ESPON

EUROPEAN UNION

Co-financed by the European Regional Development Fund

Inspire Policy Making with Territorial Evidence

TOOLS & MAPS //

ESPON TIA Tool 2020-2022

Draft Final Report // June 2021

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Disclaimer

This document is a draft 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
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 follows 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. Upgrades implemented in the context of the project are

- Updating all datasets and typologies currently included in the tool to their latest version
- Updating the NUTS and FUA versions used to the most recent ones
- Implementing updates to make the tool more user-friendly in terms of preparation and application
- Implementing additional indicator types (composite indicators) and fuzzy typologies
- Updating of all guidance material
- Developing concepts for future methodological updates

The draft final report outlines the work done so far in terms of technical upgrades to the tool, workshops conducted in the context of the projects as well as an outlook on the work towards finalisation of the project.

2 Updates of the Tool implemented

2.1 Update to NUTS 2021

As the old tool used NUTS 2013 classification, which was already is outdated, database and shapefiles of the tool have been updated to the most recent version. Eurostat has published the NUTS 2021 shapefiles and relevant correspondence tables, in 2020 already, and deliveries to Eurostat from 2021 onwards have to follow the NUTS 2021 nomenclature. This is therefore the most "future proof" solution and it was decided to implement it for the tool. It created an issue however with providing data for all regions, as several changes between the NUTS versions 2013 – 2016 – 2021 have taken place. Table 2.1 depicts the extent of those changes to the NUTS regions system. In case an indicator that is currently included in the tool is only available in an older NUTS version and will not be re-delivered in the NUTS 2021 version, the change types "recoding" and "discontinued" as well as "boundary shift" if the shift is only minor pose no problems when switching to the NUTS 2021 nomenclature. Change types "New region" and major "boundary shifts" however led to some recalculations of the underlying datasets.

Table 2.1: NUTS changes 2013 – 2016 – 2021

Change type	Number of changes 2013-2016	Number of changes 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

The methodological approach for recalculations is described in the indicator section under 3.1.

Ultimately, all existing exposure fields and typologies, as well as all new indicators added to the tool which were not yet provided in NUTS 2021 version have been recalculated to the NUTS 2021 version. The CB-portal has been updated as well. The tool now uses exclusively this NUTS version ensuring the maximum extent of comparability for assessments and allowing for easy and complete future updates without the need for recalculations for several years to come.

The update to NUTS 2021 also allows to make full use of the new "Tercet" typologies which are already officially published.

2.2 Update to FUA 2020

The FUA nomenclature was updated to the latest version similar to the NUTS version update. The changes are not considerable, but FUA nomenclatures are usually updated each year, thus the current version in the tool might see considerable changes in the future. However, most indicators that are available for FUAs are project based and not frequently updated thus loose their relevance even if there are no nomenclature updates over time. Nonetheless, updates of the nomenclature have to be implemented with recalculations where possible in order to minimise those losses. The data available via the Urban Audit is, as described in section 3.2 is not of sufficient quality to be included in the ESPON TIA Tool. Therefore, updates to the nomenclature are not as frequently needed to accommodate new indicators published.

All existing exposure fields and new indicators added to the tool have been updated to the latest FUA version.

2.3 Supplementary tools for composite indicators and indicator preparation

2.3.1 Composite indicators

Composite indicators were a methodological and technical update requested for the new TIA tool They consist of multiple individual sub-indicators and are designed to reflect results of a certain intervention targeting

multiple fields in a combined manner. 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 already available yet less specific indicators can overcome this gap.

The composition of such a composite indicator 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. To support the process of calculating composite indicators in a first phase of trialling them in the Quick Check methodology, the project team has developed an excel-tool which allows for an easy calculation of a composite indicator with up to 5 sub-indicators. The results can be directly uploaded in the ESPON TIA Tool.

A composite indicator is 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

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[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.

[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.

[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.

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 description of calculation as well as the possibilities and constraints of using composite indicators is added to the moderators guide alongside the Excel tool. The Excel tool itself allows any user with basic Excel skills to add up to 5 sub-indicators to the sheet, apply weights to each indicator and automatically create a composite indicator. The output is an excelsheet coherent with the upload template and allows for direct uploading into the tool.

The application of composite indicators was furthermore trialled within the workshops conducted. In each workshop, one composite indicator was designed in the preparation phase and introduced to the participants. Ultimately, two out of the three composite indicators designed were taken up. The experience from the workshops showed, that participants had no methodological objections and did also not question the composition. The reason for rejecting one of the indicators was simply due to it being considered not close enough to the relevant effect the experts wanted to depict.

The trial run in the three application cases can thus be considered successful and the practice of including composite indicators in TIA workshops will be continued. The experience made by the project team regarding the practical application is reflected in the moderators guide as well.

2.3.2 Indicator preparation

In the previous version of the tool, NUTS 2013 was the standard nomenclature implemented. This version was at the time widely used by statistics providers on EU and on national level, by funding programmes etc., and thus allowed the user to easily upload their own datasets. The now implemented NUTS 2021 version is not yet in widespread use and will take some time to be picked up universally. To assist the users in the meantime with preparing their datasets for uploading them into the tool without individually checking e.g. the correspondence tables published by Eurostat[4], the project team developed an easy to use excel tool for transforming data between the different NUTS versions. It covers NUTS 2010 to NUTS 2021, allows to insert data in any given NUTS version and produces as an output the indicator upload sheet.

