlikely to improve. ESPON TIA Quick Check relies on similar principles as ESPON TIA Tool, but is based on Excel sheets that have to be filled with data by the users. It was mainly intended for the initial screening before the proper assessment of the territorial impact using ESPON TIA Tool. The advantage of the method is that it can be applied to any territorial resolution that the data allows. However, data preparation and visualisations require significant additional effort compared to ESPON TIA Tool. Lastly, TARGET_TIA does not seem to have significant advantages over the ESPON TIA Quick Check, but requires considerable additional effort from the analysts performing the impact assessment.

A common drawback of the above methods is their lack of explicit treatment of a diffusion mechanism. Policies may have effects not only on the territories they target, but also on others not directly targeted. For example, even if a subsidy scheme is only aimed at certain territories, other territories in their proximity may experience indirect effects of this intervention if they are not eligible for subsidies themselves. The indirect effect can be either positive or negative, depending on the policy in question. In TIA methods relying on exposure and sensitivity, untreated territories will always have exposure set to zero, and therefore the impact of the policy on these territories will be neglected. In our proposed approach, we extend the ESPON methods with the treatment of diffusion based on geographical proximity.

3. Spa(tia) – a diffusion-oriented method of territorial impact assessment

In this section we introduce SPA(TIA) – a new method of ex-ante assessment of territorial impact designed for public policies. Our approach draws on existing tools in particular ESPON TIA Quick Check, ESPON TIA TOOL and TARGET_TIA methods - which we test-implemented to learn about their strengths and deficiencies. All three implementations were territorially confined by the Polish-German Intertwined Area, covering four German lands and four Polish voivodeships. First, we applied ESPON TIA TOOL to learn about the territorial impact of policies in support of ecological agriculture on both sides of the Polish-German border. More precisely, the assessment covered the 'Ekoschemat' programme in Poland and the intervention called 'Ökologischer Landbau' in Germany. In the next step, we used ESPON TIA Quick-Check to forecast the territorial impact of the sectoral programme European Funds for Digital Poland 2021-2027 (we focused on the impact of programme implementation in the Lubuskie voivodeship). Finally, we tested the TARGET_TIA method by applying it to the reform raising the minimum salary on the Polish side of the border.

Through these tests, as well as a broader review of the existing tools, we attempted to address three major challenges while developing our own TIA tool:

• To find an effective balance between the formalised, methodologically sound approach and the participatory nature of TIA, which requires active contribution from policy stakeholders, who typically are not familiar with quantitative research methods. Stakeholders in our implementation of SPA(TIA), as well as in earlier test-implementations of other tools, included representatives of territorial self-government at the regional and local level, representatives of the Polish Ministry of Development Funds and Regional Policy, independent experts in relevant fields, representatives of specialised units within the regional administration, and representatives of Non-Governmental Organisations.

- To directly include the diffusion of policy effects beyond the territory covered by the intervention in TIA (largely ignored by existing TIA methods).
- To propose a method that would require commonly accessible software rather than expensive, specialised software.³

We divided the TIA procedure into a few key steps, as presented in the diagram in Figure 2. The first stage of the analysis includes a necessity check that determines whether TIA is relevant for the policy under consideration, reconstruction of the intervention logic, analysis of the intended exposure of territorial units to the policy, and analysis of their sensitivity to the policy. These steps conclude with calculation of the direct effect of intervention on territorial units. The second stage of TIA is based on analysis of spatial diffusion mechanisms and concludes with the calculation and interpretation of the overall territorial impact of the policy.

A key aspect of every evaluation of a public policy is the involvement of stakeholders in the process. This applies in particular to ex-ante analysis, as it is typically aimed at improving the intervention at the design stage, before it is actually implemented. Methodological literature sometimes distinguishes between participatory and expert approaches to policy evaluation (see e.g. Salter et al. 2010; Musiol-Urbańczyk 2015; Sager and Mavrot 2022). However, in our view a successful TIA requires engagement of both external experts with strong methodological competencies in the area of policy analysis, and stakeholders, that is individuals or groups of people who are affected by a given policy and/or who have an impact on the effectiveness of its implementation (Nita 2016). Selected representatives of these groups may then form a narrow 'steering committee' responsible for the shape of a particular TIA process.

There is no single optimal solution in terms of organisation of work while conducting TIA. The ultimate model needs to fit the specific features of the policy under investigation, as well as the pool of available resources and time. However, based on our experience



Figure 2. Key stages of the SPA(TIA) method. Source: own elaboration.

