ESPON

EUROPEAN UNION

Co-financed by the European Regional Development Fund

Inspire Policy Making with Territorial Evidence

TOOLS & MAPS //

ESPON TIA Tool 2020-2022

Moderator's Guide

Final version // September 2021

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Disclaimer

This document is a final report.

The information contained herein is subject to change and does not commit the ESPON EGTC and the countries participating in the ESPON 2020 Cooperation Programme.

The final version of the report will be published as soon as approved.

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Abbreviations

CB	Cross Border
CoR	Committee of the Regions
CVD	Clean Vehicles Directive
DG MOVE	Directorate General for Mobility and Transport
DG REGIO	Directorate General for Regional and Urban Policy
EC	European Commission
ESPON	European Territorial Observatory Network
EU	European Union
GDP	Gross Domestic Product
GVA	Gross Value Added
ICT	Information and Communications Technology
IPCC	Intergovernmental Panel on Climate Change
LPD	Legislations, Policies, Directives
NUTS	Nomenclature of Territorial Units for Statistics
TIA	Territorial Impact Assessment

1 Introduction

The document at hand constitutes the moderators guide for the application of the ESPON TIA Quick Check by using the TIA webtool. It outlines the process of preparing and conducting a territorial impact assessment with the tool, indicating any potential obstacles and challenges, to assist you in the process. It is structured along four main sections:

- Section 2: The ESPON TIA Quick check at a glance
- Section 3: Preparing the Workshop session
- Section 4: Conducting the TIA workshop
- Section 5: Workshop follow-up

The ESPON TIA Quick check at a glance

Within this section, you will find an introduction to the concept and goals of Territorial Impact Assessment (TIA) also focussing on the distinction between a TIA and an evaluation. Additionally, the approach of the TIA Quick Check within the TIA Tool and the underlying methodology is presented.

Preparing the Workshop session

Here you will find a description of the steps to be undertaken before the actual start of the workshop. Both the organisational tasks regarding the group composition and the setting of the venue, as well as the preselection of indicators and corresponding preparation of the webtool are included.

Conducting the TIA workshop

This section elaborates on the 5 steps of the tool, explaining the different options available, and outlining the agenda and procedure of the workshop. Advice on how to prepare a systemic picture of the policy proposal to be assessed, how to guide the discussion on indicator selection and how to conduct the voting are given. Subsequently, the input of the votes into the tool,the interpretation of maps as well as the policy conclusions to be drawn from the workshop aredescribed.

Workshop follow-up

In this section you will find guidelines on how to use and disseminate the results of the TIA workshop. Guidance is given on what to include in the report, how to correctly sum up the workshop results and how to present the maps within this setting, as well as how to proceed with the analysis.

While this guide is intended to support the understanding of the tool and the corresponding workshop, the knowledge necessary to successfully conduct a territorial impact assessment goes beyond this. ESPON is currently developing a curriculum for interested persons to become certified moderators. If you are interested, please contact Marjan van Herwijnen at the ESPON EGTC under marjan.vanherwijnen@espon.eu

2 The ESPON TIA Quick check at a glance

2.1 The concept of territorial impact assessment

Legislations, Policies and Directives (hereinafter referred to as LPD or "EU policy proposal", "policy proposal"), may often have unintended impacts on the territory, its development and its organisation on the different spatial levels. It is the aim of territorial impact assessment (TIA) to identify whether a policy, regulation or legislation has "a large asymmetric territorial impact" (EU COM, 2013: 2). Conducting a territorial impact assessment should limit the risk of "causing an unbalanced territorial or spatial distribution of costs and benefits for different types of territories" (ESPON, 2012: 7).

Impact assessment (IA) is a standard procedure to prepare "evidence for political decision-makers on the advantages and disadvantages of possible policy options by assessing their potential impact" (EU COM, 2013: online). The basic idea behind the IA procedure is that ex-ante impact evaluations of new policy proposals, when carried out in parallel to the policymaking process, will improve the original ideas and result in robust, effective, efficient and widely supported policies (cf. ESPON, 2012: 19). The territorial impact assessment (TIA) enriches the IA procedure by showing a regional differentiation of the impact of EU policies.

2.2 The ESPON TIA Tool approach

The concept of territorial impact assessment (TIA) aims at showing the regional differentiation of the impact of EU policies. The ESPON TIA Tool[1] is an interactive web application that can be used to support policy makers and practitioners with identifying ex-ante, potential territorial impacts of new EU Legislations, Policies and Directives. The ESPON TIA Tool is based on the "ESPON TIA quick check" methodology. Its approach combines a workshop setting for identifying systemic relations between a policy and its territorial consequences with a set of indicators describing the sensitivity of European regions. It helps to steer an expert discussion about the potential territorial effects of an EU policy proposal by checking all relevant indicators in a workshop setting. The results of the guided expert discussion are judgments about the potential territorial impact of an EU policy considering different thematic fields (economy, society, environment, governance) for a range of indicators. These results are fed into the ESPON TIA Tool.

The web tool translates the combination of the expert judgments on exposure with the different sensitivity of regions into maps showing the potential territorial impact of EU policy on NUTS3 level. These maps serve as starting point for the further discussion of different impacts of a concrete EU policy on different regions. Consequently, the experts participating in the workshop provide an important input for this quick check on potential territorial effects of an EU policy proposal.

2.3 Territorial impact assessment vs. evaluation

The EU Better Regulation Guidelines (COM (2017): SWD (2017) 350) define **Impact Assessment** as:

"The impact assessment process is about gathering and analysing evidence to support policymaking. It verifies the existence of a problem, identifies its underlying causes, assesses whether EU action is needed, and analyses the advantages and disadvantages of available solutions.

Impact assessment promotes more informed decision-making and contributes to better regulation which delivers the full benefits of policies at minimum cost while respecting the principles of subsidiarity and proportionality. However, impact assessment is only an aid to policy-making/decision-making and not a substitute for it." (COM (2017), p. 16/17)

Impact Assessments are required for all Commission initiatives, which are likely to have significant economic, environmental or social impacts.

[1] https://www.espon.eu/tools-maps/espon-tia-tool

In the Better Regulation Toolbox (COM (2017): SWD (2017) 350 complement) Territorial Impact Assessment shall be applied if

- *"First, the impacts associated with the problem are often heterogeneously distributed across the Union. This means that the design of effective policy options will also bring about an uneven geographical distribution of impacts (costs and benefits).*
- *Second, a policy option may act unevenly to produce heterogeneous territorial impacts even where a problem is not necessarily unevenly distributed across the territory of the Union."* (COM (2017) complement; p. 258)

In the same document **evaluation** is defined as an

"evidence-based judgement of the extent to which an existing intervention is:

- *Effective;*
- *Efficient;*
- *Relevant given the current needs;*
- *Coherent both internally and with other EU interventions; and*
- *Has achieved EU added value."* (COM(2017); p.52)

These definitions show that even if territorial impact assessment and the evaluation approach aim at showing effects of policies following the cause-effect chain of the policy interventions, there are existing clear differences:

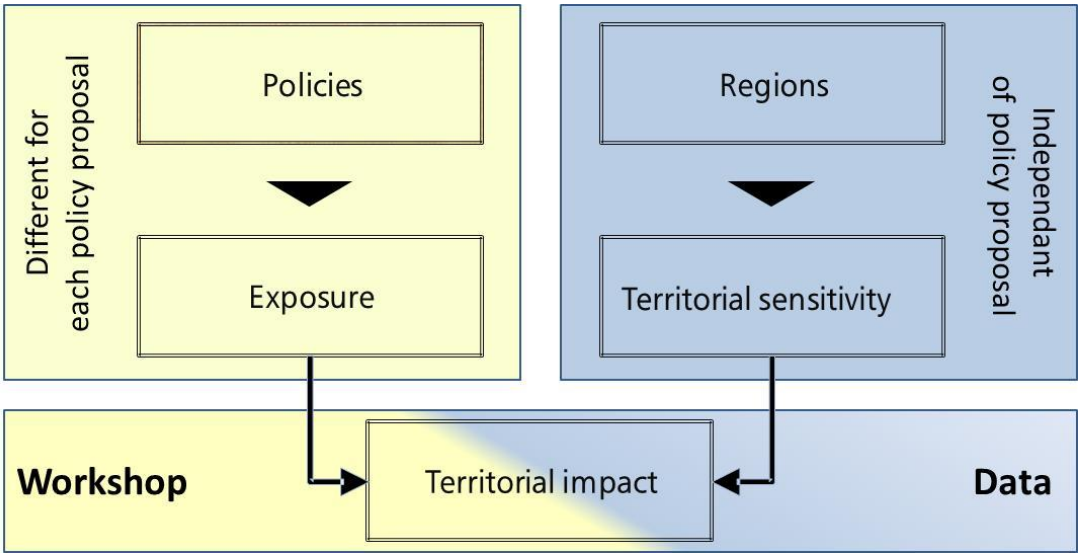
In evaluations the judgement plays a crucial role bringing in values and perceptions of the evaluators, who have to identify how far a policy or programme has reached its goals and how far it has been "successful". The territorial impact assessment is "normatively blind" only aiming at depicting effects, their interlinkages and their intensity.

Additionally, as the TIA Quick Check methodology is developed as an ex-ante assessment, no actual effects are measured. In an ex-post assessment, actual effects backed up by measured data are relevant, while in an ex-ante assessment only the probable impacts can be depicted thus acting as a basis for discussion.

2.4 The ESPON TIA Quick check methodology

The ESPON TIA Quick Check methodology is one of the approved methodologies by the European Commission to analyse potential territorial impacts[2]. It combines the expert judgement on the potential effect of the revised LPD *(exposure)* with indicators picturing the sensitivity of regions resulting in maps showing a territorial differentiated impact. This approach is based on the *vulnerability concept* developed by the Intergovernmental Panel on Climate Change (IPCC). In this case, the effects deriving from a particular policy measure *(exposure)* are combined with the characteristics of a region *(territorial sensitivity)* to produce potential territorial impacts (cf. following figure).

Figure 2.1: Exposure x territorial sensitivity = territorial impact



Source: ÖIR (2015)

- "Territorial Sensitivity" describes the baseline situation of the region according to its ability to cope with external effects. It is a characteristic of a region that can be described by different indicators independently of the topic analysed.
- "Exposure" describes the intensity of the potential effect caused by the revised LPD on a specific indicator. Exposure illustrates the experts' judgement, i.e. the main findings of the expert discussion at the TIA workshop.

[2] https://ec.europa.eu/info/files/better-regulation-toolbox-33_en

3 Preparing the Workshop session

3.1 Selection of the topic to be assessed

The standard application of the ESPON TIA Tool is the territorial impact assessment of a concrete policy intervention (e.g. a finalized Directive or Regulation or an almost final draft with defined options) before it is finally approved by co-legislators. The careful selection of the topic that shall be assessed is a cornerstone of a successful TIA:

- The clearer the proposed policy can be described, the better can the experts in the workshop identify potential effects. Vague policy descriptions will make the identification of effects fuzzier.
  However, sometimes it can be required to assess the impacts of a policy proposal in an early stage of the policy making process. The ESPON TIA Tool could help to identify relevant potentially affected fields.
- The ESPON TIA Tool is developed to provide an ex-ante assessment. The indicators within the tool are describing the sensitivity of a region towards different types of exposure, thereby opening room for discussion. They do not measure actual ex-post effects.
- When a policy proposal offers different policy options, it is essential to decide, which of them should be discussed. One option could be to select the most likely one. Another option is to discuss the one with the most intense effects (as a kind of “worst case scenario”).
  If there is no decision made, a workshop for each policy option would be needed.

Example
In a workshop on the effects of the Work Life Balance Directive a bundle of concrete measures that were to be assessed was set up.

Source: CoR (2017), Territorial Impact Assessment Work Life Balance Directive. Report

3.2 Organising the Workshop

The success of the workshop depends, amongst others, on the design of the workshop setting and the group of experts that are discussing the territorial impact of the concrete LPD.

Who should participate?

The group should include persons with different backgrounds representing various points of view, from different genders, and geographies of the EU (South, North, East and South) so as to build a representative mix of experts. The list of discussants should include the following experts and stakeholders:

- A person who knows the policy proposal and its background very well (e.g. one of the “writers” of the policy proposal) as e.g. a representative of the relevant policy-issuing Directorate General. He/she should give an introducing presentation and explain the background of the policy proposal.
- relevant stakeholders as e.g. DG Regio, CoR, representatives of Member States, regions, cities, cross border areas, and interest groups who will be affected by the proposal;
- experts representing different fields relevant to the topic of the EU policy proposal to be analysed.

Example
In a Workshop about the Revision of the Clean Vehicles Directive a representative of DG MOVE first presented the background for the initiative and the policy options developed before conducting the TIA.

Source: Dallhammer, Erich; Schuh, Bernd; Stavropoulos, Eleftherios; Zintis, Hermansons (2017): Territorial Impact Assessment Report: Revision of Directive 2009/33/EC on Clean and Energy-efficient Road Transport Vehicles – Clean Vehicles Directive (CVD)

How many experts should participate?

A group of 7-15 (max. 20) experts is a good size for discussing the territorial effects of a policy proposal. A smaller group would probably have difficulties to cover all relevant fields of expertise concerned by the discussion. With more than 15 people an open discussion and the reaching of agreements on the indicators

used to calculate the policy's effects will become more difficult, but is possible with good management by the moderator/s.

What information should the participants receive in advance?

It is important that the participants know what the TIA Tool and the policy to be analysed is about. In order to prepare themselves for the workshop, they should receive a background note describing the relevant policy measure (draft legislation, directive that will be analysed) to be discussed and the main options it offers, as well as its aims and objectives. In addition, the agenda of the workshop including a short description of the TIA Tool should also be provided in advance.

It is important to make clear to the participants before the workshop that:

- The whole group should be present throughout the process – as the process is built as a cascade of group decisions, late-comers will miss important steps. Late arrivals are counterproductive since participants will lose basic information.
- The group will take out the most of this process if they approach the session with the willingness to actively contribute, accept other opinions and allow holistic thinking. – In this respect it is not acceptable to ignore and neglect other opinions and contributions.
- The process will be designed as several loops and there will be no ultimate "truth" in the results, but rather a "best compromise solution".

How many moderators are needed? What should they prepare?

For a successful workshop two moderators are essential. One will focus more on the guidance of the discussion and the interaction with the participants. The other one should focus on the results required for the proceeding of the TIA tool, the conclusions, and the interpretations of discussions. Additionally a *"rapporteur"* would be needed for making notes in order to record the arguments of the participants.

Both moderators and the *"rapporteur"* need to be well prepared before the workshop and are expected to have studied the draft legislation, the supportive studies and the evaluations available and should be well acquainted with the policy options and their respective issues.

What is the role of a preparation study?

It could be valuable to commission a preparation study to picture the effects of the policy proposal. This could strongly contribute to the TIA by providing the following information:

- Description of main effects in the fields of economy, environment, society and governance;
- Assessing whether different types of regions would be affected differently (in this case, the study may identify concrete regions from a certain type);
- Identification of relevant indicators describing the sensitivity of regions towards potential effects and, if not already available in the TIA tool, gathering the data for these indicators at NUTS3 level.

Which equipment is needed in the room?

The setting of the room should include the following equipment:

- There should be a large table around which the participants can stand and engage into discussions. All participants should have the same access to the table, i.e.no person should stand in a second row.
- On the table, a large piece of paper (size A1 or A0) is needed. The participants will be able to write and draw a systemic picture of the effects of the policy to be discussed on it. You also need enough markers to write. Alternatively, a big whiteboard could be used with adequate space so that the participants can be placed in a hemicycle.
- A computer with access to internet and linked to a projector is needed in order to go through the steps of the ESPON TIA Tool and make the expert's input visible for all participants.
- It has been proven useful to be able to print out the resulting regional exposure maps. So a printer printing at least in A3 paper size, preferably in colour, can be helpful.

Figure 3.1: Table in the middle of the room with a white paper for discussing and drawing the systemic picture

Source: ÖIR (2017c), CoR Workshop Work Life Balance Directive

How long should a workshop session be?

There should be enough time for expert discussion during the workshop. Time will be especially needed for the following steps:

- Discussion of the systemic picture
- Discussion of the results displayed in the maps
- Discussion of the policy consequences after the assessment of the territorial impact

Usually, it is necessary to reserve almost one full day (including a break). – A draft agenda is provided in the annex.

Make certain that you create a pleasant and comfortable environment for participants. A room with good air conditioning, good ambience and light is important. Make sure that there is access for participants with disabilities. Additionally, consider providing coffee, tea, water, refreshments and some snacks to participants.

Can the workshop be conducted as an online session as well?

Several TIA workshops making use of the TIA Tool have been conducted online instead of the usual in person events. This required an adaption of the approach of the workshop agenda and moderation.

- While the analysis of the LPD to be assessed, the preparation of the workshop indicators, the setup of the tool before the workshop, as well as the documentation and reporting after the workshop are not affected, the actual work-shop process has to be changed in the following points. Instead of a one-day event, the workshop is spread over 2 days to avoid fatigue of the participants. Ideally, the workshop should start in the afternoon of day 1, ending with the decision on indicators and leaving the voting open for 30 minutes after closing the workshop. The moderators can then prepare and send out the maps and hold the second part of the workshops on the 2nd day.
- The flipchart paper for creating the systemic picture has been replaced by an online whiteboard which is prepared, similarly to the usual flipchart, in advance of the workshop. An option for this is the webtool "conceptboard"[3], but there are several applications available.

[3] https://conceptboard.com/

- Voting on the indicators has to be done with a web-based polling solution. An option for this is the webtool “sli.do”[4], but there are several applications available.
- The videoconference software applied has to be agreed upon with the participants in advance. It is advised to consult with the coordinator for a specific workshop on the expected participants and their known restrictions in terms of software.
- The team of moderators needs to be expanded to 3 persons, as the effort for moderating an online workshop alongside of several pieces of software supporting the process is too demanding for 2 persons. Thus the team of moderators should consist of:
  - One person guiding the discussion and engaging participants
  - One person focusing on identifying indicators during the expert discussion as well as taking notes of the discussion to provide minutes
  - One person focusing on the technical aspects, i.e. on-the-fly layouting of the whiteboard, monitoring the chat, monitoring raise of hands, handling the indicator selection in the polling tool, providing assistance to participants in technical issues etc.

3.3 Pre-analysing the policy proposal

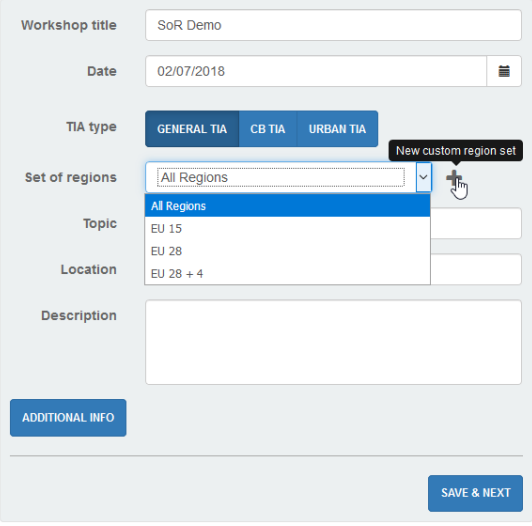
Defining the type of TIA

The TIA tool includes options for four different types of TIA: GENERAL TIA; CB TIA (Cross-border TIA), URBAN TIA and also CUSTOM TIA. With CB TIA and URBAN TIA, the possibility is offered to investigate only certain types of regions specifically targeted by a policy measure/initiative, with specific data sets behind them.

