Inspire Policy Making with Territorial Evidence

**TOOLS & MAPS //**

# ESPON TIA Tool 2020-2022

Inception Report // November 2020

**Authors**
Erich Dallhammer, Bernd Schuh; Roland Gaugitsch, Chien-Hui Hsiung, ÖIR GmbH (Austria)
Sergio Muñoz Gómez, Rubén Navarro, Laurentia Technologies (Spain)

**Advisory group**
ESPON EGTC: Marjan van Herwijnen, Zintis Hermansons. Igor Caldeira, Eleftherios Stavropoulos

**Information on ESPON and its projects can be found at www.espon.eu.**
The website provides the possibility to download and examine the most recent documents produced by finalised and ongoing ESPON projects.

Co-financed by the European Regional Development Fund

Inspire Policy Making with Territorial Evidence

# Table of contents

# List of tables

# Abbreviations

| | |
|---|---|
| CB | Cross Border |
| CoR | Committee of the Regions |
| D | Deliverable |
| DG REGIO | Directorate General for Regional and Urban Policy |
| DG AGRI | Directorate General for Agriculture and Rural Development |
| EC | European Commission |
| EEA | European Environmental Agency |
| ESPON | European Territorial Observatory Network |
| EU | European Union |
| EUROSTAT | European Statistical Office |
| FADN | Farm Accountancy Data Network |
| FUA | Functional urban area |
| GAINS | Greenhouse gas – Air pollution Interactions and Synergies |
| GDP | Gross Domestic Product |
| GVA | Gross Value Added |
| IA | Impact Assessment |
| JRC | Joint Research Centre |
| LUISA | Land-Use based Integrated Sustainability Assessment modelling platform |
| NO2 | Nitrogen dioxide |
| NUTS | Nomenclature des unités territoriales statistiques (Nomenclature of Territorial Units for Statistics) |
| PM | Particulate Matter |
| RoS | Request of Service |
| SBS | Structural Business Statistics |
| TIA | Territorial Impact Assessment |
| UAA | Utilised Agricultural Area |
| UK | United Kingdom |

# 1  Context of the report

The current report is produced in the context of ongoing work on the ESPON TIA Webtool implementing the TIA Quick Check methodology. The Quick Check methodology originates in the ESPON ARTS project and aims at supporting policymakers in assessing the potential territorial impacts of legislations, policies and directives (LPDs) ex-ante in order to improve their design in the drafting stage. The user-friendly approach of the methodology combining quantitative data on regional sensitivity with expert judgement (gathered in a workshop setting) on the type and strength of policy impacts (combination of "regional sensitivity" and "exposure" in the vulnerability concept) allows for an uncomplicated first assessment of a policies territorial effects in a short timeframe. To better support the practical application and to increase the user friendliness, the Quick Check methodology has been embedded in a Webtool which allows for calculation of territorial impact values and presents the results in impact maps as a basis for expert discussion.

The webtool has been upgraded considerably from its early stages to its current state, offering a number of customisation methods, the possibility to upload user-generated data and dedicated portals for cross-border assessments and urban assessments. Furthermore, new methodological elements such as enabling Fuzzy typologies, integrating comparative indicators as well as an aggregation function have been implemented. Numerous upgrades have been based on user requests and were tested in actual TIA workshops on their practicability. The tool thus always was developed in close consultation with the final applicants and the policy makers putting the results to use.

The current project will follow a similar logic, with some upgrades being done to the tool as a default, some upgrades being developed based on user requests, and all elements being tested in actual workshops which are part of the project. Default upgrades concern for example:

- Updating all datasets and typologies currently included in the tool to their latest version

- Updating the NUTS and FUA versions used

- Implementing additional indicator types (composite indicators) and Fuzzy typologies

- Updating of all guidance material

The inception report details the approach to those upgrades and also includes proposals for additional functionalities which the project team has been discussing with applicants and ESPON EGTC. The project is accompanied by a Steering Group comprised of members of ESPON EGTC as well as DG REGIO and the CoR which are the main implementing bodies for Territorial Impact Assessments at the EU level.

# 2 Proposal for new functionalities and implementation of NUTS 2021 version

In the inception phase of the project, a first assessment of requested functionalities based on the discussion with ESPON EGTC in the kick-off meeting has been undertaken. The project team for each functionality elaborated on the approach and proposes a way to implement those functionalities and adaptions to the tool in the sections below. All approaches will be discussed and agreed upon in the meeting with ESPON EGTC following the submission of this delivery.

## 2.1 Fuzzy typologies

Fuzzy typologies have been added to the tool in the last development phase and subsequently been trialled in several workshops and were well received. It was thus requested to further expand the application of Fuzzy typologies and integrate additional datasets as well as to further develop the methodological approach. Furthermore, it is necessary to update the typologies currently in the tool to the relevant NUTS version.

### 2.1.1 Additional Fuzzy typologies

Typologies in the TIA Quick Check context are used to either limit the analysis on specific regions (e.g. in case an LPD only/mainly affects Island Regions -> dichotomous typology) or to depict an LPDs effects which are linked to certain property (e.g. in case an LPD will create stronger effects in regions located at a border but still have effects in other regions -> Fuzzy typology). Therefore, the typology is always strongly linked to the LPD under assessment and only a selected number of standard typologies which are likely to be applied in multiple circumstances should be provided by the tool. As of now, Fuzzy typologies for Urban Areas, Rural Areas, Mountainous Areas and Border Regions have been included in the tool. The project team has screened potentially relevant datasets provided by the EEA (Corine Land Cover) and Eurostat (SBS [reg_sbs], Tourism statistics [reg_tour], Transport statistics [reg_tran], Digital Economy statistics [reg_isoc]) as well as DG AGRI (CAP Context Indicator C18) and assessed them based on the following criteria:

- **Completeness:** Only complete datasets with no data gaps in the relevant areas are a sound basis for creating typologies. As opposed to data gaps in exposure fields, which will only exclude a certain region from an assessment for one particular indicator, a data gap in a typology would mean the permanent exclusion of the affected region for all exposure fields. For standard typologies in the TIA Tool, the dataset should thus at least cover the EU27 (as the main application so far were assessments for EU LPDs) and preferably the entire ESPON space without gaps.