Table 1. The roles of the steering committee, stakeholders,⁴ and experts in SPA(TIA).

Elements of SPA(TIA)	Participants	Proposed method
Necessity check	Steering committee	Desk research supported by expertise
Reconstructing the logic of the intervention	Stakeholders + experts	Workshop (part 1) followed by data preparation phase
Intended exposure and sensitivity	Stakeholders + experts	Desk research + workshop (part 2) followed by data preparation phase
Assessment of diffusion potential	Experts + steering committee	Desk research supported by expertise
Calculation of direct effects and final impact scores	Experts	Analytical work
Interpretation and discussion of the results	Steering committee, stakeholders and experts	Joint workshop followed by preparation of the final report

with pilot implementations of SPA(TIA), we propose an indicative procedure as presented in Table 1.

3.1. Necessity check

Whether or not a TIA should be conducted depends on how significantly the analysed policy is expected to impact the territory. TIA can be applied to interventions aimed directly at changing the territorial patterns of development, but also to policies that seem at first glance to be territorial. For example, projects that develop the transport network tend to have an obvious territorial nature: they are physically located in specific places, and by definition they affect the accessibility of certain territories to a greater extent than they do elsewhere. At the same time, many sectoral policies aim to support certain activities rather than territories, but their effects are nevertheless territorially differentiated. This includes, for example, interventions in the agricultural sector that typically have a larger impact on rural areas than on cities. Investments in tertiary education may serve as another example: their territorial effects will be clearly determined by the location of higher education institutions prior to the launch of the intervention.

We propose considering the following questions with respect to the policy under investigation:

- Is the intervention aimed directly at changing existing patterns of territorial characteristics (e.g. differences between regions within a country, types of territories, districts within an urban area)?
- Does the intervention allocate funds or other kinds of assistance to territorial units of administration or other units with clearly defined geographical borders?
- Does the intervention cover territory that is highly polarised with respect to socio-economic indicators (e.g. income, access to healthcare, educational attainment)?
- Might the intervention affect territories that are not directly covered by it?

If at least one of the questions listed above yields a positive answer, there is a rationale for conducting TIA. Naturally, this rationale gets stronger in the case of multiple positive answers.

For policies in which a territorial profile is clearly embedded, i.e. ones targeting specific regions or those conditioning support on certain territorial characteristics, conducting a TIA is generally advisable. For sectoral, national, or EU-level policies, the usefulness of TIA may not be immediately evident, but its careful consideration is nevertheless highly recommended.

3.2. Reconstructing the logic of the intervention

The documentation of policy programmes is not always transparent and precise. In many cases it is prepared to fit predefined templates, and does not necessarily correspond to the nature of the very intervention it refers to. Therefore, the logic of the intervention needs to be reconstructed. This step should conclude with two outcomes: a list of intended objectives of the policy in different time horizons, and a decision on the plausible territorial level on which to conduct further analyses.

In terms of the objectives, it is essential to understand which of them are expected to be realised immediately after the intervention, and which can only be achieved in the longer term, following the processes that the intervention would initiate. In other words, it is necessary to distinguish between the short-term, medium-term, and long-term objectives. Nonetheless, all objectives should be derived from the documentation of the policy in question. We are therefore talking about consciously planned effects, and not side effects or other changes that may result from the intervention, not explicitly intended by the policymakers.

In what concerns the optimal aggregation level of the analysis, TIA exploits statistical data on territorial units, and uses cartograms to illustrate the effects of the intervention in territorial terms. This means that at an early stage of the analysis it is necessary to decide on the level of spatial aggregation at which the assessment will be conducted. In principle, a lower level of aggregation (smaller territorial units) favours the quality and accuracy of the spatial analysis. However, the decision should also take into account two important factors:

- The level at which the main stakeholders of intervention operate.
- Availability of statistical data. A detailed spatial analysis is possible when data that can support decision-making and territorial impact assessment is available at a given level of aggregation.

3.3. Intended exposure versus sensitivity of territorial units

The SPA(TIA) method highlights two sources of territorial units' sensitivity to the intervention. The first is the planned exposure of territorial units, which we denote formally as E_i (where *i* denotes the order number of the unit in question). By exposure we understand the degree to which different territorial units will be affected by the policy as intended by its designers (ESPON 2013). Therefore, exposure is integral to the intervention itself. If, for example, the intervention directly addresses specific territorial units, or units meeting specific criteria (for example: cities, rural areas, areas with above-average unemployment rates, or areas with low population density), then the differential benefits of such an intention are planned in advance.