CB TIA allows understanding the impact on cross border regions, while URBAN TIA focuses only on urban areas. The option for a CUSTOM TIA can be used in all other types of TIA and allows the user to select other (pre-defined in the tool) types of regions. The indicator values in the three additional TIA modes are normalized only in reference to selected datasets.

CUSTOM TIA – Defining the set of regions to be considered

Figure 3.2: Selecting or creating a set of regions



Source: ESPON TIA Tool (2018)

The ESPON TIA tool allows to focus the TIA on a set of regions. A TIA covers in general all of ESPON space (EU27+5) but with a CUSTOM TIA one can cover only parts of it such as the EU 15 or even a single country. In the latter case, it is recommended to confine the selection to the regions the TIA is focussed on, as the exposure calculations will relate to this selection and the differences between the regions considered will become clearer. In such a case the selection is made by clicking on “new custom region set” and subsequently picking the relevant regions or countries from the displayed menu. A proper name describing the selection should be defined.

[4] https://sli.do/

Analysing the intervention logic

It is important that the moderator knows the content of the EU policy to be assessed. As the ESPON TIA Quick check is a *policy decision support instrument,* the more concrete the policy proposal to be assessed by the tool is, the better and the more useful the results will be. So the moderator should try to get as concrete as possible regarding the policy options for the workshop.

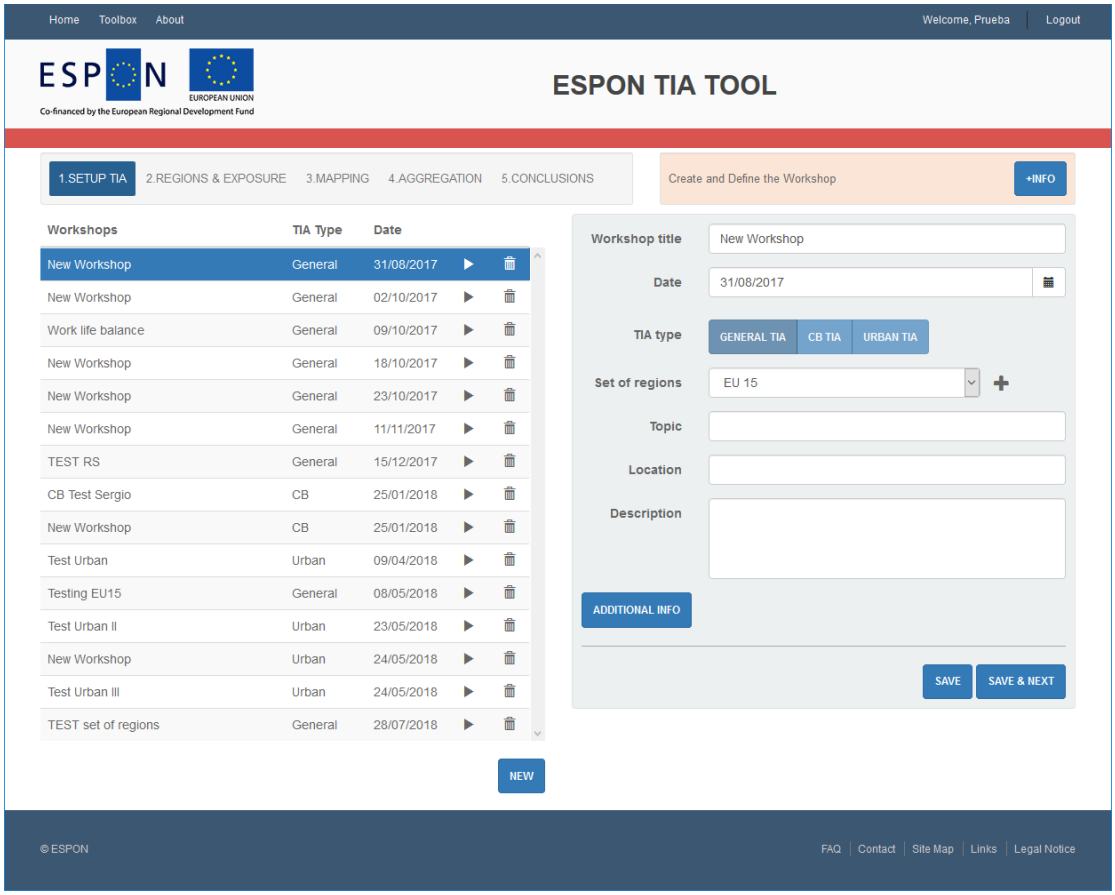
When analysing the policy proposal he/she will try to analyse the intervention logic, focusing on to two core questions:

- Are some types of regions affected more than others/in different ways than others?
- In which thematic fields are the main positive or negative (net-) effects of the policy?

3.4 Preparing the TIA tool

It is strongly recommended to prepare the TIA tool prior to the workshop and to make an internal test-run.

Figure 3.3: Screenshot of ESPON TIA Tool, Step 1



Source: ESPON TIA Tool (2018)

The following steps can be prepared in advance:

- Entering the information that is already available, as e.g. name of the workshop session, date and location in the tool (in the webtool, in the dialogue “1. Setup TIA”); this information can be saved until the workshop starts;
- Defining which type of TIA should be performed: either GENERAL TIA; CB TIA (Cross-border TIA), URBAN TIA or CUSTOM TIA as described above.
- In case of a CUSTOM TIA: pre-selecting or pre-defining the set of regions to be included (ESPON-Space, EU 27, EU 15, …) as shown in Figure 3.2 (in the webtool still in the dialogue “1. Setup TIA”)

- Screening the list of types of regions provided. During the pre-check of the EU policy it should be questioned whether the relevant types of regions potentially affected by the EU policy are covered by the existing list (in the webtool, in the dialogue “2. Regions & Exposure”);
  - If yes: the moderator should note them.
  - If no: the moderator should try to find an adequate typology of regions (on NUTS3 level) and upload it before the workshop starts.
- Identifying necessary indicators and checking the list of indicators available in the tool.[5] During the pre-check of the EU policy, it should be asked whether the provided list of indicators covers all relevant fields of potential impacts that would be expected to be raised by the experts during the workshop:
  - If yes: the moderator should make notes and try to focus the discussion on the most relevant indicators.
  - If no: the moderator should try to find adequate additional indicators describing the characteristics of the regions in the relevant fields detected (at NUTS3 or FUA level) and upload them before the workshop starts (in the webtool, in dialogue “2. Regions & Exposure”).
  - During this task, the moderator should also identify indicators that are potentially less relevant, as this will help guide the discussion on indicator selection during the workshop.
- Printing the “indicator postcards” (see section 3.2.1- Sub-step 2.1) – example shown in annex.
- Preparing a set of “voting cards” (see section 3.2.3– Sub-step 2.3), or, if needed, multiple sets with different colours – example shown in annex. Multiple sets are needed if participants will likely or possibly decide on using different types of regions, in which case using one color per type of region is advised.

Own data can be uploaded and pre-filled settings of the workshop session can be entered prior to the workshop. It can be stored and used when the expert workshop starts.

Composite indicators

Composite indicators are a special type of indicator used in the TIA tool. They consist of multiple individual sub-indicators and are designed to reflect the results of a certain intervention targeting multiple fields in a combined manner. In the context of the Quick Check methodology, this can be relevant, where no indicator specific enough to accurately reflect a certain policy action is available, but a combination of two or more indicators can.

In the composition of such an indicator, both the sub-indicators included andthe respective weights applied to each of them, have to be considered. To support the preparation, an excel-tool allowing the calculation of a composite indicator with up to 5 sub-indicators is made available. The results can be directly uploaded in the ESPON TIA Tool.

The composite indicator will then be calculated following the steps described below:

[5] Moderators are also encouraged to check „common” sources such as the Urban Audit or even Eurostat for new indicators. Some of the indicators have been ruled out as „standard“ indicators in the tool due to gaps in geographical coverage, but might have enough data available for geographically reduced assessments.

Normalising

Calculating the normalised regional value for each sub-indicator by feature scaling[6], [7]

$$X_r' = \frac{X_r - X_{min}}{X_{max} - X_{min}}$$

X_r ' normalised value of a region r for sub indicator X

X_r original value of a region r for sub indicator X

X_{max} maximum value of all regions for sub indicator X

X_{min} minimum value of all regions for sub indicator X

Before normalising, the normative direction of the indicator has to be considered, i.e. if high values are considered "positive" (e.g. in case of GDP) or "negative" (e.g. in case of unemployment rate). If indicators with different normative directions are used, they have to be adjusted without changing their sensitivity values. In these cases, all "positive" indicators should be left as they are, while for "negative" indicators all values should be multiplied by -1 in order to bring them in the correct order.

Weighting

Multiplying each normalised indicator with the assigned weight[8]

- $X_r" = X_r' * w_x$

X_r' normalised value of a region r for sub indicator X

X_r" weighted normalised value of a region r for sub indicator X

w_x weight assigned to sub indicator X $[0; 1]$

The sum of weights w across all indicators in total has to be 1.

Adding

Adding up the weighted indicators

$$C_r = X_r" + Y_r" + Z_r"$$

C_r value of a region r for composite indicator C made up of sub-indicators X, Y and Z

X_r" weighted normalised value of a region for sub indicator X

Y_r" weighted normalised value of a region for sub indicator Y

Z_r" weighted normalised value of a region for sub indicator Z

As is apparent, not only the thematic fit but also the structure and distribution of data behind each individual indicator has to be carefully considered. Skewed distributions or strong outliers can influence the interpretability of results when combining multiple indicators. The underlying data structure thus has to be considered when selecting sub-indicators. Ideally, indicators should show an even distribution with no strong outliers and not skewed to either side. It can be considered to remove strong outliers before adding sub-indicators.

[6] No transformation to the distribution of data is applied, however, all values across indicators are brought into a comparable range so they can be summed up, usually between 0 and 1

[7] Calculating the indicators requires attention to which values are considered „positive" (high or low ones). E.g. when calculating a „quality of life" indicator for a specific region, a high value on employment rates will be positive while a high value on infant mortaliy will be negative. Reversing this order can be done for the calculations by simply multiplying each value with -1 before normalising, which will be indicated in the guidance.

[8] The weight is applied as a coefficient between 0 and 1, the sum of all weight has to be 1. Weights have to be assigned by the person creating the indicator based on expert judgement or literature.

In the excel tool, 5 sheets for the respective sub-indicators are available (Sub1-Sub5). The sub-indicators need to be copied into those sheets with column A containing the NUTS3 code, column B containing the value. NUTS codes should be NUTS2021. In the sheet “weights”, the weight for each sub-indicator (the sum of all weights should be 1) is entered and the direction of impact determined (1 = more means higher sensitivity, -1 = more means lower sensitivity). The tool automatically computes the values and returns the value for each region in the “results” sheet. Save the “results” sheet as .csv and upload it into the tool just as a normal exposure field.

When using composite indicators, it is important to keep in mind the loss of information linked to the combination of different indicators. E.g. low performance in one indicator can be masked by high performance in another indicator. Composite indicators thus can tend to converge around averages, especially if multiple indicators from very different fields are combined. Furthermore, it is advised to use equal weights for indicators if there is no clear reason to set certain specific weights, as this can considerably influence the calculations.

It is important to record in detail the indicators and the weights selected in order to provide participants of the workshop with that information if requested. It is recommended to record that information on the indicator postcards prepared.

Uploading of data

It is possible to *upload additional indicators* as well as additional typologies into the tool. The process both for exposure fields and for typologies is rather similar, making use of excel-tables provided by the tool.

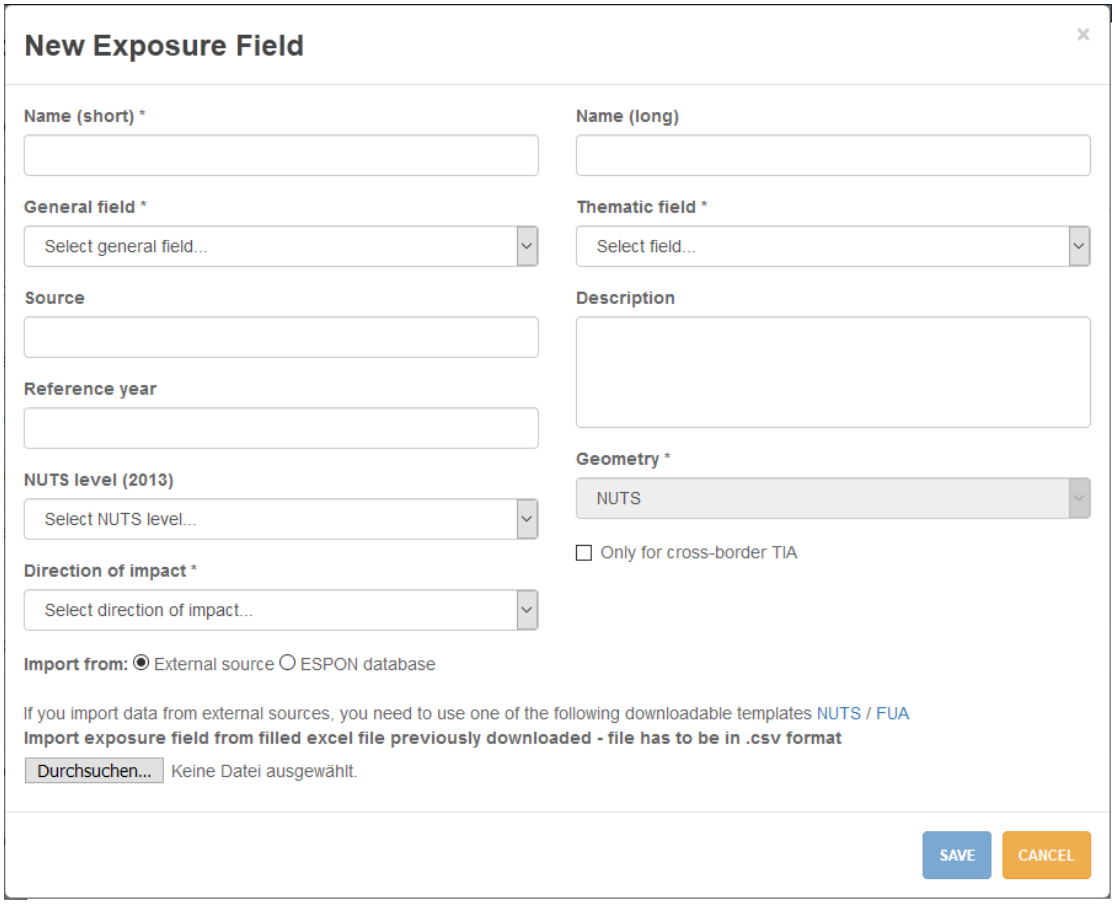
To upload an indicator, the button “upload indicator” in the “select exposure fields” dialogue within step 2 “Regions & Exposure” has to be pressed. A new window allowing for the input of metadata then pops up as shown in Figure 3.4. At the bottom of this window the user can choose whether the indicator should be imported from an external source (e.g. hard-drive of the user) or from ESPON database. When uploading from an external source, the corresponding template for NUTS or FUA data has to be downloaded as provided. The moderator can put in the values for each region in column “C” (for FUA) respectively “E” (for NUTS) of the template, and subsequently has to save it as .csv and upload the file. A correspondence table between NUTS 2013, 2016 and 2021 has been built into the template, i.e. it is possible to input values based on NUTS2013 or 2016 nomenclature and the import function will assign them to the NUTS 2021 regions. This however leads to some loss of information as newly created or abandoned regions will not be accounted for. For each indicator uploaded in that way, the name, the general- and thematic field has to be given.

Additionally, it has to be defined whether the exposure field needs to be evaluated as being harmful (“cost”) or favourable (“benefit”) for the regions’ welfare (in the tool it is also called “direction of impact” and defined by either -1 or 1). Then the tool will automatically transform the experts rating into numbers for further calculation (= normalisation).

Uploading an indicator from the ESPON database is also possible, for which the radiobutton ESPON database” at the bottom of the window has to be selected. Pressing the “search” button will then open a list of available datasets of the ESPON database from which the moderator can choose.

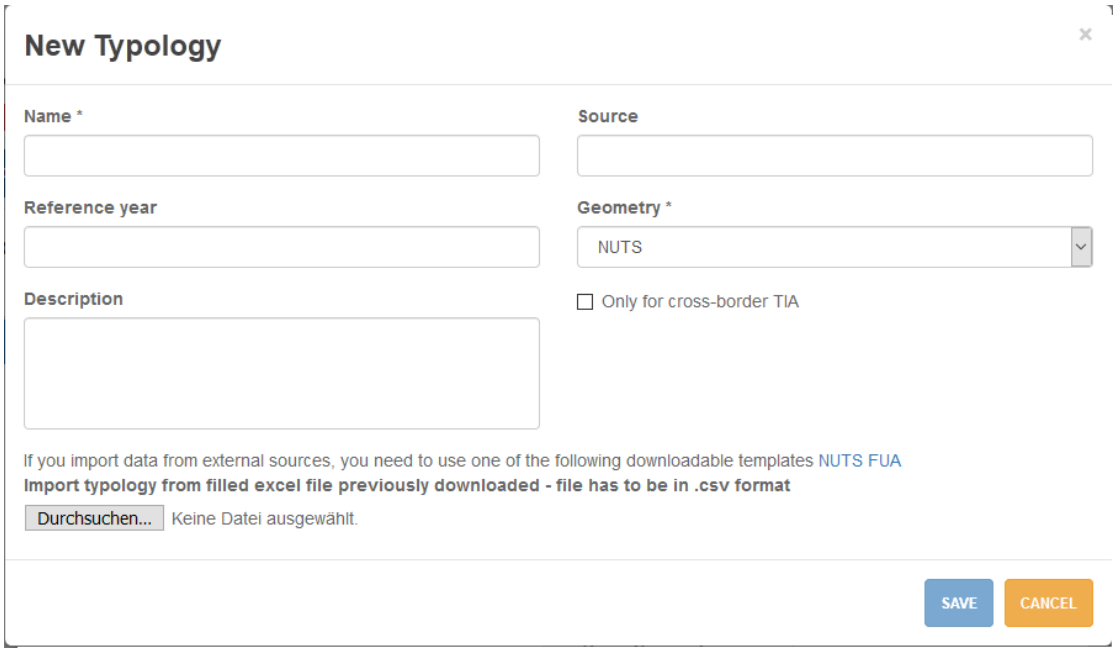
To upload, a typology the button “upload new typology” in step 2 “Regions & Exposure” has to be pressed. A new window allowing for the input of metadata similar to the one used when uploading indicators, pops up as shown in Figure 3.5. Accordingly, the upload is possible via the use of an excel template either for NUTS or for FUA geometries which has to be downloaded and filled with values. Both “standard” as well as “fuzzy” typologies can be used here as explained in section 4.2.1. Only the “name” and the “geometry” fields are mandatory, however, it is advised to include all metadata available as to enable the workshop participants to get a clear picture.