- **Value distribution:** The value distribution for a continuous typology plays an important role. While raw values in some cases can be applied without any issues, datasets which show a heavily skewed distribution to either side or which contain strong outliers lead to uninterpretable results. With a linear attribution of values between the smallest and the largest value in the raw dataset, the presence of strong outliers can lead to values close to 0 or values close to 1 for all but a few regions. This effectively eliminates the purpose of a Fuzzy typology as intraregional variation is not visible for most of the dataset.

- **Content validity:** A standard typology in the TIA Tool should not only be relevant for very specific use cases but rather applicable to a wider range of possible cases. Nevertheless, some specifics have to be covered to increase the relevance of Fuzzy typologies.

- **Methodological fit:** As the TIA Quick Check is a methodology applying relative comparisons, a TIA based on it always provides relative impact strength among the compared regions and not absolute impacts. Thus, meaningful results require a certain minimum number of regions in the dataset, and in the case of Fuzzy typologies a certain number of comparable regions (i.e. in a similar range of the typology values). Otherwise, due to the underlying mathematical concept, the typology becomes the main or even sole determining factor of impact values with little or no differentiation between exposure fields.

Based on these criteria, most datasets e.g. out of the SBS and the tourism and transport statistics were deemed to be too specialized for a standard typology (i.e. data out of the SBS related to a specific sector

can be valuable for calculating a typology, but not all individual sectors can and should be included as standard typologies but rather produced when relevant for a workshop). Furthermore, datasets for digital economy are exclusively NUTS2 or higher, and other than for exposure fields, a regional breakdown via a proxy is not advisable for a Fuzzy typology. While mathematically possible, it adds another element of uncertainty in an already "fuzzy" approach, thus potentially leading to results which cannot be interpreted on a sound basis.

Thus, the Corine Land Cover data turned out to be most valuable for calculating additional Fuzzy typologies. As it is a raster dataset, values can be calculated for any geographic resolution and for any NUTS version. The project team has tested the respective calculations and achieved promising results. With 44 different categories of land cover available in the Corine dataset, still a selection has to be made for standard typologies. In general, the share of a specific land cover category respectively aggregate of land cover categories on the total area of a region will be used for calculating the Fuzzy typology. The project team has selected 4 categories/aggregates which are listed in section 3.2 and which are proposed to be integrated into the tool.

Additionally, as there is growing interest from the European Commission regarding the "Rural Proofing" of EU legislation, a fuzzy typology relating to rural areas will be added as a standard typology. The Utilised Agricultural Area per region (as a share of the total area) calculated by DG AGRI for the CAP context indicators will be used, allowing to target policies where the rurality of a region is strongly related to its agricultural production area. Other standard typologies are included already, which are less reliant on agricultural area but rather e.g. on the rural population.

Furthermore, the project team is in contact with Eurostat regarding the potential added value the DEGURBA datasets could provide. As of now, only an additional element of the urban/rural typology has been identified as potentially valuable, however, pending further consultation with Eurostat, more detailed data. especially for the Urban IA. could be added at a later stage.

### 2.1.2    Further methodological developments

In the current project, two particular methodological approaches to Fuzzy typologies will be tested in a workshop application. Both do not require a technical change to the tool but are rather conceptual ideas which relate to the method of calculating a typology and can be uploaded into the tool as it stands. The respective challenge is that the workshops which are going to be requested do not fulfil the preconditions for applying such a methodology. The project team will consider the possibility for each workshop and at least propose the approach when potentially applicable. Nevertheless, the decision to apply a specific typology always lies with the experts participating in the workshop. The two approaches to be tested are:

- ▪ Index based typologies – which will be based on an index containing multiple sub indicators. There is a number of such indices already available on the European scale (e.g. the Regional Innovation Scoreboard) and furthermore they can be created similar to the methodology for calculating composite indicators. This approach requires a careful consideration of the LPD assessed and furthermore a sound judgement on which indicators will likely be used in the TIA workshop. An indicator which is used to build the index cannot be used as an exposure field as well, thus those would have to be excluded in the workshop. If well received, such an index-based typology could subsequently be added as a standard typology.

- ▪ Ordinal scale variables – which will be custom made typologies applying ranked categories. Based on specific properties – e.g. the type of airport in driving distance for a region's inhabitants, or the presence of specific types of cargo hubs – a "rank" can be calculated. An example of such a variable would be a typology for airport regions, where the "importance" of an airport could be ranked (e.g. world-wide hub – European hub – national hub – regional hub – no relevant airport in driving distance). For the purpose of creating a Fuzzy typology, each "rank" would be assigned a value between 0 and 1, with 1 meaning the rank would be more exposed to the policy and 0 meaning the exposure would be minimal. Ranks in between will be assigned values along a linear function. Such typologies will have to be created specifically for an LPD and are unlikely to be included as a standard typology.

Based on the results and feedback received, the approaches to fuzzy typologies will be taken up in the guidance material in order, to enable users to develop their own typologies, indicating as well additional time and effort necessary for their development. While it is unlikely that one of those typologies will be included as a standard, a methodological guidance will be provided to users to create their own corresponding indicators. Guidance will also be added to the moderators guide on how to approach Cross-Border- and Urban

Regions (deciding between the application of the specific portals and typologies/fuzzy typologies in the general TIA) as well as Rural- and Outermost Regions in relation to Rural- or Outermost Proofing.

### 2.1.3 Updating existing typologies

For the current Fuzzy typologies, a transfer to the NUTS 2016 nomenclature creates minor issues only in Ireland as well as in 3 instances in the rest of Europe (PL926/913 and DE91C). Regions in Northern Ireland however have been considerably changed and Eurostat will be consulted for a solution as the original datasets were provided by them. In case of NUTS2 level typologies due to considerable changes in Ireland, Hungary, Poland, Lithuania and the UK would arise, however, currently all Fuzzy typologies are originally NUTS3 based. A list of relevant updates for all typologies is provided in section 3.1.