As a general rule, planned exposure is positive – it defines the variation in the benefits of an intervention. Depending on the needs and the availability of data, planned exposure can be defined on a nominal scale (a value of 0 or 1) or as a continuous variable taking values from 0 to 1.

Irrespective of the planned exposure, the territorial effects of the policy depend on the sensitivity of territorial units to it. By sensitivity to an intervention we mean all the endogenous characteristics of the territory, which is beyond the control of those who design and implement the policy, but may strengthen or weaken the effects of the action taken (ESPON 2013). In our approach, the sensitivity of territorial units is not a synthetic indicator, but a set of indicators. There should be at least as many as there are defined intervention objectives. There can be more than one indicator within an objective, as long as the experts see more than one aspect of sensitivity related to this goal.

Sensitivity may be related to the initial level of the variable relating to the target. For example, the intervention may prove particularly effective in territorial units where the current level of target indicators is low (the so-called 'low base effect'). Such a phenomenon is observed, inter alia, in educational policies aimed at improving student achievements. However, the opposite effect is also possible: the effectiveness of an intervention may require a sufficiently high baseline level of the given phenomenon for a territory to take advantage of the support (the so-called 'fertile soil effect'). Such were the findings of research on the outcomes of EU cohesion policy (Ederveen et al. 2006).

Territorial sensitivity to an intervention can also be linked to other factors that strengthen or weaken its impact. Imagine a hypothetical programme (no matter in what policy area) that is funded jointly from the country's central budget and the budgets of local governments. In such cases, one can expect the intervention to have a stronger impact in more affluent territories, ones able to contribute more funds to the programme.

Depending on the needs and availability of data, the sensitivity within each objective may be determined by values manually assigned by the expert team or by a linear transformation of an existing variable that, in the experts' opinion, reflects the sensitivity of territorial units to the intervention. Ultimately, each sensitivity index takes on a value between 0 and 1, where a value of 0 means no sensitivity to the intervention, and 1 means maximum sensitivity. The linear transformation of an existing variable into a sensitivity index follows the formula:

$$S_i = \frac{Value_i - Min}{Max - Min}$$
(1)

Where *Value_i* is the value of the original variable for territorial unit *i*, *Min* is the minimum value of the original variable and *Max* is the maximum value of the original variable.

In the case of there being more than one indicator of exposure or sensitivity per objective, in the final step we calculate arithmetic means, so that the number of ultimate measures of both exposure (E) and sensitivity (S) is equal to the number of identified goals of the intervention.

3.4. Direct effect of intervention and its spatial diffusion

After carrying out the steps described in Section 3.3 we are able to estimate the direct impact of the intervention on all territorial units covered. The calculation of the value is carried out separately for each of the defined intervention objectives, according to the formula:

$$F_{ij} = S_{ij} * E_i \tag{2}$$

In other words, the value of the direct intervention effect for territorial unit *i* under objective *j* is the product of the exposure of this unit to the intervention and its sensitivity.

The effect that F_{ij} has may take any value between 0 and 1. Therefore, it illustrates the outcome of intervention

in relative terms, with two extreme points of reference: 0, meaning no effect at all, which is only possible if either exposure or sensitivity indicator is equal to 0, and 1, which indicates maximum possible effect.

Importantly, F_{ij} is calculated solely for territorial units that are eligible for the intervention, as described by the documentation reviewed in the earlier stage of the analysis. However, in the case of many policies, the actions taken may affect not only the territory to which it is addressed but also other places, not subjected directly to the intervention. This phenomenon can be seen as a spatial variant of the spillover effect. Research in regional studies and economic geography, however, usually operates with the concept of 'diffusion', which by definition has a spatial context.

The diffusion of the effects of an intervention can be either positive (when the positive impact of the actions taken spreads) or negative (when, as a result of actions in a particular territory, resources are 'washed out' from other territories) for the territories experiencing it. Thus, unlike the indicators of territorial exposure and sensitivity to intervention, which are non-negative, the diffusion index can take values in the range [-1,1], where 0 means no diffusion of the effects of the intervention for the territorial unit. 1 means that the diffusion affects the unit under investigation to the same extent as the units affected (beneficial effect), and -1 means that the diffusion affects the unit under investigation to the same extent as the units affected, but in the opposite direction (adverse effect).