Figure 3.4: Screenshot of ESPON TIA Tool, indicator upload



Source: ESPON TIA Tool (2018)

Figure 3.5: Screenshot of ESPON TIA Tool, typology upload



Source: ESPON TIA Tool (2018)

4 Conducting the TIA workshop

4.1 Step 1: Set up TIA

4.1.1 Sub-step 1.1: Opening session for setting the frame

Main Task

The first phase of a TIA workshop aims at setting the frame. It should provide the workshop participants with the relevant information about the policy proposal to be assessed and the methodology of the ESPON TIA Tool. Furthermore, it should have an “ice-braking” function for the participants in order to enable vivid discussions.

Methodological background

It is essential to have a common understanding of the policy proposal under analysis and the TIA methodology that is applied in this workshop. The presentations should ensure this.

In the discussion

The opening session shall include the following topics:

- A short presentation of the policy frame, the policy proposal, results of existing impact assessments (if available) and a concrete description on the policy option/s that should be assessed;
- A short presentation of the TIA methodology (see slides in the Annex);
- The introduction of the participants. This introduction should be done by each participant. It should be short, mentioning the name and the institution. A personal question that is related to their connection with the policy proposal policy could be used as an “ice-breaker”;
- A short presentation of the rules of the workshop;
- A note that everyone is participating as an expert and/or stakeholder concerning the policy proposal to be discussed. The personal opinion of an expert is relevant, not the position of the organisation one belongs to;
- A note that all people present at the workshop are expected to participate and to contribute to the discussions. Due to the interactive format of the workshops there are no “observers”;
- A note that the whole group should be present throughout the process – as the process is built as a cascade of group decisions late-comers will miss important steps;
- A note that the result is based on a model picturing, the sensitivity of regions and on the expert judgement about the direction and strength of the effects of the policy proposal. There will be no ultimate *“truth”* in the results, but rather *“scenarios”* of effects.

Example for an “ice-breaker questions”
TIA Workshop about sharing economy: “What would you like to share with your neighbours as your contribution to a sharing economy?”
TIA Workshop on the modification of the Work Life Balance Directive: “How would you describe your work life balance? What would you like to change?”

In the tool

No input into the tool needed. Everything relevant is done in the workshop preparation.

4.1.2 Sub-step 1.2: Drawing the systemic picture

Main Task

As an element of the Step 1 of the TIA, the participants of the workshop create together a systemic picture *("conceptual model")* depicting the potential effects of the policy measure/initiative at hand on territorial development in the fields of economy, society, environment and governance.

Methodological background

In order to identify potential territorial impacts, it is necessary to translate the text of the policy proposal into cause/effect relations describing the *"intervention logic"* of a policy. These relationships are depicted as flowcharts showing the links between the regulatory elements laid down in the policy measure/initiative, its specific targets and the different fields in which it will potentially show direct or indirect effects *("fields of exposure"* according to ESPON TIA methodology).

The conceptual model translates the text of the policy proposal into cause-effect relations showed in a systemic picture. It allows for a comprehensive systemic view in case of complex cause-effect chains.

In the ESPON TIA Tool the starting point of the discussion are the potential effects of the analysed EU Policy on different fields of impact: "economy", "society", "environment" and "governance" broken down into more detailed thematic fields, measured by indicators. The systemic picture allows traceability of the model for the user.

In the discussion

A brainstorming exercise will be used to support the drawing of the conceptual model. The brainstorming uses the expert knowledge of all participants to identify the potential consequences of policies, etc. It serves as a relatively quick way of identifying potential impacts.

Participants should think about potential effects of the policy proposal on the development of regions' or cities in comparison to the development without the new legislation ("baseline scenario").

A large paper ("tablecloth", size A1 or A0) is fixed on a table where the participants can sit or even better stand around and discuss. No person should be placed in a second row. (Standing participants allow for a more lively interaction). So, to intensify the discussion, take the chairs away). In an online workshop, the "tablecloth" is replaced by the virtual whiteboard mentioned before, where participants can post notes/text-boxes instead of writing directly on the paper. The general principles are however exactly the same.

As a starting point of the discussion the following can be done:

- The name of the policy proposal is to be written in the centre of the paper.
- On each corner the main thematic fields are to be written down: economy", "society", "environment", "governance"
- Making sure that there are enough whiteboard markers so that every participant can write down her/his ideas.

The following questions can steer the discussion:

- What are the direct and indirect economic, social, environmental and governmental effects and how they occur?
- Has the policy proposal effects on the economic development of a region or city? On the employment? In which fields?
- Has the policy proposal effects on the people in a region? On their living conditions? How and why?
- Does the policy proposal influence environmental conditions? Which ones? In which way?
- Does the policy proposal or its implementation affect the government or governance systems? Why? In Which ways?
- Are different types of regions affected differently? Which types of regions are affected in what way?

The participants should draw causal links between all the effects deriving from the policy proposal (exposure in the vulnerability concept) and the receptive capacity of a region (sensitivity in the vulnerability concept), indicating indirect or direct negative and positive relations.

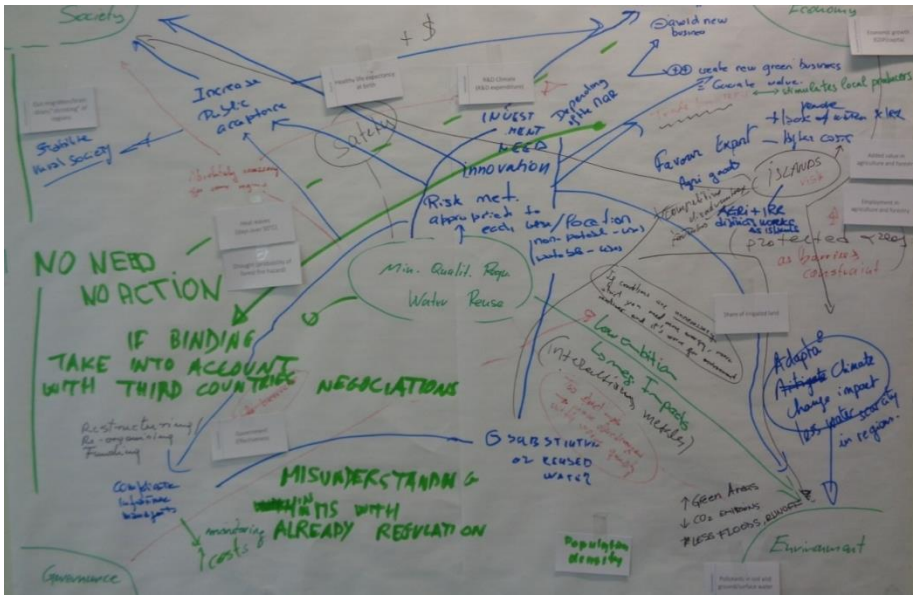
The participants should explain their ideas to the group in a few words (keywords, short phrases) and write them on the paper. Others can write amendments and comments, but crossing out is forbidden. All findings should be listed on the paper.

The moderator can ask guiding questions to make sure that all aspects have been considered and all information is captured in the picture.

Results

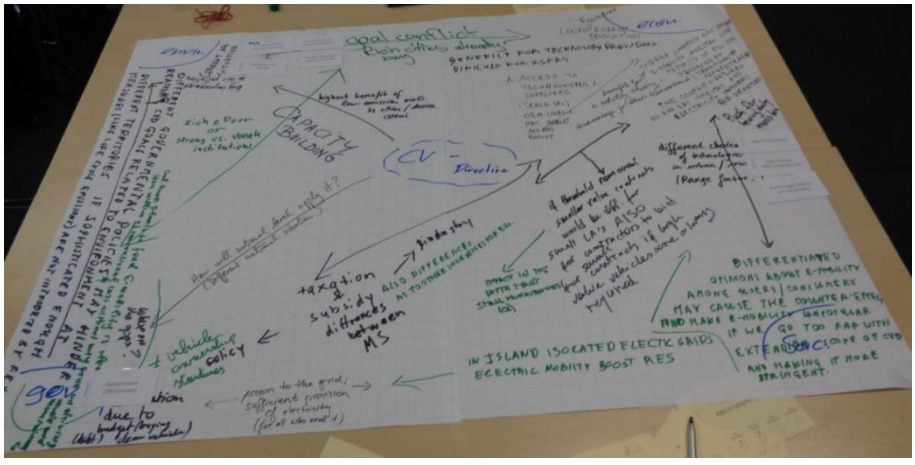
A systemic picture showing the conceptual model of the policy proposal according to its intervention logic and potential effects. This picture can be uploaded into the tool.

Figure 4.1: Workshop findings: Conceptual model of the regional effects of the development of minimum quality requirements for reused water in agricultural irrigation and aquifer recharge



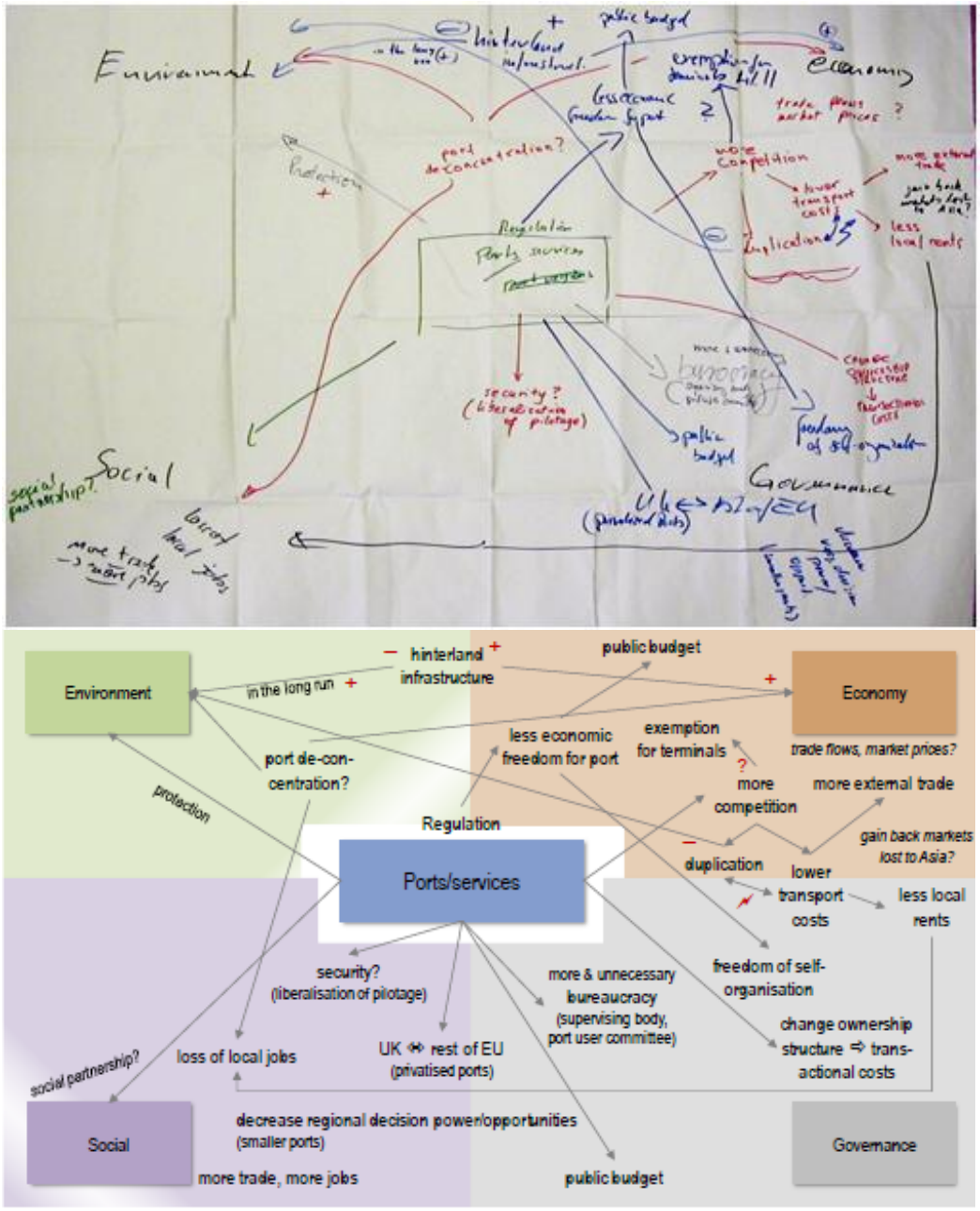
Source: ÖIR (2017a), Territorial impact assessment expert workshop, Brussels, 5 April 2017

Figure 4.2: Workshop findings: Conceptual model of the potential territorial effects from the revision of Directive 2009/33/EC on clean and energy-efficient road transport vehicles – Clean Vehicles Directive (CVD)



Source: ÖIR (2017b), Territorial impact assessment expert workshop, Brussels, 11 May 2017

Figure 4.3: Conceptual model of the regulation COM (2013) 296 final/establishing a framework on market access to port services and financial transparency of ports (handwritten in the workshop and elaborated version)



Source: ÖIR (2013), Territorial impact assessment expert workshop, Brussels, 25 September 2013

In the tool

An attachment with the systemic picture can be uploaded in the webtool in the dialogue “2. Regions & Exposure”.

4.2 Step 2: Regions and exposure

4.2.1 Sub-step 2.1: Selecting regional typology

Main Task

Policy proposals can produce spatial effects on a certain type of regions, as e.g. urban regions, mountainous regions, coastal regions, …. If the participants of the workshop identify certain effects on a special type of regions during the discussion of the systemic picture, this needs to be clearly defined, as there will be a separate voting on the strength of the effect on each type of regions identified.

Methodological background

The effects of a policy proposal could vary according to the type of region: A policy proposal may affect only particular regions (e.g. coastal regions, regions with presence of particular productions or facilities like coal mines etc.) or different types of regions could be affected in different ways. Therefore, it is essential to pre-select in this step only those types of regions being affected for-further analysis.

The tool also offers the ability to use “fuzzy” typologies. Other than in a “standard” typology, where a region can either be assigned as part of the typology (value “1”) or not part of it (value “0”), a fuzzy typology can depict the extent to which a region belongs to a certain typology as a value between 0 and 100% (i.e. value between 0 and 1). An example for this would be the fuzzy typology “Share of people living within 25km of a border region”. If 50% of the population of a given region live inside the defined corridor of 25km of the border, the corresponding value for the region in the typology would be 0.5, thus reducing the extent to which the region is affected by a policy in the calculation by 50%. Accordingly, a value of 0.1 would reduce the extent to which the region is affected in the calculation by 90%.

In the discussion

Based on the results of the discussion, the moderator will ask whether the territorial effects of a policy proposal as laid down in the systemic picture affects different types of regions. A clear agreement on the types of regions to be assessed is required. The following questions can guide the discussion:

- Does the policy proposal affect all regions in the same way or are just certain regions affected?
- Do different regions experience different effects of the policy proposal? Which types of regions are these?
- Is the differentiation relevant for all indicators or just for some?

The participants of the workshop should agree, with the help of the moderator, on which types of regions they would like to estimate the effects of the policy proposal that is analysed.

According to the experiences from previous workshops, there should be a limit on two to maximum three types of regions. It could also be decided that just a few indicators need a different judgement for different types of regions. As an expert vote is required for each type of region and indicator selected, it would be good to limit the number of types of regions.

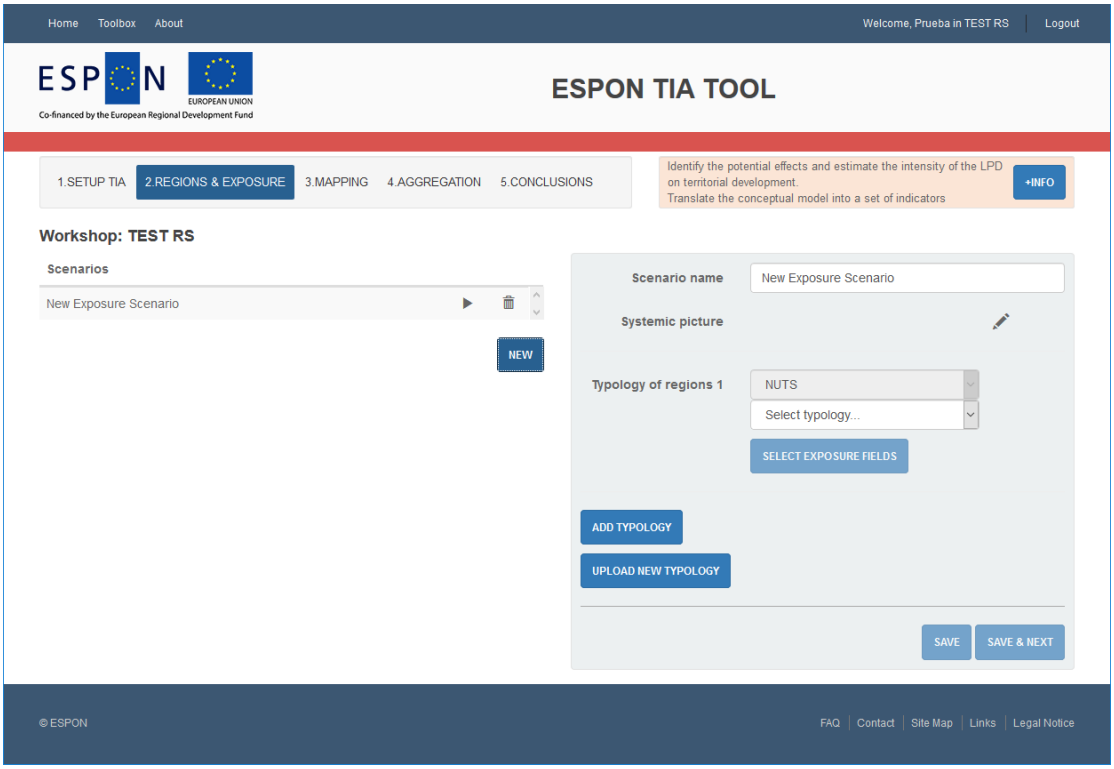
In the tool

In each exposure scenario up to five regional typologies can be entered. For each regional typology, multiple exposure fields (indicators) can be selected. In this option, the experts’ votes can be entered for different types of regions.

If there is a need for different votes by the experts for different type of regions, the moderator can define different exposure scenarios. This is done by adding a new scenario, editing scenario name, uploading an attachment (e.g. picture) of the systemic picture, selecting one or multiple types of regions to which exposure fields (indicators) as well as expert voting on the exposure is entered.

The web-tool provides a set of pre-selected types of NUTS3 regions to choose from (e.g. rural/urban, central/peripheral, advanced/lagging) that can be used. Additionally the tool offers the possibility to upload new types of regions.

Figure 4.4: Screenshot of ESPON TIA Tool, Step 2



Source: ESPON TIA Tool (2018)

Results

Final selection of regions, which are expected to be affected.

4.2.2 Sub-step 2.2: Identifying the exposure fields/indicators

Main Task

In this step, indicators that best reflect the systemic relations (in the TIA methodology known as “exposure fields”) are selected, as drawn in the systemic picture.