The easy-to-use nature of the tool however allows only for transformations in case of recodings or minor boundary changes. Any regions which were split, merged or subject to major boundary changes cannot be transformed with such a tool and will subsequently be included in the database as regions with “no data”.

2.4 Changes to the tools interface

The tools interface itself remained unchanged apart from the new shapefiles used implementing the NUTS2021 and FUA 2020 nomenclature. For both users and moderators, there is no visual difference. On the welcome page, explicit references to the Urban- and Cross-Border subtools have been made in order to draw the users attention to those otherwise potentially overlooked functionalities.

[4] https://ec.europa.eu/eurostat/web/nuts/history

2.5 Updated version of the guidance documents for moderators

The moderators guide has received updates regarding the indicators added to the tool and the associated voting cards and indicator postcards. Furthermore, guidance on composite indicator calculation has been added to the report which explains the functionality of the provided excel-tool for their calculation as well. Additional guidance has been added related to the preparation and implementation of online-workshops which have become a frequent occurrence over the course of 2020. No updates regarding functionalities of the tool were necessary so far.

2.6 Final version of the guidance documents for administrators

The administrators guidance has been updated to the latest format. The updates have been minor however, as all updated functionalities have been implemented seamlessly with the existing administrators tool. Administrators thus require no additional training if they already were familiar with the module.

3 Updated datasets, typologies and NUTS 2021 version integrated in the TIA tool

3.1 General datasets of the TIA tool

The 85 standard indicators from the current version of the TIA tool have been reviewed by the project team in terms of availability of updates and their completeness. As it was agreed with the Steering Group the NUTS 2021 version was implemented instead of the NUTS 2016 version, better future-proofing the tool. As of 1.1.2021 the NUTS 2021 version is the compulsory standard for delivering data to Eurostat, thus it is expected that this allows for easier updates in the future as other institutions take it up as well.

The dataset of the general TIA tool now contains 85standard indicators which are listed in Table 3.1 as is visible, no indicators were yet directly available in the NUTS 2021 version, with some even dating back to the NUTS2006 version. The project team thus recalculated all indicators to NUTS 2021 version by means of a script in the programming language R. When converting data into another NUTS version, there are several change types to be considered. A list of these changes is provided by Eurostat[5] and is the basis for the recalculation. In case of boundary changes between regions, the data is assigned to the equivalents as stated in the aforementioned list. In case of splits or mergings of regions and an indicator with absolute values, the data is weighted and distributed based on the population data (at the moment, an update will follow later on) of the respective (split or merged) regions. In case of mergings of regions in an indicator with relative values, the population weighted average is used to determine the value for the merged region. In the final delivery of the project, this recalculation method will be refined and for some indicators where this is relevant, i.e. the area of the region will be used as recalculation proxy instead of the population. In case of splits of regions an indicator with relative values, the same value as for the “parent” region is assigned to both new regions. In most cases however, the data doesn’t have to be recalculated and can be directly assigned to the region in the latest NUTS version, as in most cases only the NUTS code or NUTS name has been changed or there have not been any changes at all.

Table 3.1: Updated datasets in the TIA Tool

Thematic Field	Exposure Field	Year of data implemented	NUTS version
Accessibility	Potential accessibility by road	2014	2013
Accessibility	Potential accessibility by rail	2014	2013
Accessibility	Potential accessibility by air	2014	2013
Accessibility	Potential accessibility multimodal	2014	2013
Demography	Population density	2018	2016
Demography	Economically active population per km2	2019	2016
Demography	Old age dependency ratio	2019	2016
Demography	Young age dependency ratio	2019	2016
Demography	Average age of population	2019	2016
Demography	Net migration	2019	2016
Education and Skills	Educational attainment of 30-34 year olds, primary education (levels 0-2)	2019	2016
Education and Skills	Educational attainment of 30-34 year olds, secondary education (levels 3-4)	2019	2016