For each objective *j*, determining the value of the diffusion X_{kij} from territorial unit *i* (covered by the policy) to territorial unit *k* (that may be – but not necessarily is – covered by this policy), requires the following steps to be taken:

- A decision on whether there is a diffusion effect for a given intervention objective. The diffusion phenomenon may apply to all objectives, some of them, or none at all. In the latter case, we omit the further steps.
- Selection of the diffusion criterion, i.e. the reason diffusion does or does not include a territorial unit. It can be determined by adjacency with the intervention unit, the distance from the nearest intervention unit (the smaller it is, the stronger the diffusion), or the travel time to the intervention unit (the shorter it is, the stronger the diffusion).
- Definition of the cut-off point. Depending on the diffusion criterion chosen, the boundary beyond which diffusion no longer occurs must be defined. For example, if criterion 1 (neighbourhood) is used, diffusion can be considered to apply only to firstdegree neighbours (shared boundary with the intervening unit) or first and second-degree neighbours (also neighbours of neighbours). If the distance

criterion is chosen, the diffusion boundary can be defined as, for example, 50 km. Finally, in the case of commuting time, it could be, for example, 60 minutes. The above values are, of course, exemplary. The choice of cut-off point should always be the result of a substantive analysis considering the context of the intervention and its specific purpose.

- Defining, for each policy objective *j*, the sign of the diffusion ($g_j = 1$ for a beneficial effect, $g_j = -1$ for an adverse effect).
- Calculating, based on the chosen criterion of diffusion (adjacent territories, distance, or commuting time), the absolute magnitude of diffusion X_{kij} for each pair of territorial units in the dataset. For a small number of units this can theoretically be done manually, but it is recommended that a spatial matrix be created using a statistical package such as R or Stata. The values in the matrix need to be normalised between [0.1]).

Eventually, the impact of diffusion of the intervention on any territorial unit k is calculated as:

$$D_{kj} = g_{ij} \ argmax_{ik}(F_{ij}X_{kij})B_k \tag{3}$$

That is, the diffusion impact on territory k within objective j is equal to the strongest of all impacts exerted on k measured pairwise for all combinations of k and territories i covered by intervention which, according to the adopted cut-off point, are 'neighbours' of k. The sign of diffusion depends on the coefficient g. Finally, B_k is the optional coefficient used in the case of policies penetrating the borders of the state, or encountering any other administrative barrier which could weaken the diffusion of the policy impact. In such a case, it is recommended that all territorial units beyond the border be assigned the value of $B_k < 1$, while units located within the region where the policy is implemented should have $B_k = 1$.

3.5. Calculation and interpretation of the final impact

The final SPA(TIA) score for a given territorial unit (i or k) and intervention objective (j) is:

$$spa(tia)_{ij} = F_{ij} + D_{ij}$$
 (4)

The final impact, including direct effect of the policy and diffusion effect, can take a value between -1 and 2, although the extreme values are rather unlikely to occur: spa(tia) = -1 would mean no direct effect of the policy, and a strongly negative effect of its diffusion experienced by the given territory. In turn, spa(tia) = 2 would mean a strongly positive direct impact of a policy, reinforced by an equally strong and positive effect of diffusion.

4. Application of SPA(TIA) in the ex-ante assessment of the "European funds for Western Pomerania" programme

In November of 2022, the SPA(TIA) method, described in Section 3 of this paper, was applied in the ex-ante assessment of territorial impact of the programme 'European Funds for Western Pomerania 2021–2027' (EFWP, as adopted on 6 April 2022).⁵

The Zachodniopomorskie voivodeship, known also under the geographical name of Western Pomerania region, is one of 16 Polish voivodeships, which are NUTS-2 territorial units of the EU. Zachodniopomorskie is located in the north-west of Poland. It borders the German lands of Mecklenburg and Brandenburg (to the west), the Baltic sea (to the north), as well as three other Polish voivodeships: Pomorskie, Wielkopolskie, and Lubuskie. Zachodniopomorskie has a population of 1.7 million, and its gross regional product accounts for about 3.8% of Poland's total GDP. When ranked according to GDP per capita, Zachodniopomorskie is Poland's 8th most developed region (placing it square in the middle).

The European Funds for Western Pomerania 2021–2027 programme is a large initiative, one embedding numerous different policies and involving various types of stakeholder. In such cases it is advisable to focus on a smaller, more internally coherent fragment of the programme, while carrying out TIA. Therefore, SPA(TIA) was ultimately applied to a selected part of the EFWP programme, one dedicated directly to educational policy:

• Priority 6, specific objective (f): to promote equal access to and completion of good quality, inclusive education and training, especially for disadvantaged groups, from early childhood education and care through general and vocational education and training to higher education, and adult education and learning, including facilitating

learning mobility for all and accessibility for people with disabilities.