Methodological background

In order to assess the potential effects pictured in the conceptual model, suitable indicators related to the parameters that the experts discussed in the fields of economy, environment, society and governance need to be selected. The indicators are required as an input in the TIA, which describes the different sensitivity of regions.

The availability of data for all NUTS 3 regions is posing certain limitations to indicators that can be used. From the available indicators that the ESPON TIA Tool offers, the experts commonly agree on theindicators to describe the identified effects.

In case of the Urban-TIA, some of the standard datasets provided by the tool have a reference year of 2020 or later. These datasets are projections produced by the JRC for functional urban areas and are the results of varying modelling procedures based on measured data in previous years. In principle, using data based on modelling should be avoided, however as the data availability for functional urban areas is very scarce, in some cases it might be preferable to use modelled data rather than having no data at all. When using such datasets, the uncertainties and limitations connected to using projections have to be explained to the participants.

If composite indicators are used, the moderators should be ready to present the rationale used for the selection of the the sub-indicators, the weighting applied, and the general background of composite indicators.

It has to be clearly pointed out to the participants, that they are using a composite indicators and which limitations are linked to that.

In the discussion

The ESPON TIA Tool provides a pre-selected set of indicators. Each indicator of the ESPON TIA Tool is written down on a separate postcard ("indicator-postcard"- see annex) in order to be able to add the relevant indicators on to the systemic picture. The "indicator-postcards" should be printed prior to the workshop.

The "indicator-postcards" are held by the co-moderator who has observed the discussion about potential effects of the policy proposal. In an online workshop setting, it is suggested to prepare the indicators as well as virtual cards on the whiteboard somewhere to the side during the discussion so they can be moved in. When the discussion on the systemic relation is closed, the co-moderator will open the discussion with the question "Which possible indicators are able to picture the discussed effects?"

The moderator makes suggestions for possible indicators. The participants discuss whether a proposed indicator is useful/appropriate and/or might be used as a proxy or second best approach to depict the effects. For each indicator the moderator should have available the definition of what the indicator measures, which ideally should be printed on the backside of the indicator-postcards.

The moderator should try to focus the discussion on choosing the most relevant and suitable indicators. Choosing too many indicators may take much time for the expert judgements required afterwards. Moreover, choosing more indicators means more different results in terms of maps depicting territorial differences and patterns to discuss at the end of the TIA. Here a trade-off between coverage (i.e. more indicators) and time for in-depth discussions on judgements and results (i.e. less indicators) has to be considered. In most of the workshops conducted so far, the average amount of indicators which was used and still could be handled by the group was between 5 and 9.

The final selection of indicators by the group are added to the systemic picture by gluing them to the paper and drawing the relevant links. In an online workshop, they are simply moved in place on the whiteboard.

In the tool

The tool offers a set of indicators in the fields of economy, society, environment and governance that could be affected by a policy proposal. Information on each of the indicators is shown when you scroll over each of the indicator fields. Additionally, any indicator you have uploaded as explained in section 3.4 is available for selection.

Figure 4.5: Interactions between indicators

Source: ESPON TIA Tool (2018)

Furthermore, it is possible to screen the “interactions between indicators” in the tool. This shows the similarity between the selected exposure fields in values for an adjusted r^2 over the regions in the set of regions and typology selected. Thus, it can be seen if different indicators are expected to give very similar or very different regional exposure. This may be of help when interpreting the results.

Results

Final selection of indicators, which will be used to calculate the territorial impact of the policy to be analyzed.

4.2.3 Sub-step 2.3: Expert voting

Main Task

The experts estimate for each type of regions (identified in the preceding step) and each thematic field (indicator) the intensity of exposure caused by implementing the policy proposal. It is a judgement based on expert knowledge taking into account the results of the previous discussion on the systemic interlinkages.

Methodological background

The conceptual model is translated into a set of indicators that describe the intensity of policy exposure. The ESPON TIA Tool offers the opportunity for each indicator (exposure field) to judge the effect of the policy proposal according to the following scale:

- strong advantageous effect on territorial welfare
- weak advantageous effect on territorial welfare
- minor effect/diverse effects
- weak disadvantageous effect on territorial welfare
- strong disadvantageous effect on territorial welfare

When the effect is unknown, no judgement is needed.

In the discussion

The voting of the experts is collected by “voting cards”, which are provided by the moderator (see the annex). Each expert takes one voting card for each indicator selected. When votes are needed for different types of regions the voting cards will be distinguished by different colours (one colour representing one type of region). It is therefore advised to prepare multiple sets of voting cards (2-3) with different colours for all experts. In case of an online workshop, the voting is conducted via a web-based polling tool which has to be prepared in advance.

According to their knowledge, the experts provide their judgements. When judging and voting some rules are to be communicated:

- The judgement represents the point of view of the expert;
- An effect is to be judged as advantageous, when the effect is deemed to be positive for the development of a region, independently whether the relevant indicator increases or decreases;
  (For instance experts judge that a policy proposal will reduce unemployment. They will judge the effect as advantageous, even in the unemployment rate decreases.)
- If the effect is unknown, cannot be specified, or if the direction cannot be specified because of diverse effects, please indicate the respective class for the indicator (“unknown”, “direction cannot be specified”).
- An Expert may choose not to vote for an indicator if he/she believes that the indicator is not very relevant

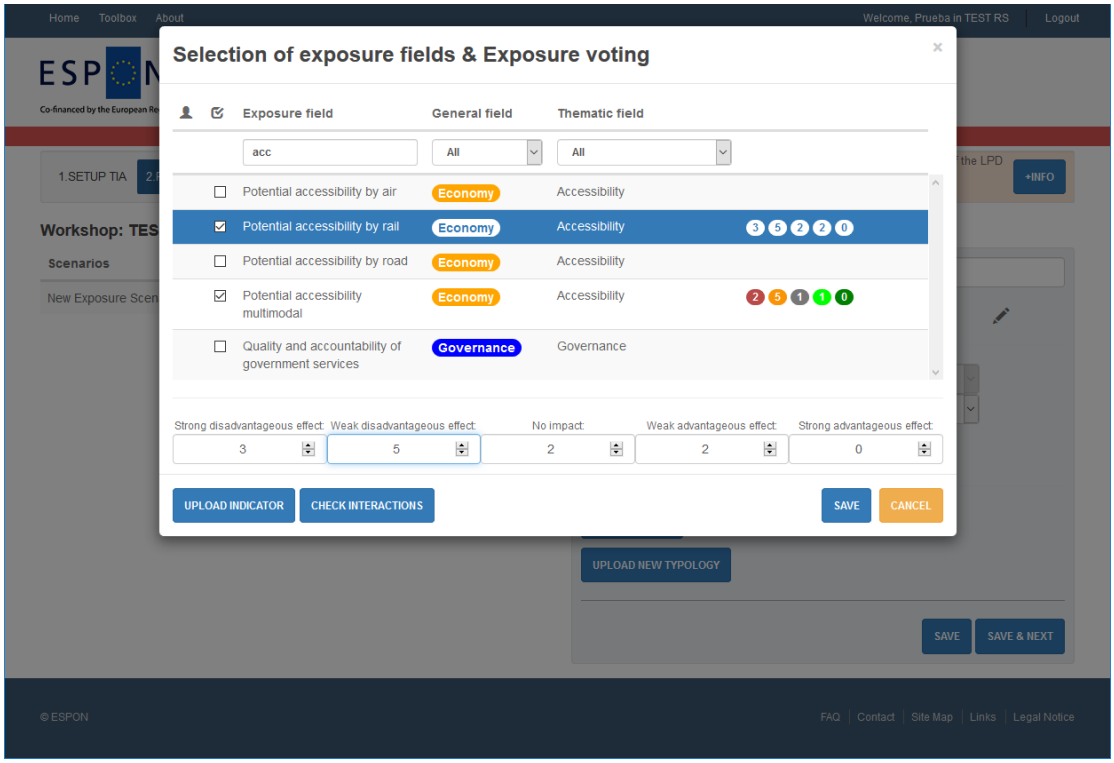
The votes are collected by the moderator and counted, then entered into the tool.

In the tool

The tool offers a set of thematic fields that could be affected by the policy proposal described by indicators in the fields of economy, society, environment and governance. Information on each of the indicators is shown when the mouse moves over each of the indicators.

The moderator counts the votes and fills in the results into the tool for each selected indicator and each type of region. Usually this is done during the lunch break, as it takes some time to collect and count the votes and to enter them into the tool.

Figure 4.6: Step 2: Selection of exposure fields & exposure voting



Source: ESPON TIA Tool (2018)

Results

Expert judgment depicting the effect of the policy proposal on the different fields of indicators in the selected types of regions

4.3 Step 3: Mapping

4.3.1 Sub-step 3.1: Generating TIA maps for each indicator/exposure field combined with expert judgement

Main tasks

Maps showing potential territorial impact are generated. In order to do so, the moderator has to select scenario, typology and exposure field – including the expert vote- for which an impact is to be presented. By default, the maps show impact for the judgement which has received most votes. It is also possible to select different normalization modes, as well as to switch between different expert judgements leading to maps with different impacts. Results are further completed by the distance to average values and a set of graphs (see Figure 4.9) showing the impact. Maps as well as graphs can be exported.

Methodological background

The territorial impact is the product of the intensity of the exposure as estimated by the participants of the workshop and the pre-defined regional sensitivity for each region described by an indicator at NUTS3 or FUA level. While the experts' judgement is a qualitative judgement provided in Step 2 (e.g. strong advantageous effect on territorial welfare), the sensitivity is a quantitative indicator estimating the identified effects.

The intensity of exposure (e) is assessed by experts' judgement, based on the identification of the fields of exposure as described in the systemic picture. Experts' judgements (strong advantageous, weak

advantageous, minor effect/divers, weak disadvantageous or strong disadvantageous) are converted into respective numerical exposure values *(e ∈{-1.5, -1, 0, 1, 1.5}).*

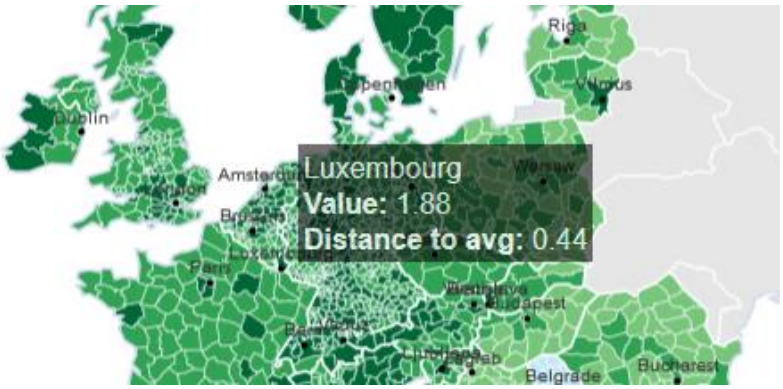
The regional sensitivity *(s)* is given by an indicator. For all regions included in the set of regions and the typology/typologies, the indicator is normalised to be in the range of 0.75 to 1.25. There are three different options for the normalization of the data provided: Z(0-100), Z(10-90) and Log. The three normalization modes offer different possibilities:

- *Z(0-100)* normalization *mode:* Here all data is directly normalized to be in the range 0.75 to 1.25. This mode does not exclude any outliers and as such offers the possibility of visualizing all data. The disadvantage of this mode is that outliers may blur differences between values at the centre of the distribution. Maps are, thus, often very homogenous in colour.
- *Z(10-90) normalization mode:* The z(10-90) method is based on first bounding the values to the 10% and 90% quantile of the values. Then values are normalized to be in the range 0.75 to 1.25. Outliers are cut off, allowing to show more subtle differences for the "normal" (non-outlier, centre 80%) regions.
- *Log normalization mode:* For the log-normalisation, first all cases with 0 values are replaced (by 0.0001) to allow computability. Then the data is logarithmized and finally also normalized to be in the range of 0.75 to 1.25. Logarithmizing values allows for a finer grained look at values when they are skewed to the left, i.e. there are many small values and few large values. This may be useful e.g. with degrees of urbanizations or similar indicators depicting spatial concentration.

Based on the normalization, the territorial impact *(i)* is calculated to be the product of the numerical value for the intensity of the exposure estimated by the experts and the normalized values for regional sensitivity *(i = e * s).* As a consequence the final scores depicting the impact are continuous and in the range of -1.875 to +1.875. These impact scores are then mapped to four positive or negative classes (plus the 0 class, indicating no exposure): minor impact *(|i| ∈]0;1]),* moderate impact *(|i| ∈]1;1.2]),* high impact *(|i| ∈]1.2;1.5])* and very high impact *(|i| ∈]1.5;1.875]).*

The tool shows the calculated impact for each region. Additionally it provides the functionality to show the *distance to the average* among impacts for each region. There is an option to show distance to average of three types of regions: the same regions as the selected typology, all regions or other regions which then need to be specified. Having chosen the type of distance to average to be calculated, the actual distance to average of each region can be read while moving the cursor of the computer over the region (see Figure 4.7). For workshop participants this is another informative way of presenting the impacts.

Figure 4.7: Step 3: Distance to average

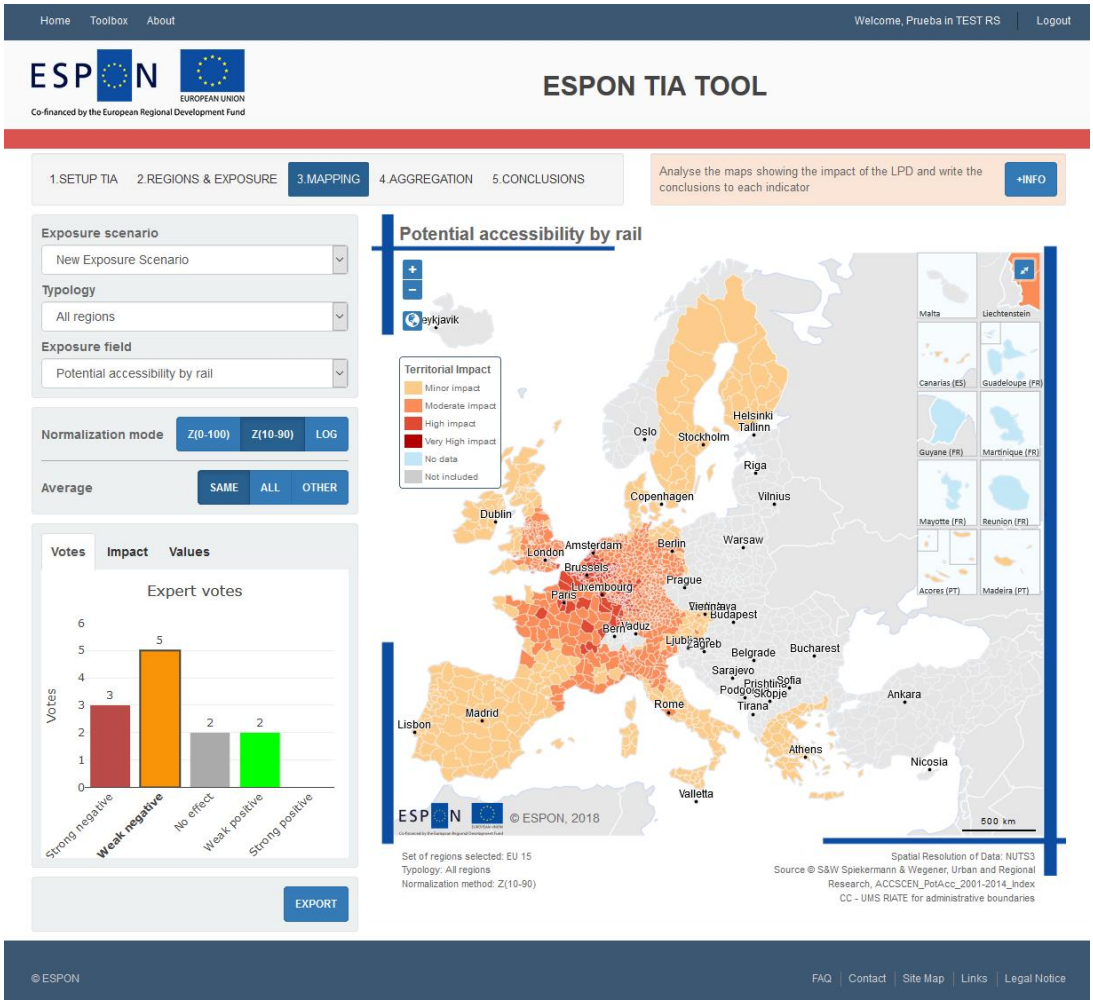


Source: ESPON TIA Tool (2018)

In the tool

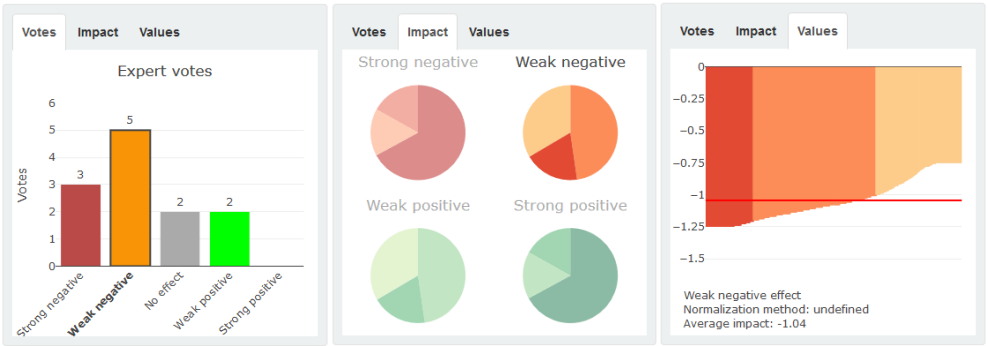
In order to generate maps, the moderator (or user) has to indicate for which scenario, typology and exposure field – including expert voting – the impact should be visualized on a map. Normalization mode should be selected as well and, if wished, the type of average for showing the distance to average. According to the selected type of region, values are shown only for the regions covered by the respective type. It is assumed that regions that do not belong to the selected type are either covered by another type of regions with a separate expert judgement or that they are only affected in a minor way.

Figure 4.8: Screenshot of ESPON TIA Tool, Step 3



Source: ESPON TIA Tool (2018)

Figure 4.9: Step 3: Graphs



Source: ESPON TIA Tool (2018)

In addition, the tool also provides visual presentations in different tabs. The tab *"votes"* shows the outcomes of expert voting on a bar graph. Impact assessment is always shown for one type of experts' judgement (usually the one that has received most votes). If the group wishes, the moderator can show the impact assuming another experts' judgement, e.g. "strong negative" instead of "negative". This can be done by clicking on the bars with judgement in the tab "votes."

Further visualizations are provided in form of pie charts and diagram presenting the distribution of impact classes, the distribution of values and the average value.

Finally, the tool contains a button for exporting maps as well as graphs and diagrams.

In the discussion

The moderator presents the voting results and the maps for each indicator in each scenario while engaging into discussion of the results. The group can choose different ways of presenting and understanding the results by switching normalization modes. The moderator can further foster the discussion and understanding by discussing the pie charts and diagrams with the experts.