## 2.2 Composite indicators

A new methodological element to be added to the Quick Check and to be implemented in the TIA tool are composite indicators. They consist of multiple individual sub-indicators and are designed to reflect results of a certain intervention targeting multiple fields in a combined manner. Composite indicators have been tested in that regard by the project team in the ESPON Territorial Evidence project. In the context of the Quick Check methodology, this can be especially relevant, where no indicator specific enough to accurately reflect a certain policy action is available, however, a combination of two or more indicators can be.

The composition of such a composite indicator, however, is no trivial task, as consideration has to be given both to the indicators included as well as to the respective weights applied to each sub-indicator. As the composition can strongly influence the results of any impact calculation within the webtool, any decision has to be well reasoned and should be linked both to the specific policy actions which need to be depicted as well as to the properties of the sub-indicators making up the composite indicator. It is apparent, that the process of creating such an indicator cannot be done "ad hoc" in the context of a workshop session, but rather has to take place in advance.

Composite indicators are therefore neither trivial to conceptualise nor trivial to use and interpret in the context of a TIA workshop. As a first step of introducing composite indicators to the TIA Quick Check methodology, the project team will trial them in in upcoming workshops to investigate how they are received by participating experts and if they should be included as a standard functionality. For each workshop, the project team will design and calculate at least one composite indicator and make sure that the experts are supplied with all relevant information to properly apply and interpret the indicator if selected. The project team will pay attention to keep those indicators simple and comprehensible, with each sub-indicator included and the respective weights applied being clearly linked to potential LPD actions and subsequent effects. The composite indicator then will be calculated with the following steps:

#### Normalising

Calculating the normalised regional value for each sub-indicator by feature scaling[1], [2]

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

$X_r'$      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

---

[1] 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

[2] 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.

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

### Weighting

Multiplying each normalised indicator with the assigned weight[3]

$$X_r{}'' \;=\; X_r{}' \,*\, w_x$$

$X_r{}'$     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 project team will document any calculations relevant for the understanding of a composite indicator prepared in the context of a given workshop and make this documentation available to the participating experts if requested.

Given the complexity of designing a composite indicator and the necessary preparatory steps, the indicators will be manually prepared outside of the tool. The project team will be setting up an excel template to support in the calculation of composite indicators, which subsequently can be uploaded into the tool as any other indicator. An additional field will be added to the database identifying if an indicator is composite (the corresponding box will have to be ticked when uploading the indicator) in order to make this apparent to the users of the tool.

In order to allow other users to create their own composite indicators, the project team will add the respective guidance to the Moderators Guide of the tool. Furthermore, the excel file supporting the creation of composite indicators will be provided together with the guidance documents.

## 2.3    NUTS 2021/FUA 2020

As the currently used NUTS 2013 classification is outdated, database and shapefiles will be updated to the most recent version. Recently, Eurostat has published the NUTS 2021 shapefiles and relevant correspondence tables, thus the project team proposes to implement the NUTS 2021 shapefile as standard into the tool. This will require an update to multiple elements of the tool, as database, import function and mapping function are affected. As the use of NUTS 2021 for transmission of data to the EC (respectively Eurostat) is only mandatory starting by January 1st 2021, no datasets are currently available in NUTS 2021 nomenclature. Nevertheless, all datasets from Eurostat and most other data providers will start using the 2021 nomenclature in the coming years while NUTS 2016 will be phased out. Therefore, the project team proposes the application of NUTS 2021 instead of NUTS 2016 as a standard.

---

[3] 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.

Changes between NUTS 2016 and 2021 are limited, while slightly more changes have been implemented in the step from 2013 to 2016 as depicted in Table 2.1.

### Table 2.1: NUTS changes 2013 – 2016 – 2021

| Change type | 2013-2016 | 2016-2021 |
|---|---|---|
| Recoded | 148 | 21 |
| Boundary shift | 19 | 14 |
| New region | 12 | 1 |
| discontinued | 7 | 6 |
| Total changes | 185 | 42 |

**Source: Consortium based on Eurostat 2020**

These changes require a decision on how to treat data from older NUTS versions than 2021, which in principle can be implemented in two different ways. In the following section, both options are presented. Based on the discussion in the Steering Group Meeting for this Inception Report, the second option will be implemented in the tool.

### Parallel use of different NUTS Versions

This solution would require the setup of multiple databases and multiple shapefiles, one for each NUTS version. All data would be stored in the originally used NUTS version and mapped accordingly with the originally used shapefile. The upside of this solution would be that no loss of information occurs for the overall calculation as no estimations for discontinued/newly created regions are necessary. On the other hand, this solution would lead to several issues related to functions of the tool:

- The aggregation function conceptually does not work with different NUTS versions. In case indicators from different NUTS versions are included in a TIA session, this would either require the aggregation function to be disabled or for all regions which have been modified between the NUTS versions to be excluded from the aggregation.

- Interactions between indicators cannot be calculated in case of different NUTS versions. The calculation requires a comparable dataset which is not the case when different NUTS versions are used. This would eliminate the possibility to judge on the relation between individual indicators in a TIA session.

- The mapping function would have to be adapted to re-load the shapefile with every switch between indicators. This could lead to reduced performance of the tool.

- Interpretability of the maps could suffer in case numerous regions with changes are part of one assessment. While this would not necessarily be the case for NUTS 2016 to NUTS 2021 (as there are mainly minor changes), it would become relevant when multiple NUTS versions are included.