• Priority 6, specific objective (g): to promote lifelong learning, in particular flexible up-skilling and re-skilling for all, including entrepreneurial skills and digital competences, to better anticipate changes and the need for new skills based on labour market needs, to facilitate career transitions and to promote occupational mobility

The analysis involved a preparatory phase (desk research) plus a two-day workshop with the participation of SPA(TIA) developers, stakeholders from regional administrations of Western Pomerania, Pomorskie, Wielkopolskie and Lubuskie, as well as representatives of the Polish Ministry of Development Funds and Regional Policy. The workshop was held in Szczecin on 7–8 November 2022. Table 2 shows the Szczecin workshop agenda.

The participants of the workshop identified six objectives in the EFWP programme's priorities 6(f) and 6(g). These include:

- Short-term objective 1: Improved accessibility of preschool education
- Short-term objective 2: Increased number of adults participating in education
- Medium-term objective 1: Higher academic achievements of students
- Medium-term objective 2: Lower unemployment and higher professional mobility among schoolleavers and the 50+ population
- Long-term objective 1: Higher productivity of labour market entrants and higher wages
- Long-term objective 2: Lower number of families requiring material assistance.

In line with the procedure described earlier in this article, the analysis was carried out separately for each of these objectives. As a first step within part 3

Table 2. Agenda of a two-day SPA(TIA) workshop held in Szczecin on 7–8 November 2022.

Agenda item	Form of presentation
Part 1 Introduction to SPA(TIA) Information on TIA methods Features of SPA(TIA)	PowerPoint presentation PowerPoint presentation
Part 2 EFWP programme and its objectives Basic programme facts Selecting the policy (part of the programme) to be analysed Defining objectives in relation to the time horizon	PowerPoint presentation Moderated discussion Work in subgroups and discussion or the results
Part 3. Exposure and sensitivity of territorial units Exposure and sensitivity: defining notions, understanding the difference Defining the criteria of territorial exposure Rules of sensitivity: low base, fertile soil, other? Working out the sensitivity of territorial units within objectives	PowerPoint presentation Joint discussion, micro-survey if necessary PowerPoint presentation Work in subgroups (including micro-surveys), joint discussion
Part 4 Diffusion of effects Theoretical foundations of spatial diffusion, possible approaches Defining rules of diffusion for particular EFWP objectives.	PowerPoint presentation Work in subgroups (including micro-surveys), joint discussion
Part 5 Presentation of results Presentation of maps	PowerPoint presentation and discussion

of the assessment (see Table 2), the participants of the workshop discussed on how the intentions of the policymakers, as expressed in the documentation of the EFWP programme, translate into the exposure of different municipalities in Zachodniopomorskie voivodeship to the planned intervention. The participants agreed to assign maximum values of exposure indicator (1) to municipalities within the so called Urban Functional Areas and to those located in the Special Inclusion Zone (municipalities with high structural unemployment), as these were the priority target areas of the EFWP. For comparison, the minimum value assigned to any municipality was 0.52.

In the next step the workshop participants exchanged views on how sensitivity to the intervention differs between municipalities within each identified objective of the assessed programme. The debate was structured by the workshop organizers in the following way: First, the participants, assisted by a moderator, chose 'proxy' variables reflecting the progress in achieving individual objectives. For example, the medium-term objective 1 (higher academic achievements of students) were to be measures by the average test scores of 8-graders in local schools. Second, the participants had to decide whether sensitivity of municipalities within a given objective is subject to a 'low-base' rule, 'fertile-soil' rule, or any other mechanism. This was done using a micro-survey. As a result of the voting, two objectives were assigned to the 'low-base' category, while three others were classified as of 'fertile-soil' type. Long-term objective 2 was in turn characterised as the one with uniform sensitivity level for all municipalities in the region. Third, the ultimate values of sensitivity indicators for the municipalities were calculated by the workshop coordinators (through linear transformations as discussed in Section 3) and then presented to the participants as cartograms.

In part 4 of the workshop, the participants elaborated on the rules of territorial diffusion of the programme's impact. Again, the discussion was followed by the voting procedure in which the participants decided on:

- The sign of a diffusion effect (positive, negative, no diffusion)
- The criterion of proximity (adjacency vs travel time)
- The extent to which the state border between Poland and Germany limits the diffusion.