Guiding questions could be:

- Does the selection of regions provide a plausible picture?
- Is the relationship between the different regions and the different results reasonable?
- Which patterns and results are astonishing for you? For which regions have you expected other results?
- Which might be the reason for different results than expected?
- Is the relationship between the different fields of exposure plausible? If it is not, the expert judgment about the intensity of exposure may need modification and further elaboration.

Note
As some participants will use the TIA tool for the first time, they can be overwhelmed with the amount of information and graphic presentation. The moderator should make sure to go through the different results and options available in the tool slowly and explain how to read the maps and diagrams.
Furthermore, when discussing the maps, it should not be forgotten that the maps are not showing the ultimate "truth", but the result of the sum of the judgments of the experts participating at the workshop.
The results should therefore be handled with care – i.e. in case of publication a clear reference must be made. The results should be critically reviewed and at best used to make up the minds of the decision-makers and/or to trigger further targeted analysis (i.e. a case study for some regions that have been identified as potential impacted in an asymmetrical way). It is worth also comparing them with findings of stakeholder consultations etc.

Results

Maps visualizing the impact based on the expert judgement, as well as graphs and diagrams that can be exported.

4.4 Step 4: Aggregation of Impact

Main tasks

The ESPON TIA quick check highlights, in which thematic fields which regions are potentially affected by a policy proposal. In policy discussions there might be a need to get a more consolidated information summing up the effects of all relevant thematic fields for each region. Such an aggregation can be done within the tool, but one has to consider some basic conditions under which this can be done:

Methodological background

The claim for an aggregation of results and a single denominator of territorial impact is legitimate and goes hand in hand with the human need for complete comparability and commensurability in decision-making. There are four major concepts which have to be taken into account (see e.g. Martinez-Alier et al., 1997):

- Strong commensurability, according to which there exists a common measure of the different consequences of an action, based on a cardinal scale of measurement.
- Weak commensurability, according to which there exists a common measure based on an ordinal scale of measurement.
- Strong comparability, according to which there exists a single comparative term by which all different consequences can be ranked.
- Weak comparability, according to which values are irreducibly plural and cannot be uniquely ordered along a single scale.

However, in decision theory it is also clear that an increase in either or both comparability and commensurability leads as consequence to a loss of information (see criticism on methods like cost-benefit analysis,

ecological footprint concepts etc.). Thus, in principle an aggregation of results may be possible (e.g. through cluster analysis), but it would mean that the TIA quick check loses its character of being quick and simple. Moreover, methodologically a simple overlay of two maps is completely misleading and outright wrong, as despite the fact that the single indicators are strongly comparable (as a single scale has been created), they are only weakly commensurable and may not be simply added up – as this would lead to false simplifications of thematically unrelated conclusions.

Therefore, aggregation of vastly different exposures is generally something one should only consider with great caution. The overall strength of different impacts related to each other is not known in detail. As a consequence the aggregated impact can only hint on what is exactly the overall result. The following conditions have to be taken into account:

- First, only exposures within a single typology can be compared and thus aggregated. Thus for every typology impact aggregation is conducted separately.
- Second, positive and negative exposure need to be aggregated separately, as it cannot be safely assumed that positive and negative effects mediate each other.
- Third, the results of the expert voting are used to weight the single exposures, i.e. the single exposure contributes to the overall positive or negative exposure based on the votes that have been collected.

The tool offers the possibility to get an overview of the aggregated territorial impact with the conditions above applied. An average positive and negative vote for each exposure is calculated. For the positive and negative aggregated impact the votes for strong and weak effects in that direction are added up with a respective vote value (1 for weak effects, 1.5 for strong effects) and then averaged by the use of the count of all votes (positive and negative). Thus, conflicting or undecided votes reduce the weights for the respective exposure field.

Then these average votes are applied as factors to the exposure values and they are added up. Finally, those values are normalized in the common way described in section 4.3.1 for all territories included in the set of regions and the typology selected. Here again an average vote is applied but this time only those exposure fields with a positive or negative voting are considered to land at an overall positive or negative impact comparable to the single maps.

In the discussion

In the discussion the moderator can present the results for an aggregated positive and an aggregated negative impact separately. However, in doing so, he needs to mention under which conditions.

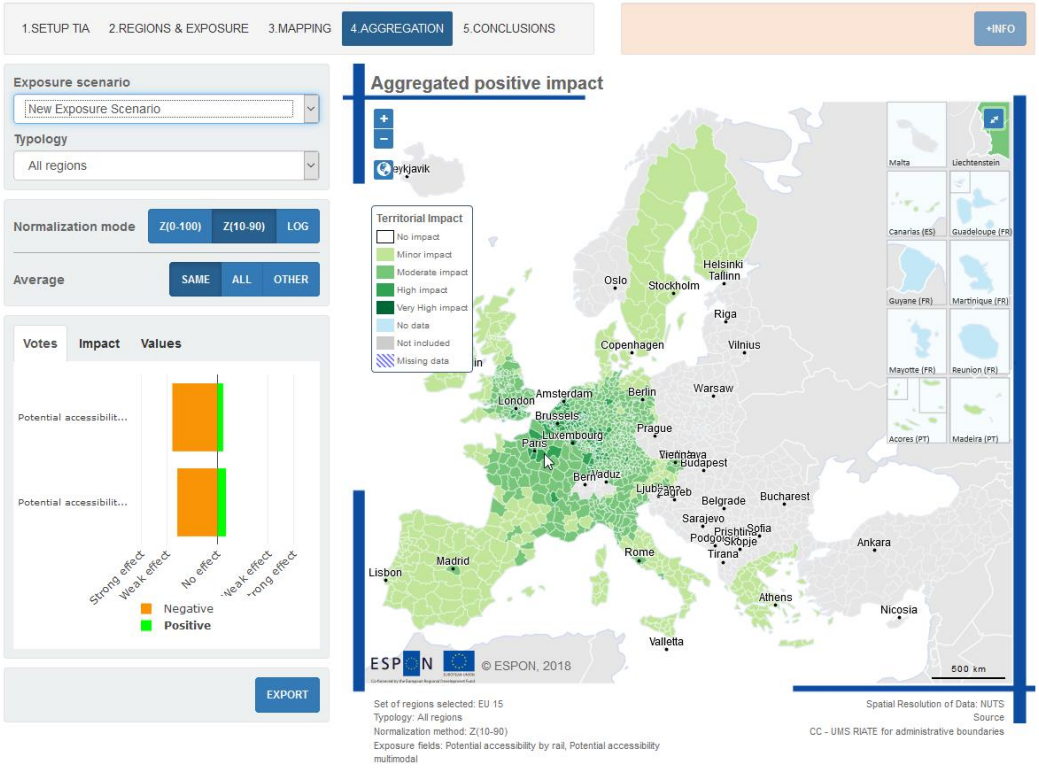
Based on the aggregated impact maps for each type of region, the moderator can foster the discussion by some guiding questions:

- Which regions are affected mostly in positive and negative turns?
- Which patterns and results are astonishing for you? For which regions have you expected other results?
- Are there special types of regions that would need special attention when further developing the policy proposal?

In the tool

Figure 4.10 shows an example for a map of aggregated positive impact. On the bottom left the average positive and negative voting (i.e. the weights) for the exposure fields is shown. When moving the cursor of the computer over a region, the name of the region appears and its aggregated impact value and a chart for the individual positive and negative exposure values for this region. This may help to understand better the territorial specifics in terms of all exposure fields. In the map, a distinction between “Missing data” and “No data” is made. “No data” indicates, that there is no data available for the specific region in any exposure field included in the aggregation. “Missing data” (drawn as an overlay hatch) indicates, that some of the exposure fields have data available while others do not for a given region. In this case, the aggregation is performed only for the exposure fields where data is available.

Figure 4.10: Aggregated impact map



Source: ESPON TIA Tool (2018)

Results

Overview of the impact of the policy on a larger scale, taking into account all regions within the selected set, and all selected exposure fields.

4.5 Step 5: Conclusions

4.5.1 Sub-step 5.1: Discussion on conclusions and recommendations

Main tasks

Based on the discussions about the systemic picture and the maps showing the territorial patterns of the potential impact a discussion on conclusions and policy recommendations can be initiated.

Methodological background

The main aim of the ESPON TIA Tool is to develop policy recommendations based on the results of the workshop. The results need to be discussed and reflected upon from a wider perspective of the proposed policy measure/initiative.

In the discussion

When starting the discussion about policy implications, it should be kept in mind that the maps give a “quick and dirty” first impression about the territorial distribution of potential impacts based on expert judgement and modelling. They show how, according to the expert group assessment, the policy proposal may affect different territories. The maps can be a starting point for further analysis on the territorial distributions of effects.

The discussion can be steered by the following guiding questions:

- Could this policy proposal have a disproportionately large impact on certain areas, regions or Member States? If yes, please indicate which ones and why.

- What kind of positive and negative implications can be derived?
- Is this problem concentrated in certain areas, regions or Member States?
- Which policy implications can be deducted from the results of the workshop?
- Should the policy be adjusted for the entire Union or some of its parts?
- Should the EU exempt some parts of the Union from the policy?

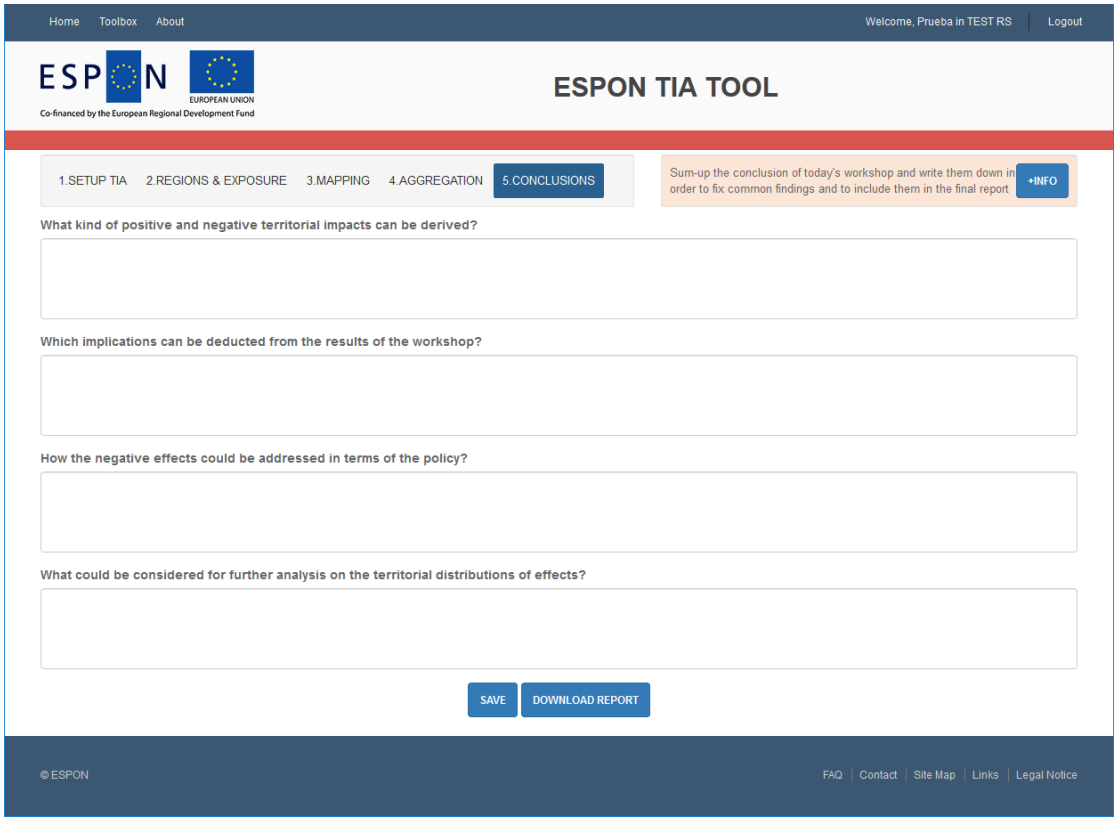
In the tool

The tool offers the possibility to formulate conclusions based on the findings of the workshop. The moderator and experts can mutually reflect on the findings based on guiding questions. Subsequently, the tool offers the possibility to download a template of the report where the steps and findings can be described while exported maps and graphs can be attached.

Results

Formulated conclusions based on the results of the workshop.

Figure 4.11: Screenshot of ESPON TIA Tool, Step 4



Source: ESPON TIA Tool (2018)

5 Workshop follow-up

Main tasks

As the result of a TIA Quick Check is meant to be a first impression of the territorial distribution of potential impacts, and not an in-depth analysis of those impacts, the follow-up is an important part. Depending on the scope of the TIA and the policy measure/initiative in question this can result in very different requirements. In general, based on the results of the workshop, a report describing all outcomes of the workshop can be prepared. All further measures, which could include an expert discussion on the base of the TIA report, a consultation with the target audience such as policymakers, the dissemination of the results to the general public etc. will depend on the policy background.

Methodological background

In order to record the outcomes of the workshop, it is essential to make a (short) report which includes all relevant steps and results. This helps to communicate the results of the ex-ante analysis to the relevant audience. It could serve as an input for further discussions.

However, the limitations of the results should be kept in mind: The maps are a result of a one-day workshop, the exposure is based on the expert judgement of a small group of experts, while the sensitivity of regions is described in many cases by proxy indicators. This very general model helps to steer the discussion but it cannot replace a thorough assessment of relevant and concrete territorial effects of a policy proposal.

The conclusions based on the workshop, and the interpretation of maps, especially when presenting them within a report, should always be clearly written down. The maps themselves without proper explanation and interpretation could lead to highly wrong assumptions, in particular when made available to the general public. This has to be kept in mind when writing the report and any further policy recommendations derived thereof.

In the tool

All impact-maps and diagrams can be downloaded and attached to the report.

A draft version of the report can be circulated to the participants asking them for their input. A final version of the report can then be prepared.

Results

Report documenting the results of the workshop, dissemination of the results to the target audience

Annex

A.1 Links and Literature

ESPON has conducted a lot of research in the field of territorial impact assessment. Examples of projects are ESPON ARTS – on which the ESPON TIA Tool is based upon – as well as the project ESPON EATIA. Further information can be obtained from the following links:

- ESPON (2011): The TIA tool. Standard Version. Available from: https://www.espon.eu/sites/default/files/attachments/TIA_quick_check_standard_version.pdf
- ESPON (2011): The TIA tool. Advanced Version. Available from: https://www.espon.eu/sites/default/files/attachments/TIA_quick_check_advanced_version.pdf
- ESPON (2012): ESPON ARTS. Assessment of Regional and Territorial Sensitivity. Available from: https://www.espon.eu/programme/projects/espon-2013/applied-research/arts-assessment-regional-and-territorial-sensitivity
- ESPON (2013): EATIA – ESPON and Territorial Impact Assessment. Available from: https://www.espon.eu/programme/projects/espon-2013/targeted-analyses/eatia-espon-and-territorial-impact-assessment

A practical ESPON guide summarises the main issues of territorial impact assessment:

- ESPON (2012): Territorial Impact Assessment of Policies and EU Directives. A practical guidance for policymakers and practitioners based on contributions from ESPON projects and the European Commission. Luxembourg. Available from: https://www.espon.eu/sites/default/files/attachments/TIA_Printed_version.pdf

Key documents of impact assessment in the European Union:

- EU COM general webpage on Impact Assessment: http://ec.europa.eu/smart-regulation/impact/index_en.htm
- EU COM (2009): Impact Assessment Guidelines. SEC(2009) 92. Available from: http://ec.europa.eu/smart-regulation/impact/commission_guidelines/docs/iag_2009_en.pdf
- EU COM (2013): Commission Staff Working Document. Assessing territorial impacts: Operational guidance on how to assess regional and local impacts within the Commission Impact Assessment System. Available from: http://ec.europa.eu/smart-regulation/impact/key_docs/docs/cswd_ati_en.pdf
- EU COM (2017): Commission Staff Working Document. Better Regulation Guidelines. Available from: https://ec.europa.eu/transparency/regdoc/rep/10102/2017/EN/SWD-2017-350-F1-EN-MAIN-PART-1.PDF
- EU COM (2017 com): Better Regulation toolbox. Complementing SWD(2017) 350. https://ec.europa.eu/info/sites/info/files/better-regulation-toolbox_0.pdf

Additional publications are e.g.:

- Martinez-Alier, J., G. Munda and J. O'Neill (1997), "Incommensurability of Values in Ecological Economics", in M. O'Connor and C. Spash (eds), Valuation and the Environment – Theory, Method and Practice, Cheltenham, UK and Lyme, USA: Edward Elgar.
- Fischer, Thomas B.; Gore, Tom; Golobic, Mojca; Marot, Naja (2013): Territorial Impact Assessment – a new policy assessment tool to support territorial cohesion. Available from: http://conferences.iaia.org/2013/pdf/Final%20papers%20review%20process%2013/Territorial%20Impact%20Assessment%20%E2%80%93%20a%20new%20policy%20assessment%20tool%20to%20support%20territorial%20cohesion%20.pdf
- Fischer, Thomas B.; Sykes, Olivier; Gore, Thomas; Marot, Naja; Golobic, Mojca; Pinho, Paulo; Waterhout, Bas; Perdicoulis, Anastassios (2014): Territorial Impact Assessment of European Draft Directives – The Emergence of a New Policy Assessment Instrument. Available from: https://www.tandfonline.com/doi/abs/10.1080/09654313.2013.868292

Committee of the Regions on Territorial Impact Assessment

- General information page including links to conducted workshops: https://cor.europa.eu/en/our-work/Pages/Territorial-Impact-Assessment.aspx
- CoR (2017): TIA Report – Work-life balance directive. TIA Workshop conducted on the 11.10.2017. Available from https://cor.europa.eu/en/our-work/Documents/Territorial-impact-assessment/work-life-balance.pdf

Other Sources:

- ÖIR (2013): Test exercise for a TIA workshop based on ESPON ARTS – Analysing the Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a framework on market access to port services and financial transparency of ports – The PORT'S PACKAGE (COM(2013) 296 final). TIA Workshop conducted on the 25.09.2013
- ÖIR (2015): Introduction presentation of the TIA Webtool.
- ÖIR (2017a): TIA Workshop – Development of Minimum Quality Requirements for Reused Water in Agricultural Irrigation and Aquifer Recharge. Workshop conducted 05.04.2017.
- ÖIR (2017b): TIA Workshop – Revision of Directive 2009/33/EC on Clean and Energy-efficient Road Transport Vehicles – Clean Vehicles Directive (CVD).Workshop conducted 11.05.2017.
- ÖIR (2017c): TIA Workshop – Work-life balance directive. TIA Workshop conducted on the 11.10.2017