### Implementation of correspondence tables

For each NUTS version change, Eurostat publishes correspondence tables clearly identifying which regions have experienced which changes. Furthermore, adaptions to regions borders can be assessed based on the official shapefiles provided. The project team based on these correspondence tables and the work done by JRC[4] has already successfully trialled an R algorithm capable of automatically converting datasets between NUTS versions offering multiple methods for establishing values for split regions, merged regions and regions with boundary shifts. This correspondence calculator could be implemented in the upload function of the tool. It would require the uploader to identify which NUTS version was used by the indicator and what type of data is used (absolute or relative values) and all further calculations would be done by the tool automatically. While this solution would lead to a small loss of information (i.e. a few regional values would be estimates), it would eliminate the issues of the other available option, i.e.:

---

[4] https://urban.jrc.ec.europa.eu/nutsconverter/#/

▪ The aggregation function would work to the full extent

▪ Interactions between indicators could be calculated for any combination of indicators

▪ The mapping function would not require reloading of shapefiles for each switch between indicators

▪ All maps would be NUTS 2021 maps thus applying the same basis and allowing for complete comparisons

Based on the considerations above, the project team recommends the implementation of correspondence tables. This solution would enable all functions of the tool to work as expected and do not place any limitations on them, while also improving the performance. This upside would make up for the downside of a small loss of information, where in the worst case 1.9% of regions will be affected in the switch from 2013 to 2016 NUTS version and, also in the worst case, 1.4% of regions will be affected in the switch from 2016 to 2021 NUTS version. Furthermore, this solution is flexible to adapt to future NUTS changes as only the correspondence script in the import function would have to be changed. Thus if data for the NUTS 2024/2026 version is made available, adapting the correspondence tables can be updated easily e.g. in the frame of a future service contract for the TIA tool.

For Functional Urban Areas[5] in the Urban IA Tool the same solution can be applied with the respective correspondence to be calculated automatically.

All data currently available in the tool will be transformed to NUTS 2021 in the course of the updating process.

## 2.4    Additional functionalities

Additional functionalities can be requested to be implemented in the scope of the contract by ESPON EGTC. While a number of possible functionalities have been discussed, the project team considers four as particularly relevant:

### Updating the CB portal

The cross-border portal of the TIA tool is developed based on a typology of cross-border regions from the last programming period. For the 2021-2027 period, some changes to the CB programmes have occurred, with some regions having been removed while others have been added. While this concerns only a limited number of regions and programmes, an update to cover all programmes in the 2021-2027 programming period is advised. This would require a recalculation of comparative CB indicators as well, as those depend on the regions included in the typology.

In the context of such an update, it could be discussed to go beyond the definition of "CB areas" as those regions participating in CB programmes. However, the implementation of specific CB "functional areas" is likely better achieved through tailor-made typologies and comparative indicators as those definitions very much depend on the specific LPD addressed through a specific TIA. The existing guidance on creating CB comparative indicators can be enriched to that end.

### Concept for an Outermost Regions portal

There has been growing interest especially from DG REGIO to add a portal focusing on Outermost Regions to the TIA tool, as this could become especially relevant in the context of "outermost proofing" of EU policies and legislations. The Outermost Regions are included in the tool already, however, due to their small number and their unique circumstances might get "lost" in the overall picture of a TIA. A portal focusing on the Outermost Regions would mitigate this issue, however, requires some adaption to the methodology of the Quick Check. The application of the standard methodology would produce a comparative assessment of Outermost Regions amongst each other, which again due to the unique circumstances (including their large

---

[5] https://ec.europa.eu/eurostat/web/gisco/geodata/reference-data/administrative-units-statistical-units/urban-audit

geographical distances) will not provide satisfactory results. The project team has discussed some approaches to provide relevant information about territorial impacts on Outermost Regions:

- Comparing them to geographically similar regions in Europe

- Comparing them to a cluster of regions with similar properties defined based on the relevance towards the LPD assessed

- Comparing them with European averages for specific exposure fields

which by themselves or in combination can provide relevant information about impacts. Developing an elaborated concept for such a portal based on these first thoughts and in close consultation with DG REGIO would be a valuable task which would lay the groundwork for a future Outermost Regions portal.

### Multiple years for one indicator

Currently, indicators are stored in the database with one complete database entry per year. I.e. if an indicator should be available for 2015 as well as 2018, it has to be uploaded with full metadata documentation two times. This could be improved by allowing to store multiple years for an indicator within the same database entry, enabling easier updates but also enabling easier assessments of impacts across multiple years. For example, a comparison of impacts pre and post a specific crisis (e.g. 2008 financial crisis, COVID-19 crisis) would be possible by simply creating two separate impact maps and putting them side by side.

This functionality would require an adjustment of the database as well as an adjustment of the upload function as both templates and approach to how they are entered in the database would have to be adapted.

### Improved starting page

The improved starting page could approach specific user groups in a more targeted way. Currently only a general overview of the tool is given, but it does not focus on specific application cases. For improving the starting page these application cases and user groups would be defined in consultation with ESPON EGTC, allowing to create separate landing pages for each user group. These landing pages could provide targeted examples of specific applications relevant to the user group, show the capabilities of the tool and link to specific guidance material or even allow a direct access to the relevant portals (e.g. URBAN or CB TIA).

## 2.5    Lessons learned for Online TIA Workshops

Over the course of the year 2020, 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, which has been further improved based on the lessons learned when conducting the workshops.

While analysis of the LPD to be assessed, preparation of the workshop indicators, setup of the tool before the workshop as well as documentation and reporting after the workshop are not affected, the actual workshop process was changed to accommodate the needs of an online event in the following points:

- Instead of a one-day event, the workshop is spread over 2 days to avoid fatigue of the participants. As the total duration of a single workshop is approximately 5-6 hours, it would be unreasonable to expect from participants to actively contribute in a videoconference over such a long time. The workshops should be thus start in the afternoon of day 1, ending with the decision on indicators and leaving open the voting overnight. The moderators can then prepare maps early morning on day 2 and hold the second part of the workshops on the 2nd day closing around noon.

- The flipchart paper for creating the systemic picture has been replaced by an online whiteboard which is prepared similar to the flipchart in advance of the workshop. The project team applies the

software "conceptboard"[6] for this, which allows participants to edit the systemic picture without the need of an account. Experience has shown, that providing a "trial" board for participants to experiment with the invitation to the workshop is well received and reduces time necessary for them to familiarise themselves with the software during the workshop.