In the final part of the workshop the choices of the participants were used as in input while determining the total impact of the intervention expected for each objective and each municipality. Figures 3 and 4 show TIA results for two selected objectives: medium-term objective 1 (higher achievements of students), and long-term



Figure 3. Estimated territorial impact of the EFWP programme with respect to mid-term objective 1*. *Dark violet denotes strongest impact while in municipalities marked in yellow the impact is negligible. Source: own elaboration based on workshop results.



Figure 4. Estimated territorial impact of the EFWP programme with respect to long term objective 1*. *Dark violet denotes strongest impact while in municipalities marked in yellow the impact is negligible. Source: own elaboration based on workshop results.

objective 1 (higher productivity of labour market entrants).

The results indicate that the EFWP programme is likely to have positive, territorially differentiated effects, the territorial pattern of which may vary depending on the objectives of the programme. For example, from the perspective of improving the academic achievements of students (see Figure 3), the programme will be particularly effective in the central part of the voivodeship, in Świdwiński and Białogardzki counties (South of Koszalin), as well as in the Nowe Warpno powiat (south of Świnoujście, north of Szczecin). These territories are characterised by high exposure to the programme (they fulfil most criteria that will likely be used for allocating the funds). At the same time, according to the findings of the workshop, they will be highly sensitive to the intervention due to a low initial level of student achievements, which creates the opportunity to 'catch up'. This is based on the fact that in the case of medium-term objective 1, the discussion among experts and stakeholders led to a consensus that for the related sensitivity indicators the mode of territorial sensitivity was 'low-base' and therefore local communities with the worst education measures amongst those studied are those that are going to benefit the most whenever this low base is combined with a high level of fund allocation. One may expect some diffusion of the programme's beneficial effects to neighbouring voivodeships, although probably not across the country's border.

In turn, where the objective of increasing the productivity of labour market entrants is concerned (see Figure 4), the programme is expected to have the strongest impact in the proximity of the region's largest cities: Szczecin, Koszalin, Szczecinek, and Wałcz. A moderate effect of diffusion is to be observed across the Polish-German border. However, the central part of the Western Pomerania region will be largely unaffected by the programme. This geographical pattern stems from the key role of urban centres on the region's labour market. The results of the workshop indicate that even though funds may be directed to less developed rural areas, cities will still attract most productive individuals. Moreover, this effect is strengthened by the fact that the discussion pointed to the fertile soil effect of sensitivity in relation to long-term objective 1, and the aforementioned communities in the proximity of large cities display a relatively high level of wages, which was the main sensitivity indicator. Hence, the intervention may contribute to higher productivity among individuals, but is unlikely to lead to a more balanced distribution of talent within the region.

5. Conclusions

Before we present the conclusions from the testapplications of the proposed method, it is important to understand the value added of TIA as a process. When policies are designed, in particular those implemented at the central level, the territorial dimension is often overlooked, mainly because the impact assessment of the policy at the macro level is already a tedious task. While policy design often takes into account cohesion arguments (and cohesion may even be one of the goals of the policy itself), performing detailed territorial analysis is often beyond the scope of evaluation practice. An important dimension of policy impact is thereby neglected. One purpose of TIA is to increase awareness of the territorial impact of policies.

In this paper, we have briefly considered the options for policymakers to perform territorial impact assessments of various policies. While we do not think that any universal tool could address all needs, we do believe that hybrid methods combining stakeholder involvement with systematic statistical analysis are a good solution, one combining the analytical capability, realistic use of the resources, and participatory character of the assessment process.

The inclusion of stakeholders in TIA is crucial for the quality of the analysis. However, it is important to provide a well-structured framework for a guided discussion, rather than relying on ad-hoc information gathered during workshops and interviews. The SPA(TIA) method that we introduce in this paper uses the stakeholder and expert knowledge as information complementary to statistical data, furthering a more accurate and effective usage of quantitative indicators.

Our method emphasises one aspect of TIA which is not explicitly treated in the existing tools: the diffusion of policy effects beyond the territories exposed to the policy. We propose using a spatial proximity matrix to evaluate the possible diffusion effects. Our testimplementations show that this approach improves the realism of the assessment.