A.2 Draft Agenda for a workshop

A.2.1 Draft agenda for a one-day in person workshop

09:30 – 09:30	**Registration and Welcome Coffee**
09:30 – 09:40	**Welcome and introduction into the Territorial Impact Assessment** e.g. representative of the hosting institution
09:40 – 10:00	**Tour de table – Getting to know the experts**
10:00 – 10:30	**Presentation of the policy proposal** representative of the institution developing the policy proposal
10:30 – 10:45	**Presentation of the results of impact study (if available)** author of the impact study
10:45 – 11:00	**ESPON TIA Quick Check tool** Moderator
11.00 – 12:30	**Interactive discussion on potential benefits of the policy proposal** with respect to the development of different territories of the EU ▪ Discussing cause/effect chains ▪ Defining the types of regions affected and estimating the intensity of the regional exposure
12:30 – 13:30	Lunch Break
13:30 – 14:30	**Interactive discussion on effects of the policy proposal** with respect to the development of different territories of the EU, Discussion on the findings, results and hypothesis
14:30 – 15:30	**Policy recommendations**
15:30 – 15:45	**Summing up the results, feedback, discussion on options for further improvements**

A.2.2 Draft Agenda for an online workshop

DAY 1	
09:45 – 10:00	**Connection and welcome**
10:00 – 10:15	**Welcome and introduction into the Territorial Impact Assessment** e.g. representative of the hosting institution
10:15 – 10:35	**Tour de table – Getting to know the experts**
10:35 – 11:00	**Presentation of the policy proposal** representative of the institution developing the policy proposal
11:00 – 11:00	**Presentation of the results of impact study (if available)** author of the impact study
11:00 – 11:15	**ESPON TIA Quick Check tool** Moderator
11.15 – 13:00	**Brainstorming and mind-mapping** with respect of effects on the development of different territories of the EU ▪ Discussing cause/effect chains ▪ Defining the types of regions affected and estimating the intensity of the regional exposure ▪ Discussing potential effects and selection of indicators
13:00	**End of day 1 – Voting open until afternoon**
DAY 2	
10:00 – 10:30	**Presentation of the TIA Tool outputs** ▪ Results of the Voting ▪ Maps
10:30 – 12:00	**Discussion on the findings, results and hypothesis**
12:00 – 12: 30	**Policy recommendations**
12:30 – 12:45	**Summing up the results, feedback, discussion on options for further improvements**
12:45	**End of Day 2**

A.3 List of indicators

General TIA Indicators

Accessibility

- Potential accessibility by air
- Potential accessibility by rail
- Potential accessibility by road
- Potential accessibility multimodal

Demography

- Average age of population
- Economically active population per km^2
- Net migration
- Old age dependency ratio
- Population density
- Young age dependency ratio

Education and Skills

- Early leavers from education and training
- Educational attainment of 30-34 year olds, primary education (levels 0-2)
- Educational attainment of 30-34 year olds, secondary education (levels 3-4)
- Educational attainment of 30-34 year olds, tertiary education (levels 5-8)
- Number of students in tertiary education
- Participation rate in education and training
- Quality of public education
- Share of young adults in education system

Employment

- Employment in agriculture, forestry and fishing
- Employment in industry
- Employment in industry and construction
- Employment in services
- Employment in technology and knowledge-intensive sectors
- Employment in tourism
- Entrepreneurship (share of private enterprises)
- Female employment ratio
- Share of full-time employments
- Share of part-time employments
- Electricity generated from hard coal and lignite
- Electricity generated from renewable sources
- Emissions of CO_2 per capita (tonnes)
- Emissions of NO_x per capita (kilotonnes)
- Exposure to heat waves
- Land cover: Share of agricultural areas
- Land cover: Share of forest areas
- Land cover: Share of irrigated land
- Land cover: Share of shrubland
- Land cover: Share of water areas

- Land use: Share of heavy environmental impact
- Municipal waste generated
- Protected areas (NATURA 2000)
- Recreational potential
- Relative size of built-up areas
- Solar energy potential
- Structural Green Infrastructures
- Urban population exposed to PM_{10} concentrations
- Urban wastewater
- Water Consumption
- Wind energy potential

Governance

- Corruption
- EAGF & EAFRD: Expenditure in share of GDP
- ERDF & CF Expenditure in Million Euro
- Impartiality of government services
- Quality and accountability of government services
- Quality of law enforcement
- Trust in the legal system
- Trust in the political system

Health

- Birth rate
- Health personnel
- Hospital beds
- Life expectancy at birth
- Quality of the public health care system
- Total fertility rate

Infrastructure

- Regional ICT infrastructure
- Regional transport infrastructure: motorways
- Regional transport infrastructure: navigable canals
- Regional transport infrastructure: navigable rivers
- Regional transport infrastructure: total railway lines

Innovation

- Patent applications/Mio inhabitants
- Share of R&D personnel and researchers

Natural Hazards

- Capacity of ecosystems to avoid soil erosion
- Landslide susceptibility
- Probability for seismic hazard
- Probability of forest fire hazard
- Sensitivity to avalanches
- Sensitivity to floods
- Soil erosion by water
- Soil retention
- Windstorm hazard

Regional economy

- Economic performance (GDP/capita)
- Economic performance (GVA/capita)
- GVA in industry (secondary sector)
- Ratio between emissions of CO_2 and GVA
- Total overnight stays per thousand inhabitants

Social disparities

- Disposable Income
- Gender balance employment
- People at risk of poverty or social exclusion
- Unemployment rate

Societal wellbeing

- Crimes recorded by the police
- Housing: Number of rooms per person
- Perceived social network support
- Self-evaluation of life satisfaction

Cross-Border TIA Indicators

Accessibility

- CB lower: Potential accessibility multimodal
- Service level of cross-border rail transport connections

Environment

- CB product: Protected areas (NATURA 2000)

Governance

- CB difference: Quality and accountability of government services
- CB lower: Quality and accountability of government services

Health

- CB difference: Hospital beds

Regional economy

- GDP loss due to cross-border obstacles

Urban TIA Indicators

Accessibility

- Average travel distances
- Potential accessibility by transport infrastructure

Demography

- Net migration
- Old age dependency ratio
- Population density
- Population weighted density
- Urbanisation level
- Young age dependency ratio

Education and Skills

- Early leavers from education and training
- Educational attainment of 30-34 year olds, primary education (levels 0-2)
- Educational attainment of 30-34 year olds, secondary education (levels 3-4)
- Educational attainment of 30-34 year olds, tertiary education (levels 5-8)
- Participation rate in education and training

Environment

- Concentration of NO_2
- Concentration of PM_{10}
- Recreational areas
- Removal capacity of NO_2
- Removal capacity of PM_{10}

Health

- Crude birth rate

Infrastructure

- Length of local roads per inhabitant
- Road safety
- Urban form efficiency

Innovation

- Share of R&D personnel and researchers

Land use and conservation

- Annual land take per inhabitant
- Built-up areas per inhabitant
- Hectare of green infrastructure per capita
- Share of green infrastructure

Natural Hazards

- Urban Flood Risk

Regional economy

- Economic performance (GDP/capita)
- Economic performance (GVA/capita)

Social disparities

- Unemployment rate

Outermost regions TIA indicators

(all indicators where at least 50% of the outermost regions are covered)

Accessibility

- Potential accessibility by road
- Potential accessibility by rail
- Potential accessibility by air
- Potential accessibility multimodal

Demography

- Population density
- Economically active population per km^2
- Old age dependency ratio
- Young age dependency ratio
- Out-migration

Education and Skills

- Educational attainment of 30-34 year olds, primary education (levels 0-2)
- Educational attainment of 30-34 year olds, secondary education (levels 3-4)
- Educational attainment of 30-34 year olds, tertiary education (levels 5-8)
- Share of pupils in Youth Education system
- Number of students in tertiary education
- Early leavers from education and training
- Quality of public education

Governance

- Corruption
- Quality and accountability of government services
- Impartiality of government services
- Quality of law enforcement
- EAGF & EAFRD: Expenditure in share of GDP
- ERDF & CF Expenditure in Million Euro

Infrastructure

- Regional ICT infrastructure

Innovation

- Patent applications/Mio inhabitants
- Employment in technology and knowledge-intensive sectors
- Share of R&D personnel and researchers

Economic development

- Economic performance (GDP/capita)
- Economic performance (GVA/capita)
- Entrepreneurship (share of private enterprises)
- Total overnight stays per thousand inhabitants
- Employment in agriculture, forestry and fishing
- Employment in industry and construction
- Employment in services
- Share of full-time employments
- Share of part-time employments
- Female employment ratio

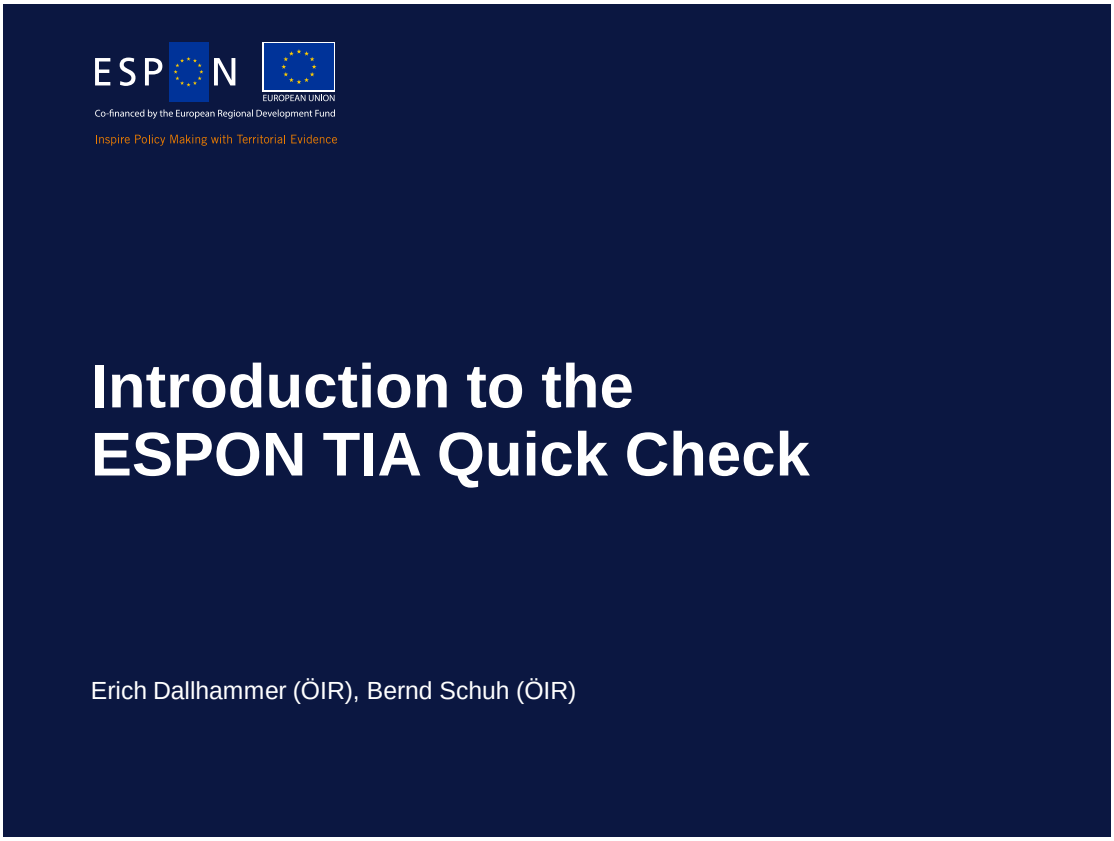
Social disparities

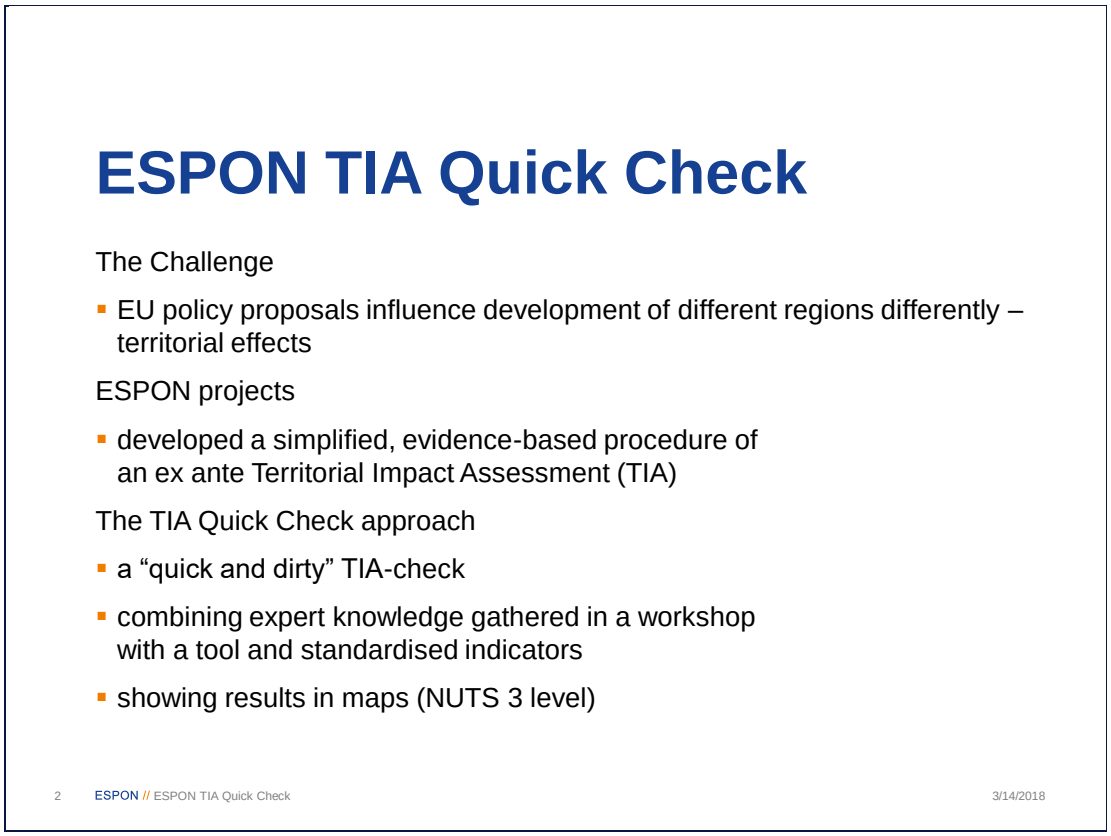
- Gender balance employment
- Unemployment rate
- Disposable Income
- People at risk of poverty or social exclusion

Societal wellbeing

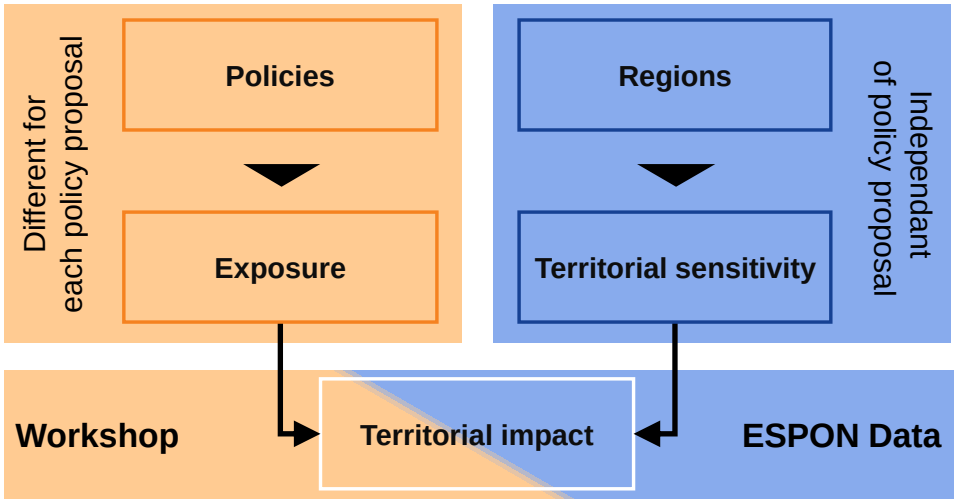
- Crimes recorded by the police
- Housing: Number of rooms per person
- Perceived social network support
- Self-evaluation of life satisfaction

A.4 Presentation on the ESPON TIA Quick Check methodology





The vulnerability concept



3 ESPON // ESPON TIA Quick Check 3/14/2018

Conceptual model: Brainstorming

Creating a systemic picture linking the policy proposal with territorial effects

economy
society
environment
governance

workshop morning session

4 ESPON // ESPON TIA Quick Check 3/14/2018

Are different types of regions effected differently?

Potential types of regions e.g.

- Urban regions / rural regions
- all regions
- Island regions / coastal regions / mountainous regions
- Crossborder regions
- etc.

workshop morning session

Indicators picturing the effects

- Group Decision:
  Which indicators picture the discussed effects best?
  - TIA tool provides a pre-defined set of indicators that picture the sensitivity of regions.
    - GDP/Capita
    - Quality and Accountability of Government Services
    - Share of Part-Time Employments
    - ...
  - Sensitivity: the "baseline" of the region when calculating impacts – the higher the sensitivity, the higher the impact

workshop morning session

Expert judgement on the exposure caused by the policy

For indicators selected according to the systemic picture

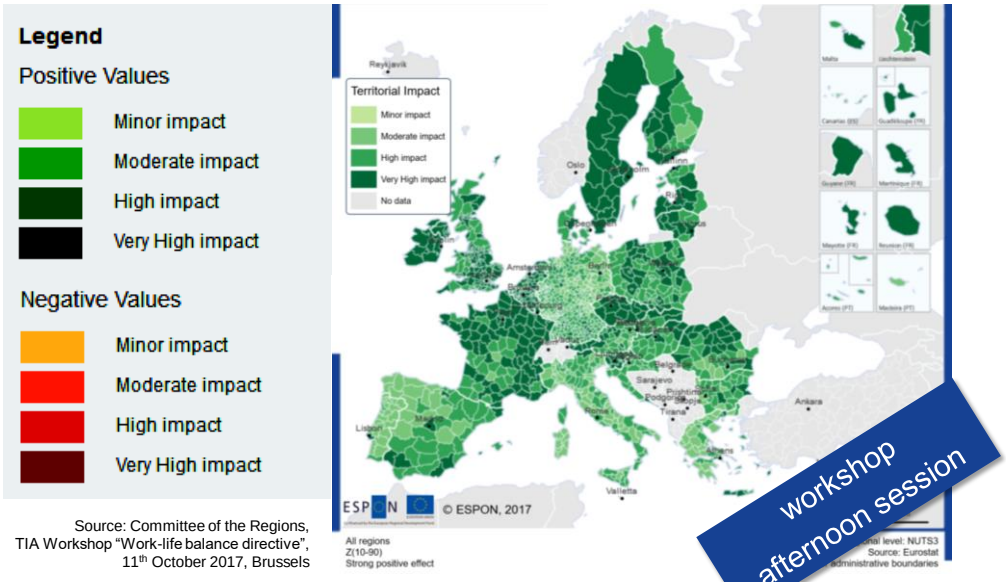
Economic growth (GDP/capita)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

workshop morning session

7 ESPON // ESPON TIA Quick Check 3/14/2018

Which regions will be affected in which fields?



Source: Committee of the Regions, TIA Workshop "Work-life balance directive", 11th October 2017, Brussels

workshop afternoon session

8 ESPON // ESPON TIA Quick Check 3/14/2018

Discussion: Conclusions and recommendations

- Hypothesis about the consequences on territorial development of regions
  - More favoured regions?
  - Regional concentration of effects?
  - Equal results across the EU?
- Conclusions and recommendations
  - Need for deeper understanding?
  - Policy measures to reduce negative effects?