- Voting on the indicators has to be done with a web-based polling solution. The project team has applied "sli.do" for this purpose, which allows easy access to participants either via web-browser or smartphone, again without the need to set up an account in advance.

- The videoconference software applied has to be agreed upon with the participants in advance. While the most convenient solution found so far is MS Teams[7], which allows participation to any discussion without the need for setting up an account or installing any software and without any time restrictions, this software might not be permitted by all institutions. It is thus 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:

    o One person guiding the discussion and engaging participants

    o One person focusing on identifying indicators during the expert discussion as well as taking notes of the discussion to provide minutes

    o 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 sli.do, providing assistance to participants in technical issues etc.

---

[6] https://conceptboard.com/

[7] https://www.microsoft.com/de-at/microsoft-365/microsoft-teams/group-chat-software

# 3 Proposal for updating the datasets and typologies in the TIA tool

## 3.1 Updating of existing datasets and typologies in the TIA tool

### 3.1.1 Dataset of the general TIA tool

The dataset of the general TIA tool contains 85 standard indicators. In case of availability of newer data, the indicator will be updated to the latest year. Table 3.1 provides an overview of the standard indicators with the current year integrated in the TIA tool. For many indicators a more recent year is available.

In the current general TIA tool, all indicators have been integrated as NUTS 2013 version. If an indicator was available in another NUTS version (e.g. 2010 or 2016), the project team performed a recalculation to the NUTS 2013 version. As the table below shows, most of the indicators are available in the NUTS 2013, 2016 or 2021 version. If an indicator is available in an older NUTS version, the project team will recalculate to a newer NUTS version as done in the past.

**Table 3.1: Dataset currently integrated in the general TIA tool**

| Thematic Field | Exposure Field | Year available in tool | Latest year available | NUTS Version |
|---|---|---|---|---|
| Accessibility | Potential accessibility by road | 2014 | - | 2013 |
| | Potential accessibility by rail | 2014 | - | 2013 |
| | Potential accessibility by air | 2014 | - | 2013 |
| | Potential accessibility multimodal | 2014 | - | 2013 |
| Demography | Population density | 2015 | 2018 | 2016 |
| | Economically active population per km$^2$ | 2016 | 2019 | 2016 |
| | Old age dependency ratio | 2016 | 2019 | 2016 |
| | Young age dependency ratio | 2016 | 2019 | 2016 |
| | Average age of population | 2017 | 2019 | 2016 |
| Education and Skills | Educational attainment of 30-34-year olds, primary education (levels 0-2) | 2016 | 2019 | 2016 |
| | Educational attainment of 30-34-year olds, secondary education (levels 3-4) | 2016 | 2019 | 2016 |
| | Educational attainment of 30-34-year olds, tertiary education (levels 5-8) | 2016 | 2019 | 2016 |
| | Share of pupils in Youth Education Systems | avg. 2014/15 | 2018 | 2016 |
| | Number of students in tertiary education | 2014 | 2018 | 2016 |
| | Early leavers from education and training | avg. 2011-15 | 2019 | 2016 |
| | Quality of public education | 2013 | 2017 | 2006, 2010, 2016 |
| Employment | Employment in agriculture, forestry and fishing | 2013 | 2017/2018 | 2016 |
| | Employment in industry and construction | 2013 | 2017/2018 | 2016 |
| | Employment in services | 2013 | 2017/2018 | 2016 |
| | Employment in industry | 2015 | 2017/2018 | 2016 |
| | Employment in tourism | 2016 | 2019 | 2016 |
| | Share of full-time employments | avg. 2014-16 | 2019 | 2016 |
| | Share of part-time employments | avg. 2014-16 | 2019 | 2016 |
| | Female employment ratio | 2016 | 2019 | 2016 |
| Environment | Land cover: Share of agricultural areas | 2012 | 2015 | 2013 |
| | Land use: Share of agriculture | 2012 | 2015 | 2013 |
| | Land use: Share of irrigated land | 2013 | 2016 | 2013 |
| | Protected areas (NATURA 2000) | 2012 | 2018 | 2013 |
| | Land cover: Share of Woodland, Shrubland and Wetland | 2012 | 2015 | 2013 |
| | Relative size of built-up areas | 2012 | - | 2013 |
| | Land use: Share of heavy environmental impact | 2012 | 2015 | 2013 |
| | Urban population exposed to PM$_{10}$ concentrations | 2020 (projection) | - | 2013 |
| | Emissions of CO$_2$ per capita (tonnes) | 2020 (projection) | - | 2013 |