In this paper, we discussed the application of SPA(TIA) for the territorial impact assessment of the 'European Funds for Western Pomerania' programme. Focusing on the Western Pomerania Voivodeship in northwestern Poland allowed us to test the method in a highly economically and socially diversified environment with important cross-border ties to the neighbouring regions in Germany. The results show positive though moderate programme impacts on the exposed voivodeship, with considerable differences across

municipalities. Diffusion of the effects is expected to bring benefits to the immediate neighbours of Western Pomerania, but small in magnitude. Parts of the programme that directly address the functioning of the regional labour market are likely to have some cross-border effects (observable on the German side of the border).

Based on our experience in designing and applying SPA(TIA), we strongly recommend that territorial impact assessment become a standard stage in policy planning. TIA methods are very effective in translating expert and stakeholder knowledge to visualisation of expected policy effects. This can help identify whether a policy addresses the problems it is designed to solve, and what its possible unintended effects are. One opinion expressed repeatedly by stakeholders and policy planners during the workshops was that 'we should have had this discussion before'. This shows that TIA should be implemented early on in policy design to provide decision makers with information when changes are still possible.

One final recommendation is to ensure a broad territorial representation of stakeholders at the workshops. Different territories within the area exposed to the policy may have conflicting interests, and it is easy for discussions to become dominated by the strongest actors, such as representatives of a regional metropolis. Therefore, when local and regional stakeholders are invited to cooperate within TIA, one should aim for the representation of different spatial structures: cities, small towns, rural areas, peripheral municipalities, and even territories not exposed to the policy but potentially being touched by diffusion effects.

Notes

- 1. Territorial Agenda (2020) was adopted at the informal meeting of ministers responsible for spatial planning, territorial development and/or territorial cohesion in EU countries. The meeting was held in Germany in December of 2020.
- 2. European Funds for Western Pomerania is an EUfunded programme developed by the authorities of Zachodniopomorskie voivodeship, a NUTS-2 region in the north-west of Poland. Aimed at supporting the region's socio-economic development in the years 2021–2027, and amounting to EUR 1.69 billion, the programme was approved for implementation by the European Commission on 7 December 2022.
- 3. The first SPA(TIA) applications were spreadsheetbased with additional use of an open-source GIS (QGIS). Subsequent attempts used a combination of spreadsheet and R (freeware for statistical calculations and graphics). Finally, the entire procedure was ported to Python, a high-level general-purpose programming language that is freely available. The final version of the code is available on request.
- In the case of the Szczecin workshop, the participants included area experts, i.e. experts on education, policy evaluation and spatial planning, as well as stakeholders

from the central government, regional level of the government and selected local governments from the Zachodniopomorskie voivodeship as well as the neighbouring Lubuskie, Pomorskie and Wielkopolskie voivodeships, There was also one stakeholder from the Brandenburg region. The total number of participants was 20.

5. Full information on the programme is available at www. https://rpo.wzp.pl/fepz- see pages 127–137 for description of the priorities 6(f) and 6(g).

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This research has been made possible by the funding received from the Polish Ministry of Development Funds and Regional Policy within the framework of the international research project: "Understanding how sector policies shape spatial imbalances through an in-depth Territorial Impact Assessment". The authors wish to thank Agnieszka Skowronek for outstanding research assistance.

ORCID

Mikołaj Herbst D http://orcid.org/0000-0001-7841-3030 Jan Hagemejer D http://orcid.org/0000-0003-0775-3411

References

- Angelucci M, Di Maro V. 2016. Programme evaluation and spillover effects. J Dev Effect. 8(1):22–43. doi: 10.1080/ 19439342.2015.1033441.
- Camagni R. 2017. Territorial impact assessment (TIA): a methodological proposal. In: Capello R, editor. Seminal studies in regional and urban economics. Cham: Springer. doi: 10.1007/978-3-319-57807-1_20.
- Camagni R. 2020. The pioneering quantitative model for TIA: TEQUILA. In: Medeiros E, editor. Territorial impact assessment. pp. 27–54. doi: 10.1007/978-3-030-54502-4_3.
- CoR. 2011. An initial assessment of territorial forward planning/foresight projects in the European Union. doi: 10. 2863/90678.
- Ederveen S, de Groot HLF, Nahuis R. 2006. Fertile soil for structural funds? A Panel Data Analysis of the conditional effectiveness of European cohesion policy. Kyklos. 59 (1):17–42. doi: 10.1111/j.1467-6435.2006.00318.x.
- ESPON. 2011. The TIA quick check. Advanced version. A methodology for a TIA ex-ante quick check. ESPON 2013 Programme.
- ESPON. 2013. ESPON ARTS assessment of regional and territorial sensitivity. Final report.
- ESPON. 2020. ESPON TIA tool upgrade. Monitoring and tools. Delivery 5 – report on the work done in relation to the upgraded version of the TIA tool.
- EU. 2010. Territory matters to make Europe 2020 a success joint contribution by the director generals of ministerial departments responsible for territorial development policy in the European Union Sevilla. accessed 2010 May 10.
- Fischer TB, Sykes O, Gore T, Marot N, Golobič M, Pinho P, Waterhout B, Perdicoulis A. 2015. Territorial impact assessment of European draft directives—the emergence of

a new policy assessment instrument. Eur Plan Stud. 23 (3):433-451. doi: 10.1080/09654313.2013.868292.