A.5 Voting cards

ACCESSIBILITY

Potential accessibility by air

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ACCESSIBILITY

Potential accessibility by rail

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ACCESSIBILITY

Potential accessibility by road

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ACCESSIBILITY

Potential accessibility multimodal

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

DEMOGRAPHY

Average age of population

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

DEMOGRAPHY

Economically active population per km^2

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

DEMOGRAPHY

Net migration

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

DEMOGRAPHY

Old age dependency ratio

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

DEMOGRAPHY

Population density

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

DEMOGRAPHY

Young age dependency ratio

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EDUCATION AND SKILLS

Early leavers from education and training

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EDUCATION AND SKILLS

Educational attainment of 30-34 year olds, primary education (levels 0-2)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EDUCATION AND SKILLS

Educational attainment of 30-34 year olds, secondary education (levels 3-4)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EDUCATION AND SKILLS

Educational attainment of 30-34 year olds, tertiary education (levels 5-8)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EDUCATION AND SKILLS

Number of students in tertiary education

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EDUCATION AND SKILLS

Participation rate in education and training

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EDUCATION AND SKILLS

Quality of public education

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EDUCATION AND SKILLS

Share of young adults in education system

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EMPLOYMENT

Employment in agriculture, forestry and fishing

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EMPLOYMENT

Employment in industry

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EMPLOYMENT

Employment in industry and construction

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EMPLOYMENT

Employment in services

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EMPLOYMENT

Employment in technology and knowledge-intensive sectors

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EMPLOYMENT

Employment in tourism

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EMPLOYMENT

Entrepreneurship (share of private enterprises)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EMPLOYMENT

Female employment ratio

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EMPLOYMENT

Share of full-time employments

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EMPLOYMENT

Share of part-time employments

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Electricity generated from hard coal and lignite

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Electricity generated from renewable sources

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Emissions of CO_2 per capita (tonnes)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Emissions of NO_x per capita (kilotonnes)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Exposure to heat waves

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Land cover: Share of agricultural areas

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Land cover: Share of forest areas

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Land cover: Share of irrigated land

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Land cover: Share of shrubland

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Land cover: Share of water areas

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Land use: Share of heavy environmental impact

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Municipal waste generated

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Protected areas (NATURA 2000)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Recreational potential

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Relative size of built-up areas

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Solar energy potential

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Structural Green Infrastructures

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Urban population exposed to PM_{10} concentrations

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Urban wastewater

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Water Consumption

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Wind energy potential

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

GOVERNANCE

Corruption

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

GOVERNANCE

EAGF & EAFRD: Expenditure in share of GDP

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

GOVERNANCE

ERDF & CF Expenditure in Million Euro

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

GOVERNANCE

Impartiality of government services

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

GOVERNANCE

Quality and accountability of government services

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

GOVERNANCE

Quality of law enforcement

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

GOVERNANCE

Trust in the legal system

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

GOVERNANCE

Trust in the political system

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

HEALTH

Birth rate

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

HEALTH

Health personnel

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

HEALTH

Hospital beds

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

HEALTH

Life expectancy at birth

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

HEALTH

Quality of the public health care system

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

HEALTH

Total fertility rate

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

INFRASTRUCTURE

Regional ICT infrastructure

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

INFRASTRUCTURE

Regional transport infrastructure: motorways

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

INFRASTRUCTURE

Regional transport infrastructure: navigable canals

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

INFRASTRUCTURE

Regional transport infrastructure: navigable rivers

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

INFRASTRUCTURE

Regional transport infrastructure: total railway lines

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

INNOVATION

Patent applications/Mio inhabitants

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

INNOVATION

Share of R&D personnel and researchers

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

NATURAL HAZARDS

Capacity of ecosystems to avoid soil erosion

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

NATURAL HAZARDS

Landslide susceptibility

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

NATURAL HAZARDS

Probability for seismic hazard

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

NATURAL HAZARDS

Probability of forest fire hazard

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

NATURAL HAZARDS

Sensitivity to avalanches

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

NATURAL HAZARDS

Sensitivity to floods

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

NATURAL HAZARDS

Soil erosion by water

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

NATURAL HAZARDS

Soil retention

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

NATURAL HAZARDS

Windstorm hazard

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

REGIONAL ECONOMY

Economic performance (GDP/capita)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

REGIONAL ECONOMY

Economic performance (GVA/capita)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

REGIONAL ECONOMY

GVA in industry (secondary sector)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

REGIONAL ECONOMY

Ratio between emissions of CO_2 and GVA

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

REGIONAL ECONOMY

Total overnight stays per thousand inhabitants

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

SOCIAL DISPARITIES

Disposable Income

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

SOCIAL DISPARITIES

Gender balance employment

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

SOCIAL DISPARITIES

People at risk of poverty or social exclusion

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

SOCIAL DISPARITIES

Unemployment rate

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

SOCIETAL WELLBEING

Crimes recorded by the police

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

SOCIETAL WELLBEING

Housing: Number of rooms per person

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

SOCIETAL WELLBEING

Perceived social network support

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

SOCIETAL WELLBEING

Self-evaluation of life satisfaction

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ACCESSIBILITY

CB lower: Potential accessibility multimodal

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ACCESSIBILITY

Service level of cross-border rail transport connections

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

CB product: Protected areas (NATURA 2000)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

GOVERNANCE

CB difference: Quality and accountability of government services

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

GOVERNANCE

CB lower: Quality and accountability of government services

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

HEALTH

CB difference: Hospital beds

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

REGIONAL ECONOMY

GDP loss due to cross-border obstacles

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ACCESSIBILITY

Average travel distances

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ACCESSIBILITY

Potential accessibility by transport infrastructure

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

DEMOGRAPHY

Net migration

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

DEMOGRAPHY

Old age dependency ratio

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

DEMOGRAPHY

Population density

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

DEMOGRAPHY

Population weighted density

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

DEMOGRAPHY

Urbanisation level

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

DEMOGRAPHY

Young age dependency ratio

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EDUCATION AND SKILLS

Early leavers from education and training

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EDUCATION AND SKILLS

Educational attainment of 30-34 year olds, primary education (levels 0-2)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EDUCATION AND SKILLS

Educational attainment of 30-34 year olds, secondary education (levels 3-4)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EDUCATION AND SKILLS

Educational attainment of 30-34 year olds, tertiary education (levels 5-8)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

EDUCATION AND SKILLS

Participation rate in education and training

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Concentration of NO_2

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Concentration of PM_{10}

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Recreational areas

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Removal capacity of NO_2

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

ENVIRONMENT

Removal capacity of PM_{10}

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

HEALTH

Crude birth rate

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

INFRASTRUCTURE

Length of local roads per inhabitant

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

INFRASTRUCTURE

Road safety

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

INFRASTRUCTURE

Urban form efficiency

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

INNOVATION

Share of R&D personnel and researchers

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

LAND USE AND CONSERVATION

Annual land take per inhabitant

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

LAND USE AND CONSERVATION

Built-up areas per inhabitant

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

LAND USE AND CONSERVATION

Hectare of green infrastructure per capita

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

LAND USE AND CONSERVATION

Share of green infrastructure

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

NATURAL HAZARDS

Urban Flood Risk

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

REGIONAL ECONOMY

Economic performance (GDP/capita)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

REGIONAL ECONOMY

Economic performance (GVA/capita)

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

SOCIAL DISPARITIES

Unemployment rate

strong advantageous	weak advantageous	neutral/no/ unknown	weak disadvantageous	strong disadvantageous
++	+	o	-	--
☐	☐	☐	☐	☐

A.6 Indicator postcards

ACCESSIBILITY

Potential accessibility by air

– more means lower sensitivity

For each NUTS-3 region the population in all destination regions is weighted by the travel time by air to go there. The weighted population is summed up to the indicator value for the accessibility potential of the origin region. All indicator values are expressed as index, i.e. related to the ESPON average.

ACCESSIBILITY

Potential accessibility by rail

– more means lower sensitivity

For each NUTS-3 region the population in all destination regions is weighted by the travel time by rail to go there. The weighted population is summed up to the indicator value for the accessibility potential of the origin region. All indicator values are expressed as index, i.e. related to the ESPON average.

ACCESSIBILITY

Potential accessibility by road

– more means lower sensitivity

For each NUTS-3 region the population in all destination regions is weighted by the travel time by road to go there. The weighted population is summed up to the indicator value for the accessibility potential of the origin region. All indicator values are expressed as index, i.e. related to the ESPON average.

ACCESSIBILITY

Potential accessibility multimodal

– more means lower sensitivity

For each NUTS-3 region the population in all destination regions is weighted by the multimodal travel time to go there. The weighted population is summed up to the indicator value for the accessibility potential of the origin region. All indicator values are expressed as index, i.e. related to the ESPON average. Multimodal accessibility is an aggregation of road, rail and air accessibility.

DEMOGRAPHY

Average age of population

+ more means higher sensitivity

Average age of population

DEMOGRAPHY

Economically active population per km^2

\+ more means higher sensitivity

Economically active population or labour force or workforce, includes both employed (employees and self-employed) and unemployed people, but not the economically inactive, such as pre-school children, school children, students and pensioners.

DEMOGRAPHY

Net migration

– more means lower sensitivity

The crude rate of net migration is equal to the difference between the crude rate of population change and the crude rate of natural change (that is, net migration is considered as the part of population change not attributable to births and deaths).

DEMOGRAPHY

Old age dependency ratio

\+ more means higher sensitivity

Ratio of persons of an age when they are conventionally considered economically inactive (65 years and over) to the number of persons conventionally considered of working age (15-64)

DEMOGRAPHY

Population density

\+ more means higher sensitivity

Inhabitants per km^2

DEMOGRAPHY

Young age dependency ratio

\+ more means higher sensitivity

Ratio of the persons aged 0-14 divided by the number of persons conventionally considered of working age (respectively 15-64)

Education and Skills	Early leavers from education and training + more means higher sensitivity	People with at most lower secondary education and not in further education or training, % of total population aged 18-24
Education and Skills	Educational attainment of 30-34 year olds, primary education (levels 0-2) + more means higher sensitivity	Share of population aged 30-34 with less than primary, primary and lower secondary education (levels 0-2) by NUTS 2 regions
Education and Skills	Educational attainment of 30-34 year olds, secondary education (levels 3-4) + more means higher sensitivity	Share of population aged 30-34 with upper secondary and post-secondary non-tertiary education (levels 3-4) by NUTS 2 regions
Education and Skills	Educational attainment of 30-34 year olds, tertiary education (levels 5-8) + more means higher sensitivity	Share of population aged 30-34 with tertiary education (levels 5-8) by NUTS 2 regions
Education and Skills	Number of students in tertiary education + more means higher sensitivity	Students enrolled in tertiary education (levels 5-8) per 1,000 inhabitants

Education and Skills	Participation rate in education and training + more means higher sensitivity	Share of population aged 25-64 years who stated in a survey that they received education or training in the last four weeks
Education and Skills	Quality of public education – more means lower sensitivity	People were asked to rate the quality of public education on a scale of “1” (extremely poor quality) to “10” (extremely high quality) in their area.
Education and Skills	Share of young adults in education system + more means higher sensitivity	Share of young adults (20-24 years) in education system
Employment	Employment in agriculture, forestry and fishing + more means higher sensitivity	Share of persons employed in agriculture, forestry and fishing on total employment
Employment	Employment in industry + more means higher sensitivity	Share of persons employed in industry (NACE Rev 2. Section C-D) on total employment (SBS data comprises the NACE Rev 2. sections B-J and L-N and division S95)

EMPLOYMENT	Employment in industry and construction + more means higher sensitivity	Share of persons employed in industry and construction on total employment
EMPLOYMENT	Employment in services + more means higher sensitivity	Share of persons employed in services on total employment
EMPLOYMENT	Employment in tech-nology and knowledge-intensive sectors + more means higher sensitivity	Share of employment in high-technology manufacturing and knowledge-intensive high-technology services
EMPLOYMENT	Employment in tourism + more means higher sensitivity	Total number of employment in tourism (NACE Rev2. Sections Accommodation (I55) and Food and beverage service activities (I56)) in 1,000 persons
EMPLOYMENT	Entrepreneurship (share of private enterprises) – more means lower sensitivity	Share of self employed persons on total employed persons

EMPLOYMENT	Female employment ratio + more means higher sensitivity	Ratio between female and male employment (at working age, 15 to 64 years)
EMPLOYMENT	Share of full-time employments + more means higher sensitivity	Share of full-time employments on full-time and part-time employments
EMPLOYMENT	Share of part-time employments + more means higher sensitivity	Share of part-time employments on full-time and part-time employments
ENVIRONMENT	Electricity generated from hard coal and lignite + more means higher sensitivity	Share of electricity generated from hard coal and lignite on total electricity generated
ENVIRONMENT	Electricity generated from renewable sources – more means lower sensitivity	Share of electricity generated from renewable sources on total electricity generated

ENVIRONMENT	Emissions of CO_2 per capita (tonnes) + more means higher sensitivity	CO_2 (Carbon dioxide) emissions in tonnes/year/capita
ENVIRONMENT	Emissions of NO_x per capita (kilotonnes) + more means higher sensitivity	NO_x (Nitrogen oxides) emissions in kilotonnes/year/capita
ENVIRONMENT	Exposure to heat waves + more means higher sensitivity	Number of days over 30°C per year
ENVIRONMENT	Land cover: Share of agricultural areas + more means higher sensitivity	Share of agricultural areas (arable land, permanet crops, pastures, heterogeneous agricultural areas) on total NUTS 3 area
ENVIRONMENT	Land cover: Share of forest areas + more means higher sensitivity	Share of forest areas on total NUTS 3 area

ENVIRONMENT

Land cover: Share of irrigated land

\+ more means higher sensitivity

Share of irrigated land on agricultural area

ENVIRONMENT

Land cover: Share of shrubland

\+ more means higher sensitivity

Share of shrubland (natural grassland, moors and heathland, sclerophyllous vegetation, transitional woodland shrub) on total NUTS 3 area

ENVIRONMENT

Land cover: Share of water areas

\+ more means higher sensitivity

Share of water areas (seas, rivers, coastal lagoons, estuaries,...) on total NUTS 3 area

ENVIRONMENT

Land use: Share of heavy environmental impact

\+ more means higher sensitivity

Share of land used for uses with heavy environmental impact

ENVIRONMENT

Municipal waste generated

\+ more means higher sensitivity

Tonnes of municipal waste generated per capita

ENVIRONMENT

Protected areas (NATURA 2000)

\+ more means higher sensitivity

NATURA 2000 areas in % of total NUTS 3 area 2012

ENVIRONMENT

Recreational potential

– more means lower sensitivity

Public, local, nature-based, outdoor recreational activities include a wide variety of practices ranging from walking, jogging or running in the closest green urban area or at the river/lake/sea shore, among a myriad of other possibilities. The model estimates the capacity of urban ecosystems to provide recreational opportunities.

ENVIRONMENT

Relative size of built-up areas

\+ more means higher sensitivity

Share of built-up areas on total NUTS 3 area

ENVIRONMENT

Solar energy potential

\+ more means higher sensitivity

Potential for electricity generation of solar photovoltaics in MWh/km^2

ENVIRONMENT

Structural Green Infrastructures

– more means lower sensitivity

Share of Green Infrastructure on total NUTS area

ENVIRONMENT

Urban population exposed to PM_{10} concentrations

\+ more means higher sensitivity

% of urban population exposed to PM_{10} concentrations exceeding the daily limit value (50 µg/m^3) on more than 35 days in a year

ENVIRONMENT

Urban wastewater

\+ more means higher sensitivity

Urban wastewater not collected by collecting systems nor treated by individual or other appropriate systems in % of generated load

ENVIRONMENT

Water Consumption

\+ more means higher sensitivity

Freshwater consumption litres/day/capita

ENVIRONMENT

Wind energy potential

\+ more means higher sensitivity

Potential for electricity generation by land area of wind onshore in MWh/km^2

GOVERNANCE

Corruption

– more means lower sensitivity

This indicator is computed based on the results of a survey and the national estimates from the World Bank Governance Indicators. In the survey, people were asked about their perceptions and experiences with corruption in the government services health care, education and law enforcement as well as in elections in their area.

GOVERNANCE

EAGF & EAFRD: Expenditure in share of GDP

\+ more means higher sensitivity

Share of EAGF & EAFRD expenditure on GDP

GOVERNANCE

ERDF & CF Expenditure in Million Euro

\+ more means higher sensitivity

Share of ERDF & CF expenditure on GDP

GOVERNANCE

Impartiality of government services

– more means lower sensitivity

This indicator is computed based on the results of a survey and the national estimates from the World Bank Governance Indicators. In the survey, people were asked to rate the impartiality of the government services health care, education and law enforcement as well as of the tax authorities in their area.

GOVERNANCE

Quality and accountability of government services

– more means lower sensitivity

This indicator is computed based on the results of a survey and the national estimates from the World Bank Governance Indicators. In the survey, people were asked to rate the quality of the government services health care, education and law enforcement in their area.

GOVERNANCE

Quality of law enforcement

– more means lower sensitivity

People were asked to rate the quality of police force on a scale of “1” (extremely poor quality) to “10” (extremely high quality) in their area.

GOVERNANCE	Trust in the legal system + more means higher sensitivity	Percentage of people having low trust in the legal system (expressed as 100-% having low trust)
GOVERNANCE	Trust in the political system + more means higher sensitivity	Percentage of people having low trust in the political system (expressed as 100-% having low trust)
HEALTH	Birth rate – more means lower sensitivity	Number of live births per 1,000 inhabitants
HEALTH	Health personnel – more means lower sensitivity	Medical doctors per hundred thousand inhabitants
HEALTH	Hospital beds – more means lower sensitivity	Hospital beds per hundred thousand inhabitants

HEALTH

Life expectancy at birth

– more means lower sensitivity

Life expectancy at given exact age (less than one year)

HEALTH

Quality of the public health care system

– more means lower sensitivity

People were asked to rate the quality of the health care system on a scale of “1” (extremely poor quality) to “10” (extremely high quality) in their area.

HEALTH

Total fertility rate

– more means lower sensitivity

The total fertility rate is the mean number of children that would be born alive to a woman during her lifetime if she were to pass through her childbearing years conforming to the fertility rates by age of a given year.

INFRASTRUCTURE

Regional ICT infrastructure

– more means lower sensitivity

The availability of broadband is measured by the percentage of households that are connectable to an exchange that has been converted to support xDSL-technology, to a cable network upgraded for internet traffic, or to other broadband technologies.