| Thematic Field | Exposure Field | Year available in tool | Latest year available | NUTS Version |
|---|---|---|---|---|
| Govern-ance | Emissions of NO$_x$ per capita (kilotons) | 2020 (projection) | - | 2013 |
| | Land cover: Share of Water areas | 2012 | 2015 | 2013 |
| | Water Consumption | 2020 (projection) | - | 2013 |
| | Structural Green Infrastructures | 2020 (projection) | - | 2013 |
| | Urban wastewater | 2010 | - | 2013 |
| | Municipal waste generated | 2013 | - | 2013 |
| | Days over 30°C | 1995 | - | 2010 |
| | Solar energy potential | 2012 | - | 2013 |
| | Wind energy potential | 2012 | - | 2013 |
| | Corruption | 2013 | 2017 | 2006, 2010, 2016 |
| | Quality and accountability of government services | 2013 | 2017 | 2006, 2010, 2016 |
| | Impartiality of government services | 2013 | 2017 | 2006, 2010, 2016 |
| | Quality of law enforcement | 2013 | 2017 | 2006, 2010, 2016 |
| | Trust in the political system | 2013 | - | 2013 |
| | Trust in the legal system | 2013 | - | 2013 |
| | EAGF & EAFRD: Expenditure in share of GDP | avg. 2004-2008 | - | 2013 |
| | ERDF & CF Expenditure in million Euros | 2014 | - | 2013 |
| Health | Life expectancy at birth | 2015 | 2018 | 2016 |
| | Total fertility rate | avg. 2014-15 | 2018 | 2016 |
| | Birth rate | avg. 2014-15 | 2018 | 2016 |
| | Quality of the public health care system | 2013 | 2017 | 2006, 2010, 2016 |
| | Health personnel | 2014 | 2018 | 2016 |
| | Hospital beds | 2014 | 2018 | 2016 |
| Infrastruc-ture | Regional ICT infrastructure | 2016 | 2019 | 2016 |
| | Regional transport infrastructure: navigable canals | 2015 | 2018 | 2016 |
| | Regional transport infrastructure: navigable rivers | 2015 | 2018 | 2016 |
| | Regional transport infrastructure: motorways | 2015 | 2018 | 2016 |
| | Regional transport infrastructure: total railway lines | 2015 | 2018 | 2016 |
| Innovation | Patent applications/mio inhabitants | 2012 | - | 2013 |
| | Employment in technology and knowledge-intensive sectors | 2015 | 2019 | 2016 |
| | Share of R&D personnel and researchers | 2013 | 2017/2018 | 2016 |
| Natural Hazards | Soil erosion by water | 2010 | 2016 | 2016 |
| | Capacity of ecosystems to avoid soil erosion | 2020 (projection) | - | 2013 |
| | Soil retention | 2020 (projection) | - | 2013 |
| | Landslide susceptibility | 2012 | - | 2013 |
| | Sensitivity to floods | 2012 | - | 2013 |
| | Sensitivity to avalanches | 2012 | - | 2013 |
| | Probability of forest fire hazard | 1997-2003 | - | 2010 |
| Regional economy | Economic performance (GDP/capita) | 2014 | 2018 | 2016 |
| | Economic performance (GVA/capita) | 2014 | 2018 | 2016 |
| | GVA in industry (secondary sector) | 2015 | 2018 | 2016 |
| | Entrepreneurship (share of private enterprises) | 2014 | 2019 | 2016 |
| | Total overnight stays per thousand inhabitants | 2015 | 2019 | 2016 |
| Social dis-parities | Net migration | 2015 | 2018 | 2016 |
| | Gender balance employment | 2014 | 2019 | 2016 |
| | Unemployment rate | 2014 | 2019 | 2016 |
| | Disposable Income | 2014 | 2017 | 2016 |
| | People at risk of poverty or social exclusion | 2015 | 2018 | 2016 |
| Societal wellbeing | Crimes recorded by the police | 2010 | - | 2013 |
| | Housing: Number of rooms per person | 2014 | - | 2013 |
| | Perceived social network support | 2014 | - | 2013 |
| | Self-evaluation of life satisfaction | 2014 | - | 2013 |

**Source: Consortium (2020)**

### 3.1.2    Datasets of the sub-tool for the Cross-Border TIA

The core element of the Cross-Border-TIA module was the introduction of comparative indicators the project team calculated as a basis for standard indicators. Other than stock indicators provided e.g. by Eurostat, these had to be specifically calculated and require an in-depth understanding of the methodology. Their actual application is strongly connected to the individual approaches of a concrete CB TIA, thus only a small set of standard indicators was calculated (see Table 3.3). In most cases, indicators connected to a concrete LPDs effect will have to be calculated for the respective workshop. As for the dataset of the general TIA tool, the standard cross-border indicators will be updated if a more recent year is available. In case one of the Work Package 4 workshops includes a CB TIA, the project team will explore additional comparative CB indicators tailored to the respective LPD.

**Table 3.2: Dataset currently integrated in the sub-tool for the Cross-Border TIA**

| Thematic Field | Exposure Field | Year available in tool | Latest year available | NUTS Version |
|---|---|---|---|---|
| Accessibility | CB difference: Quality and accountability of government services | 2013 | 2017 | 2016 |
| | CB lower: Potential accessibility multimodal | 2014 | - | 2013 |
| Environment | CB product: Protected areas (NATURA 2000) | 2012 | 2018 | 2013 |
| Governance | CB lower: Quality and accountability of government services | 2013 | 2017 | 2016 |
| Health | CB difference: Hospital beds | 2014 | 2018 | 2016 |
| Regional economy | GDP loss due to cross-border obstacles | 2017 | - | 2013 |

**Source: Consortium (2020)**

### 3.1.3    Dataset of the sub-tool for the Urban TIA

The core specifity of the Urban TIA module was the addition of data based on Functional Urban Areas. A number of highly specialised datasets is available at this level. Table 3.3 shows the indicators for FUA which were integrated into the TIA tool. Only few of them can be updated as many of the indicators are already integrated in recent version and/or no updates are available. Additional indicators to be added are presented in section 3.2.

**Table 3.3: Dataset currently integrated in the sub-tool for the Urban TIA**

| Thematic Field | Exposure Field | Year available in tool | Latest year available |
|---|---|---|---|
| Accessibility | Potential accessibility by transport infrastructure | 2020 (projection) | - |
| Accessibility | Average travel distances | 2010 | - |
| Demography | Population density | 2020 (projection) | - |
| Demography | Population weighted density | 2020 (projection) | - |
| Demography | Old age dependency ratio | 2016 | 2019 |
| Demography | Young age dependency ratio | 2016 | 2019 |
| Demography | Urbanisation level | 2010-2030 | - |
| Environment | Recreational areas | 2020 (projection) | - |
| Environment | Concentration of $PM_{10}$ | 2020 (projection) | - |
| Environment | Concentration of $NO_2$ | 2020 (projection) | - |
| Environment | Removal capacity of $PM_{10}$ | 2020 (projection) | - |
| Environment | Removal capacity of $NO_2$ | 2020 (projection) | - |
| Health | Crude birth rate | 2015 | 2019 |
| Infrastructure | Urban form efficiency | 2011 | - |
| Infrastructure | Length of local roads per inhabitant | 2014 | - |
| Infrastructure | Road safety | 2014 | - |
| Land use and conservation | Share of green infrastructure | 2020 (projection) | - |
| Land use and conservation | Hectare of green infrastructure per capita | 2020 (projection) | - |
| Land use and conservation | Built-up areas per inhabitant | 2011 | - |

| Thematic Field | Exposure Field | Year available in tool | Latest year available |
|---|---|---|---|
| Land use and conservation | Annual land take per inhabitant | 2010-2030 | - |
| Natural Hazards | Urban Flood Risk | 2020 (projection) | - |
| Social disparities | Unemployment rate | 2015 | 2019 |