- Gaugtisch R, Dallhammer E, Hsiung C-H, Holstein F, Besana F, Zillmer S, Kruljac D, Ulied A. 2020. State of the art and challenges ahead for territorial impact assessments (no. QG-04-19-758-EN-N). European Committee of the Region, Commission for Territorial Cohesion Policy and EU Budget. ISBN: 978-92-895-1031-8. doi: 10.2863/797486.
- Gaugtisch R, Messinger I, Neugebauer W, Schuh B, Toptsidou M, Böhme K. 2022. Rural proofing – a foresight framework for resilient rural communities. Eur Committee Reg. doi: 10.2863/542366.
- Glickman NJ. 1980. Urban impact analysis: premises, promises, procedures, and problems. Built Environ. 6(2):84–91.
- Golobič M, Marot N, Kolarič S, Fischer T. 2015. Applying territorial impact assessment in a multi-level policy-making context – the case of Slovenia. Impact Assess Proj Apprais. 33 (1):43–56. doi: 10.1080/14615517.2014.938438.
- Howlett M. 2019. Designing public policies: principles and instruments. London: Routledge.
- Lecca P, Barbero Jimenez J, Christensen M, Conte A, Di Comite F, Diaz Lanchas J, Diukanova O, Mandras G, Persyn D, Sakkas S. 2018. RHOMOLO V3: a spatial modelling framework. EUR 29229 EN. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-85886-4. doi: 10.2760/671622,JRC111861.
- Medeiros E. 2014a. Assessing territorial impacts of the EU cohesion policy at the regional level: the case of algarve. Impact Assess Proj Apprais. 32(3):198–212. doi: 10.1080/14615517.2014.915134.
- Medeiros E. 2014b. Territorial Impact Assessment (TIA). Lisbon: The Process, Methods, Techniques, CEG.
- Medeiros E. 2017. European union cohesion policy and Spain: a territorial impact assessment. Reg Stud. 51 (8):1259–1269. doi: 10.1080/00343404.2016.1187719.
- Medeiros E. 2019. Spatial planning, territorial development, and territorial impact assessment. J Plan Lit. 34(2):171–182. doi: 10.1177/0885412219831375.
- Medeiros E. 2020. TARGET_TIA: a complete, flexible and sound territorial impact assessment tool. In: Medeiros E, editor. Territorial impact assessment. pp. 9–25. doi: 10. 1007/978-3-030-54502-4_2.
- Musioł-Urbańczyk A. 2015. Metody wspomagające implementację strategii rozwoju jednostki samorządu terytorialnego. Zeszyty Naukowe Organizacja i Zarządzanie Politechnika Śląska. 78:293–303.
- Nita B. 2016. Stakeholder theory and reporting information on the example of performance prism. Theor Accounting Notebooks. 87(143):117–128. doi: 10.5604/16414381. 1207439.
- Prezioso M. 2020. STeMA: a sustainable territorial economic/ environmental management approach. In: Medeiros E, editor. Territorial impact assessment. pp. 55–76. doi: 10. 1007/978-3-030-54502-4_4.
- Radaelli C, Dunlop C, Fritsch O. 2013. Narrating impact assessment in the European Union. Eur Polit Sci. 12 (4):500–521. doi: 10.1057/eps.2013.26.
- Sager F, Mavrot C. 2022. Participatory vs expert evaluation styles. In: Howlett M, Tosun J, editors, The Routledge handbook of policy styles. London: Routledge; p. 395–407.
- Salter J, Robinson J, Wiek A. 2010. Participatory methods of integrated assessment–a review. Wiley Interdiscip Rev Clim Change. 1(5):697–717. doi: 10.1002/wcc.73.
- Territorial Agenda 2030. A future for all places. 2020. Informal meeting of Ministers responsible for Spatial Planning and Territorial Development and/or Territorial Cohesion. Germany: Territorial Agenda.