INFRASTRUCTURE

Regional transport infrastructure: motorways

– more means lower sensitivity

Kilometres of motorways per 1,000 km^2

INFRASTRUCTURE	Regional transport infrastructure: navigable canals – more means lower sensitivity	Kilometres of navigable canals per 1,000 km^2
INFRASTRUCTURE	Regional transport infrastructure: navigable rivers – more means lower sensitivity	Kilometres of navigable rivers per 1,000 km^2
INFRASTRUCTURE	Regional transport infrastructure: total railway lines – more means lower sensitivity	Kilometres of total railway lines per 1,000 km^2
INNOVATION	Patent applications/Mio inhabitants + more means higher sensitivity	Total patent applications to the EPO per million inhabitants
INNOVATION	Share of R&D personnel and researchers + more means higher sensitivity	Share of R&D personnel and researchers on active population; numerator in full-time equivalent

NATURAL HAZARDS

Capacity of ecosystems to avoid soil erosion

– more means lower sensitivity

Capacity of ecosystems to avoid soil erosion assigning values ranging from 0 to 1 at pixel level. This indicator is related to the capacity of a given land cover type to provide soil protection.

NATURAL HAZARDS

Landslide susceptibility

+ more means higher sensitivity

The landslide hazard indicator shows the mean landslide susceptibility at NUTS3. The indicator is based on the data of the JRC European Landslide Susceptibility Map, version 2 (ELSUS v2) (Wilde et al. 2018; Günther et al. 2014). The data are provided by JRC European Soil Data Centre (ESDAC). The ELSUS v2 map includes topographic information (elevation, slope angle), shallow sub-surface lithology, land cover, and more than 149,000 landslide events. The data provides no information on the actual frequency, timing or magnitude of landslide events (Wlide et al. 2018). In addition, the reliability of the ELSUS v2 map could be evaluated against actual landslide events for only 65% of the mapped area. Especially in relatively flat areas, there was no information about landslide events (Wilde et al. 2018; Günther et al. 2014). ELSUS v2 classifies landslide susceptibility in five classes (1= very low; 2= low; 3= moderate; 4= high; 5= very high) at a resolution of 200 m x 200 m. To present landslide susceptibility at NUTS3 average for each NUTS3 area was calculated.

NATURAL HAZARDS

Probability for seismic hazard

+ more means higher sensitivity

This indicator displays the territorially distributed intensity of ground shaking with a certain probability of exceedance rather than the occurrence of earthquakes at specific locations. The information for the indicator is provided by the Seismic Hazard Harmonization in Europe -project (SHARE) (Gardini et al., 2013, 2014). Rather than the occurrence of earthquakes at specific locations, the seismic hazard indicator displays the territorially distributed intensity of ground shaking with a certain probability of exceedance. The calculation of the seismic hazard includes in addition to records of earthquake events, e.g., fault structures, the strain of the Earth's crust, and other factors affecting ground motion (Gardini et al. 2014). SHARE provides a European dataset of peak ground acceleration in proportion to the acceleration of gravity (m/s2) with a 10 % chance of exceedance in 50 years.

NATURAL HAZARDS

Probability of forest fire hazard

+ more means higher sensitivity

Probability of forest fire hazard (1= very low; 5 = very high)

NATURAL HAZARDS

Sensitivity to avalanches

+ more means higher sensitivity

Spatial likelihood of avalanches occurrence in 6 classes (1= very low; 5 = very high; 0 = probability)

NATURAL HAZARDS

Sensitivity to floods

\+ more means higher sensitivity

This indicator shows the percentage of flooded land area per NUTS 3 for riverine floods. The indicator is based on the Joint Research Center (JRC) flood hazard map for Europe – 100-year return period. The JRC flood hazard maps are based on the Lisflood hydrological model (Van Der Knijff et al., 2010)

NATURAL HAZARDS

Soil erosion by water

\+ more means higher sensitivity

Soil erosion by water, tonnes per hectare

NATURAL HAZARDS

Soil retention

\+ more means higher sensitivity

Soil retention is calculated as soil loss without vegetation cover minus soil loss including the current land use/cover pattern. Specifically, this indicator takes into account climate data (observed measurements for rainfall and modelled for snow), topographic aspects, soil properties and the presence or not of the vegetation cover.

NATURAL HAZARDS

Windstorm hazard

\+ more means higher sensitivity

This indicator shows maximum 3-second gust speeds (m/s) over a 72-hour time period for winter storms in the years 1981-2010 at NUTS 3 level. The maximum 3-second gust is retrieved for each NUTS3 area from 46 storms that were considered “insurance relevant” (WISC, 2020). This maximum can be interpreted as wind speed with a pseudo-30-years return period (WISC, 2020). The data was retrieved from a set of historical storm footprints for the years 1940 to 2016 produced by the UK Met Office as part of the Windstorm Information Service (WISC) project. The historic storm footprints were created with the UK Met Office Unified Model and reanalysis data from ERA-Interim and ERA5.

REGIONAL ECONOMY

Economic performance (GDP/capita)

– more means lower sensitivity

Gross domestic product (GDP) at current market prices; Purchasing Power Standard per inhabitant

REGIONAL ECONOMY	Economic performance (GVA/capita) – more means lower sensitivity	Gross Value Added (GVA) at basic prices, Euro, total per inhabitant
REGIONAL ECONOMY	GVA in industry (secondary sector) + more means higher sensitivity	Share of GVA in NACE Rev 2. Section B-E on total GVA
REGIONAL ECONOMY	Ratio between emissions of CO_2 and GVA + more means higher sensitivity	Ratio between emissions of CO_2 (tonnes) and GVA (Mio Euro)
REGIONAL ECONOMY	Total overnight stays per thousand inhabitants + more means higher sensitivity	Total nights spent at hotels; holiday and other short-stay accommodation; camping grounds, recreational vehicle parks and trailer parks
SOCIAL DISPARITIES	Disposable Income – more means lower sensitivity	Disposable income in purchasing power standard, Euro per inhabitant

SOCIAL DISPARITIES

Gender balance employment

\+ more means higher sensitivity

Absolute difference between female and male employment rates

SOCIAL DISPARITIES

People at risk of poverty or social exclusion

\+ more means higher sensitivity

At-risk-of-poverty rate on total population

SOCIAL DISPARITIES

Unemployment rate

\+ more means higher sensitivity

Unemployed people/economically active population

SOCIETAL WELLBEING

Crimes recorded by the police

\+ more means higher sensitivity

Crimes recorded by the police (intentional homicide, robbery, burglary of private residential premises, theft of a motorized land vehicle) per 1,000 inhabitants

SOCIETAL WELLBEING

Housing: Number of rooms per person

– more means lower sensitivity

Average number of rooms per person in occupied dwellings, ratio.

SOCIETAL WELLBEING

Perceived social network support

– more means lower sensitivity

Percentage of people that replied “Yes” with respect to all respondents to the following question: If you were in trouble, do you have relatives or friends you can count on to help you whenever you need them, or not?

SOCIETAL WELLBEING

Self-evaluation of life satisfaction

– more means lower sensitivity

Average score from 0 to 10 of people that replied to the following question: On which step of the ladder would you say you personally feel you stand at this time?

ACCESSIBILITY

CB lower: Potential accessibility multimodal

\+ more means higher sensitivity

For each NUTS-3 region the population in all destination regions is weighted by the multimodal travel time to go there. The weighted population is summed up to the indicator value for the accessibility potential of the origin region. All indicator values are expressed as index, i.e. related to the ESPON average. Multimodal accessibility is an aggregation of road, rail and air accessibility. CB lower: Regions lower than the CB neighbours are senstitive, higher differrences mean higher sensitivities.

ACCESSIBILITY

Service level of cross-border rail transport connections

– more means lower sensitivity

Based on the service level of cross-border rail transport connections classified by Sippel et al. (2018), the overall service quality of each NUTS 3 region was assessed on a scale from 0 to 5:

- 5: at least two “fully exploited” connections
- 4: at least one “fully exploited” connection
- 3: at least one “exploited” connection “with shortcomings” (service or speed)
- 2: at least one “not fully exploited” connection or a connection that is “under construction”
- 1: at least one connection with “only freight services” or with “official, well-advanced plans for new railway infrastructure”
- 0: all other regions

ENVIRONMENT

CB product: Protected areas (NATURA 2000)

\+ more means higher sensitivity

NATURA 2000 areas in % of total NUTS 3 area; CB product: High values on both sides result in high sensitivity

GOVERNANCE

CB difference: Quality and accountability of government services

\+ more means higher sensitivity

This indicator is computed based on the results of a survey and the national estimates from the World Bank Governance Indicators. People were asked to rate the quality of the government services health care, education and law enforcement in their area. CB difference: Higher differences between region and neighbours mean higher sensitivity

GOVERNANCE

CB lower: Quality and accountability of government services

\+ more means higher sensitivity

This indicator is computed based on the results of a survey and the national estimates from the World Bank Governance Indicators. People were asked to rate the quality of the government services health care, education and law enforcement in their area. CB lower: Regions lower than the CB neighbours are sensitive, higher differences mean higher sensitivities

HEALTH	CB difference: Hospital beds + more means higher sensitivity	Hospital beds per hundred thousand inhabitants; CB difference: Higher differences between region and neighbours mean higher sensitivity
REGIONAL ECONOMY	GDP loss due to cross-border obstacles + more means higher sensitivity	Loss of GDP in EU NUTS 3 land border regions due to cross-border obstacles
ACCESSIBILITY	Average travel distances + more means higher sensitivity	Modelled average travel distances according to LUISA projections and a spatial interaction model. The results are based on a number of simulation-specific assumptions but are instrumental in informing on the relative potential for sustainable urban transport.
ACCESSIBILITY	Potential accessibility by transport infrastructure – more means lower sensitivity	This indicator shows the opportunity for interaction that transport infrastructure provides. The measures are based on road travel times and population distributions in such a way that shorter travel times and/or higher population counts lead to higher levels of accessibility.
DEMOGRAPHY	Net migration – more means lower sensitivity	The crude rate of net migration is equal to the difference between the crude rate of population change and the crude rate of natural change (that is, net migration is considered as the part of population change not attributable to births and deaths).

DEMOGRAPHY

Old age dependency ratio

\+ more means higher sensitivity

Ratio of persons of an age when they are conventionally considered economically inactive (65 years and over) to the number of persons conventionally considered of working age (15-64). This indicator comprises the reference year 2018 and, in case of unavailability of data, the next closest possible year, i.e. 2017 or 2016.

DEMOGRAPHY

Population density

\+ more means higher sensitivity

Total population divided by total area (person/km^2). This indicator is calculated by dividing the projected population in a region by the total area of the region.

DEMOGRAPHY

Population weighted density

\+ more means higher sensitivity

Population weighted density (Person/km^2) refers to a metric which measures the density at which the average citizen lives. It is calculated by taking the weighted average of the density of all parcels of land that make up a city, with each parcel weighted by its population (using the formula D=Sum(Pidi)/Sum(Pi), where D is the population-weighted density of an metro area and Pi and di the respective population and density of each "parcels"). For this indicator, this concept was extended to larger geographical boundaries (LAU2 or country) and consider 1km pixels as "parcels".

DEMOGRAPHY

Urbanisation level

\+ more means higher sensitivity

Annual rate of change in urban population proportion from 2010 to 2030 – proportion of the population living in Local Administrative Units – 2 (LAU2s) classified as cities, towns and suburbs. Classification of LAU2s as cities, towns and suburbs is based on the LUISA degree of urbanisation projections. The population that live in cities, towns and suburbs is calculated based on total LAU2 populations, not the population of grids.

DEMOGRAPHY

Young age dependency ratio

\+ more means higher sensitivity

Ratio of the persons aged 0-14 divided by the number of persons conventionally considered of working age (respectively 15-64). This indicator comprises the reference year 2018 and, in case of unavailability of data, the next closest possible year, i.e. 2017 or 2016.

EDUCATION AND SKILLS

Early leavers from education and training

\+ more means higher sensitivity

Share of population aged 18-24 years with at most lower secondary education and not in further education or training

EDUCATION AND SKILLS

Educational attainment of 30-34 year olds, primary education (levels 0-2)

\+ more means higher sensitivity

Share of population aged 30-34 with less than primary, primary and lower secondary education (levels 0-2)

EDUCATION AND SKILLS

Educational attainment of 30-34 year olds, secondary education (levels 3-4)

\+ more means higher sensitivity

Share of population aged 30-34 with upper secondary and post-secondary non-tertiary education (levels 3-4)

EDUCATION AND SKILLS

Educational attainment of 30-34 year olds, tertiary education (levels 5-8)

\+ more means higher sensitivity

Share of population aged 30-34 with tertiary education (levels 5-8)

EDUCATION AND SKILLS

Participation rate in education and training

– more means lower sensitivity

Share of population aged 25-64 years who stated in a survey that they received education or training in the last four weeks

ENVIRONMENT

Concentration of NO_2

\+ more means higher sensitivity

This indicator measures the annual mean concentrations of NO_2. NO_2 is one of the main pollutants emitted by road vehicles, shipping, power generation industry and households. Annual mean concentrations NO_2 were calculated using Land Use Regression (LUR) Models. The LUR model was built using annual mean NO_2 concentration for 2010 from the monitoring sites included in the AirBase database (dependent variable) and several parameters (independent variables) defined within a Geographic Information System.

ENVIRONMENT

Concentration of PM_{10}

\+ more means higher sensitivity

This indicator measures the annual mean concentrations of PM_{10}. PM_{10} is one of the main pollutants emitted by household and (to a lower extent) commercial and institutional fuel combustion, followed by industrial activities and transport. Annual mean concentrations PM_{10} were calculated using Land Use Regression (LUR) Models. The LUR model was built using annual mean PM_{10} concentration for 2010 from the monitoring sites included in the AirBase database (dependent variable) and several parameters (independent variables) defined within a Geographic Information System.

ENVIRONMENT

Recreational areas

– more means lower sensitivity

Public, local, nature-based, outdoor recreational activities include a wide variety of practices ranging from walking, jogging or running in the closest green urban area or at the river/lake/sea shore, among a myriad of other possibilities. The model estimates the capacity of urban ecosystems to provide recreational opportunities.

ENVIRONMENT

Removal capacity of NO_2

– more means lower sensitivity

Removal by urban vegetation was calculated as the product of deposition velocity and NO_2 concentration. Air pollutant deposition velocity was assessed following the approach proposed by Pistocchi et al. (2010) that estimates deposition velocity (DV) as a linear function of wind speed at 10 m height (w) and land cover type. NO_2 concentration levels were estimated from a concentration map derived from Land Use Regression (LUR) models. Areas covered by vegetation were calculated by combination of detailed maps of urban vegetation and forest, aggregated to 100-meter resolution. For urban vegetation, the green layers of the Global Human Settlement Layer were used (Florczyk et al., 2014, Pesaresi et al, 2013). For forests, the High Resolution Global Forest map developed by Hansen (2014) was used. In overlapping areas, the maximum value of both maps was applied. Final map of vegetation had values between zero (no vegetation) and one (totally covered by vegetation).

ENVIRONMENT

Removal capacity of PM_{10}

– more means lower sensitivity

Removal by urban vegetation was calculated as the product of deposition velocity and PM_{10} concentration in areas covered by vegetation. Air pollutant deposition velocity was assessed following the approach proposed by Pistocchi et al. (2010) that estimates deposition velocity (DV) as a linear function of wind speed at 10 m height (w) and land cover type. PM_{10} concentration levels were estimated from a concentration map derived from Land Use Regression (LUR) models. Areas covered by vegetation were calculated by combination of detailed maps of urban vegetation and forest, aggregated to 100-meter resolution. For urban vegetation, the green layers of the Global Human Settlement Layer were used (Florczyk et al., 2014, Pesaresi et al, 2013). Hansen. For forests, the High Resolution Global Forest map developed by Hansen (2014) was used. In overlapping areas, the maximum value of both maps was applied. Final map of vegetation had values between zero (no vegetation) and one (totally covered by vegetation)

HEALTH

Crude birth rate

– more means lower sensitivity

Ratio of the number of live births during a year to the average population in that year. The value is expressed per 1000 population. This indicator comprises the reference year 2018 and, in case of unavailability of data, the next closest possible year, i.e. 2017, 2016, 2015 or 2014.

INFRASTRUCTURE

Length of local roads per inhabitant

– more means lower sensitivity

Length of all local roads (Functional Roads Classes 4-8) divided by total residential population of the area.

INFRASTRUCTURE

Road safety

+ more means higher sensitivity

Number of road traffic fatalities per 100,000 inhabitants. Where possible, a recent 2-year average has been calculated. AT: 2013; BG, LV, NL: 2012-2013; FR: 2012; IT, PL, PT, SK, NO: 2011-2012; IE, EL: 2011; CZ, SE: 2010-2011; LU, MT: 2009; RO: 2008.

INFRASTRUCTURE

Urban form efficiency

– more means lower sensitivity

The indicator first identifies the minimum number of public transport stops that could serve 80% of a city's total population, and second computes the average distance between the identified stops. It finally normalizes the multiplication of these two values with the population that is served within the city. If the majority of a city can be served with few public transport stops and these stops are close to each other, this city has a more efficient urban form. It classifies cities into five classes, based on their population size from small to large and compares cities within these classes whether they have high or low urban form efficiency in terms of ease of access to potential public transport services.

INNOVATION

Share of R&D personnel and researchers

+ more means higher sensitivity

Share of R&D personnel and researchers on active population; numerator in full-time equivalent

LAND USE AND CONSERVATION

Annual land take per inhabitant

\+ more means higher sensitivity

Annual rate land take per inhabitant from 2010 to 2030. This indicator measures how much land initially covered by agriculture, forests and semi-natural areas is converted into housing, commercial, industrial and service areas over time. In this indicator, first annual average of total land take is taken, and then it is divided by the last years' population in order to find the annual land take per inhabitant described in square metres.

LAND USE AND CONSERVATION

Built-up areas per inhabitant

\+ more means higher sensitivity

Total surface of built-up areas (buildings detected by means of satellite imagery analysis) per inhabitant.

LAND USE AND CONSERVATION

Hectare of green infrastructure per capita

– more means lower sensitivity

Green Infrastructure (GI) is defined as a strategically planned and delivered network of high quality green spaces and other environmental features that are structurally and functionally "interconnected and therefore bring added benefits and are more resilient". GI includes natural and semi-natural areas, features and green spaces in rural and urban, terrestrial, freshwater, coastal and marine areas. GI is calculated by reclassifying the LUISA land use map and provided in ha per capita.

LAND USE AND CONSERVATION

Share of green infrastructure

– more means lower sensitivity

Green infrastructure includes natural and semi-natural areas, features and green spaces in rural and urban, terrestrial, freshwater, coastal and marine areas.

NATURAL HAZARDS

Urban Flood Risk

\+ more means higher sensitivity

A composite indicator reflecting the relative flood risk within urban areas by taking into account the natural exposure (predicted flooded area and mean depth), and the sensitivity of the city to flooding (population and infrastructure affected).

REGIONAL ECONOMY

Economic performance (GDP/capita)

– more means lower sensitivity

Gross domestic product (GDP) at current market prices in Purchasing Power Standards (PPS) per inhabitant

REGIONAL ECONOMY

Economic performance (GVA/capita)

– more means lower sensitivity

Gross value added (GVA) at basic prices in Euro per inhabitant

SOCIAL DISPARITIES

Unemployment rate

+ more means higher sensitivity

The unemployment rate is the number of people unemployed as a percentage of the labour force. This indicator comprises the reference year 2018 and, in case of unavailability of data, the next closest possible year, i.e. 2017 or 2016.

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