**Source: Consortium (2020)**

### 3.1.4 Typologies in the TIA tool

A manifold set of typologies is currently available in the TIA tool (see Table 3.4). As all of them are in NUTS 2013 or 2016 version, no recalculation is required to integrate them into the new tool. In case the Urban-Intermediate-Rural classification is updated by Eurostat in 2021 based on the 2021 census, this new dataset will be integrated into the TIA tool. Additional typologies to be added are presented in section 3.2.

**Table 3.4: Typologies currently integrated in the general TIA tool**

| Regional Typology Name | Ref. year | NUTS Version |
|---|---|---|
| Predominantly urban | 2011 | 2013 |
| Intermediate | 2011 | 2013 |
| Predominantly rural | 2011 | 2013 |
| Metropolitan region | 2011 | 2013 |
| Mountain region | 2016 | 2013 |
| > 50% of population live in mountain areas | 2016 | 2013 |
| > 50% of surface are in mountain areas | 2016 | 2013 |
| > 50% of population and 50% of surface are in mountain areas | 2016 | 2013 |
| Island region | 2016 | 2013 |
| Major island < 50,000 inhabitants | 2016 | 2013 |
| Major island between 50,000 and 100,000 inh. | 2016 | 2013 |
| Major island between 100,000 and 250,000 inh. | 2016 | 2013 |
| Island with 250,000 – 1 million inhabitants | 2016 | 2013 |
| Island with >= 1 million inhabitants | 2016 | 2013 |
| Urban Areas (fuzzy) | 2016 | 2016 |
| Rural Areas (fuzzy) | 2016 | 2016 |
| Mountainous Regions (fuzzy, share mountainous areas of the total area) | 2016 | 2016 |
| Mountainous Regions (fuzzy, share of population living in mountainous areas) | 2016 | 2016 |
| Border Regions (Maritime) | 2016 | 2013 |
| Border Regions (Terrestrial) | 2016 | 2013 |
| Border Regions (fuzzy) | 2016 | 2013 |

**Source: Consortium (2020)**

## 3.2 Additional datasets and typologies to be included in the TIA tool

### 3.2.1 Additional datasets for general TIA

As preceding projects have already conducted a very thorough review of European statistics and integrated most relevant datasets on regional level which are suitable in the tool already, new standard indicators for a general TIA are limited. A list of indicators identified as suitable standard indicators is provided in Table 3.5. All indicators identified are available on NUTS2 level only and thus have to be broken down to NUTS3 level.

**Table 3.5: Additional indicators to be included in the TIA Tool for the general TIA**

| Thematic Field | Indicator | Source | Ref. year | NUTS lvl |
|---|---|---|---|---|
| Economic development | Ratio between emissions of $CO_2$ and GVA | JRC, GAINS model, Eurostat, ÖIR calculation | 2020 | 2 |
| | Recreation potential | JRC | 2020 | 2 |
| Environment | Share of total area under organic farming | Eurostat | 2013 | 2 |
| | Electricity generated from renewable sources | JRC | 2015 | 2 |
| | Electricity generated from hard coal and lignite | JRC | 2015 | 2 |
| Education and Skills | Share of population in education and training on total population | Eurostat | 2019 | 2 |

**Source: Consortium (2020)**

DG AGRI context indicators have been screened as well, one of the indicators listed above (Share of total area under organic farming) is proposed to be included as standard. Further indicators from DG AGRI are considered to be too specific for standard indicators and will only be relevant for some specialised topics (e.g. age structure of farm managers or irrigation patterns in agriculture). The project team thus proposes not to include them as standard indicators, however, a reference to this source will be made in the guidance documents.

The FADN database provides rather specialised indicators as well which could be suitable for agriculture related topics in a TIA context. Data from FADN, however, is provided in a non-standard nomenclature, namely "FADN regions", where an individual "FADN region" can comprise anything from one NUTS2 over multiple NUTS2 up to one NUTS0 region, which requires multiple breakdown steps to arrive at a NUTS3 level dataset necessary for the TIA tool. The project team through another project is in contact with the FADN database team and inquiring about the possibility of providing NUTS3 level data.

ESPON EGTC furthermore asked the project team to check whether there are any ESPON projects with potentially interesting indicators for the TIA tool that could have a follow-up project in order to an updated dataset. The project team proposes the following indicators:

**Table 3.6: Proposed dataset developed within an ESPON project to be updated**

| Thematic Field | Exposure Field | Years available | Project |
|---|---|---|---|
| Environment | Final energy consumption in the agriculture sector | 2002, 2012 | ESPON LOCATE |
| | Final energy consumption in the rail transport sector | 2002, 2012 | ESPON LOCATE |
| | Final energy consumption in the air transport sector | 2002, 2012 | ESPON LOCATE |

**Source: Consortium**

### 3.2.2 Additional datasets for Urban IA

The database for the urban TIA will be also expanded with additional datasets covering some new thematic fields that have not been represented so far. The following indicators can be included for the Urban IA:

**Table 3.7: Additional indicators to be included in the TIA Tool for urban IA**

| Thematic Field | Indicator | Source | Ref. year |
|---|---|---|---|
| Economy | Economic performance (GDP/capita) | ESPON FUORE, Eurostat | 2014 |
| | Economic performance (GVA/capita)* | ESPON FUORE, Eurostat | 2014 |
| Innovation | Patent applications/mio inhabitants* | ESPON FUORE, Eurostat | 2011 |
| | Share of R&D personnel and researchers | ESPON FUORE, Eurostat | 2015 |
| | Educational attainment of 30-34-year olds, primary education | ESPON FUORE, Eurostat | 2015 |
| | Educational attainment of 30-34-year olds, secondary education | ESPON FUORE, Eurostat | 2015 |
| Education and Skills | Educational attainment of 30-34-year olds, tertiary education | ESPON FUORE, Eurostat | 2015 |
| | Participation rate in education and training | ESPON FUORE, Eurostat | 2015 |
| | Early leavers from education and training | ESPON FUORE, Eurostat | 2015 |
| Demography | Net migration | ESPON FUORE, Eurostat | 2014 |

| Thematic Field | Indicator | Source | Ref. year |
|---|---|---|---|
| Social dispari-ties | People at risk of poverty or social exclusion | ESPON FUORE, Eurostat | 2015 |
| | Disposable income of private households | ESPON FUORE, Eurostat | 2012 |
| | Gender balance employment* | ESPON FUORE, Eurostat | 2015 |

**Source: Consortium, *: will be calculated based on the ESPON FUORE data**

A number of datasets collected for the urban audit contain numerous potentially interesting sub-sets which are listed in Table 3.8. A detailed assessment for each dataset has been conducted and revealed that none provides a consistent coverage of a sufficient number of FUAs to fit the requirements of the TIA tool for comparative assessments. Systematically, large parts of the EU are missing data (e.g. Germany, Hungary, parts of Poland) for almost all indicators. Furthermore, a number of highly specific indicators seems to be only provided by a few member states. It was thus concluded by the project team, that the Urban Audit provides no source for standard datasets to be included in the tool. It could, however, become a relevant source for some geographically limited assessments, in which case the indicators can be added to the tool by the user.

## Table 3.8: Datasets out of the Urban Audit to be investigated further

| Thematic Field | Dataset | Source | Ref. year |
|---|---|---|---|
| Social disparities/ Societal Wellbeing | Living conditions (urb_livcon) Numerous indicators relating to types of housing, structure of households, household income | Eurostat | 2018 |
| Education and Skills | Education (urb_leduc) Various education related indicators, more recent than other education indicators for FUAs | Eurostat | 2018 |
| Employment | Labour market (urb_llma) Up to data employment and unemployment data, some sectoral information, employment/unemployment data by age | Eurostat | 2018 |
| Accessibility/ Infrastructure | Transport (urb_ltran) Information on transport types, commuters, journey lengths | Eurostat | 2018 |
| Demography | Population structure (urb_lpopstr) | Eurostat | 2018 |

**Source: Consortium**

### 3.2.3    Additional typologies to be included in the TIA tool

Most dichotomous typologies which can be considered "EU Standard" as they are published by Eurostat and included in the "Tercet" addition[8] to the NUTS regulation[9] are already implemented in the tool. One additional typology has been published, however, and will thus be included in the tool.

## Table 3.9: Additional dichotomous typologies

| Typology | Description | Source |
|---|---|---|
| Coastal regions | Typology of regions which have a sea border and where more than 50% of the population live within 50km of the seashore | Eurostat |
| External border re-gions | Typology of regions which are participating in an IPA-CBC programme | INTER-ACT |

**Source: Consortium**

Furthermore, all existing typologies (where possible) will be updated as outlined in section 3.1.

As outlined in section 2.1.1, the project team has conducted an assessment of potential Fuzzy typologies to be added to the tool as a standard typology. Based on the assessment criteria, the Corine Land Cover dataset which allows targeted calculations of typologies on every NUTS level has been identified as being

[8] COM/2016/0788

[9] (EC) No 1059/2003

able to provide some standard typologies. The 44 classes[10] have been screened and based on the potential applicability to multiple TIA circumstances. The project team proposes to use the following four categories/aggregates for calculating Fuzzy typologies:

## Table 3.10: Additional Fuzzy typologies (Corine)

| Class(es) | Content | Source |
|---|---|---|
| 1.1 Urban Fabric | 1.1.1 continuous urban fabric<br>1.1.2 discontinuous urban fabric | Corine Land Cover 2018 |
| 1.2 Industrial, commercial and transport units | 1.2.1 Industrial or commercial units<br>1.2.2 Road and rail networks and associated land<br>1.2.3 port areas<br>1.2.4 port areas | Corine Land Cover 2018 |
| Total residential & industrial land | 1.1.1 continuous urban fabric<br>1.1.2 discontinuous urban fabric<br>1.2.1 Industrial or commercial units | Corine Land Cover 2018 |
| 3.1 Forest | 3.1.1 broad leaved forest<br>3.1.2 coniferous forest<br>3.1.3 mixed forest | Corine Land Cover 2018 |

**Source: Consortium**

Furthermore a typology from DG AGRI, namely the share of the Utilised Agricultural Area (UAA) on the total Area of a Region out of the Cap Context Indicators will be added as a standard typology.

## Table 3.11: Additional Fuzzy typologies (DG AGRI)

| Typology | Description | Source |
|---|---|---|
| Agricultural Regions (Fuzzy) | Typology of regions based on the share of the Utilised Agricultural Area (UAA) on the total area of the region | DG AGRI |

**Source: Consortium**

The proposal will be agreed upon with ESPON EGTC and subsequently be integrated into the tool. All typologies will be calculated as share of the respective category(-ies) on the total area of the region.

Further suggestions which were put forward by DG REGIO (e.g. new accessibility indicators for road and railway which are currently developed by DG REGIO) still need to be discussed with the responsible unit (DG REGIO Unit B1) at the time of writing these report. The project team will consult with ESPON EGTC before D2 as soon as the possibilities of the typologies are clarified with DG REGIO.

---

[10] https://land.copernicus.eu/user-corner/technical-library/corine-land-cover-nomenclature-guidelines/html

ESPON

**Inspire Policy Making with Territorial Evidence**

espon.eu