[5] https://ec.europa.eu/eurostat/en/web/nuts/history

Thematic Field	Exposure Field	Year of data implemented	NUTS version
Education and Skills	Educational attainment of 30-34 year olds, tertiary education (levels 5-8)	2019	2016
Education and Skills	Share of young adults in education system	2016-2018	2016
Education and Skills	Number of students in tertiary education	2019	2016
Education and Skills	Early leavers from education and training	2019	2016
Education and Skills	Participation rate in education and training	2019	2013
Education and Skills	Quality of public education	2013	2006/10/13
Environment	Protected areas (NATURA 2000)	2018	2013
Environment	Recreational potential	2020 (projection)	2013
Environment	Land use: Share of heavy environmental impact	2015	2013
Environment	Urban population exposed to PM10 concentrations	2020 (projection)	2016
Environment	Emissions of CO2 per capita (tonnes)	2020 (projection)	2016
Environment	Emissions of NOx per capita (kilotonnes)	2020 (projection)	2016
Environment	Water Consumption	2020 (projection)	2016
Environment	Structural Green Infrastructures	2020 (projection)	2016
Environment	Urban wastewater	2010	2010
Environment	Municipal waste generated	2013	2010
Environment	Exposure to heat waves	1995	2010
Environment	Solar energy potential	2012	2013
Environment	Wind energy potential	2012	2013
Environment	Electricity generated from hard coal and lignite	2015	2013
Environment	Electricity generated from renewable sources	2015	2013
Governance	Corruption	2021	2013
Governance	Quality and accountability of government services	2021	2013
Governance	Impartiality of government services	2021	2013
Governance	Quality of law enforcement	2013	2006/10/13
Governance	Trust in the political system	2013	2013
Governance	Trust in the legal system	2013	2013
Governance	EAGF & EAFRD: Expenditure in share of GDP	avg. 2004-2008	2006/2010
Governance	ERDF & CF Expenditure in Million Euro	2014	2006/2010
Health	Life expectancy at birth	2018	2016
Health	Total fertility rate	2018	2016
Health	Birth rate	2018	2016
Health	Quality of the public health care system	2013	2016
Health	Health personnel	2017-2018	2016
Health	Hospital beds	2017	2016
Infrastructure	Regional ICT infrastructure	2019	2016
Infrastructure	Regional transport infrastructure: navigable canals	2019	2016
Infrastructure	Regional transport infrastructure: navigable rivers	2018	2016
Infrastructure	Regional transport infrastructure: motorways	2018	2016

Thematic Field	Exposure Field	Year of data implemented	NUTS version
Infrastructure	Regional transport infrastructure: total railway lines	2018	2016
Innovation	Patent applications/Mio inhabitants	2012	2013
Innovation	Employment in technology and knowledge-intensive sectors	2019	2016
Innovation	Share of R&D personnel and researchers	2017	2013/2016
Natural Hazards	Soil erosion by water	2016	2016
Natural Hazards	Capacity of ecosystems to avoid soil erosion	2020 (projection)	2016
Natural Hazards	Soil retention	2020 (projection)	2016
Natural Hazards	Landslide susceptibility	2012	2010
Natural Hazards	Sensitivity to floods	2012	2010
Natural Hazards	Sensitivity to avalanches	2012	2010
Natural Hazards	Probability of forest fire hazard	1997 – 2003	2010
Regional economy	Economic performance (GDP/capita)	2018	2016
Regional economy	Economic performance (GVA/capita)	2018	2016
Regional economy	Ratio between emissions of CO2 and GVA	2020	2013
Regional economy	GVA in industry (secondary sector)	2018	2016
Regional economy	GDP loss due to cross-border obstacles	2017	2013
Regional economy	Entrepreneurship (share of private enterprises)	2019	2016
Regional economy	Total overnight stays per thousand inhabitants	2019	2016
Regional economy	Employment in agriculture, forestry and fishing	2019	2016
Regional economy	Employment in industry and construction	2018	2016
Regional economy	Employment in services	2018	2016
Regional economy	Employment in industry	2018	2016
Regional economy	Share of full-time employments	2019	2016
Regional economy	Share of part-time employments	2019	2016
Regional economy	Female employment ratio	2019	2016
Social disparities	Gender balance employment	avg. 2017-19	2016
Social disparities	Unemployment rate	2019	2016
Social disparities	Disposable Income	2018	2016
Social disparities	People at risk of poverty or social exclusion	2019	2016
Societal wellbeing	Crimes recorded by the police	2010	2013
Societal wellbeing	Housing: Number of rooms per person	2014	2013
Societal wellbeing	Perceived social network support	2014	2013
Societal wellbeing	Self-evaluation of life satisfaction	2014	2013

Source: Consortium (2021)

The project team revisited each indicator included in the tool and considered its necessity. Especially for indicators older than 5 years it has to be considered if they are still relevant. Table 3.2 presents the results of the assessment conducted.

Table 3.2: Potentially outdated datasets

Thematic Field	Exposure Field	Year	Assessment/proposal
Accessibility	Potential accessibility by road	2014	Population development and major infrastructure projects can distort the regional values to some extent. It is however the most comprehensive dataset of this kind available for the EU which also applies the same methodology to different modes of transport. This allows for comparability between transport modes. The dataset is also frequently used, thus it is proposed to *keep it in the database.*
	Potential accessibility by rail	2014	
	Potential accessibility by air	2014	
	Potential accessibility multimodal	2014	
Environment	Land cover: Share of agricultural areas	2015	There is no significant change in agricultural areas in relation to the size of a NUTS3 region. It is proposed to *keep the dataset in the database.*
	Land use: Share of agriculture	2015	There is no significant change in agricultural areas in relation to the size of a NUTS3 region. It is proposed to *keep the dataset in the database.*
	Land cover: Share of Woodland, Shrubland and Wetland	2015	There is no significant change in woodland, shrubland and wetland areas in relation to the size of a NUTS3 region. It is proposed to *keep the dataset in the database.*
	Relative size of built-up areas	2012	The indicator is somewhat outdated, and increase in construction in the past 9 years can make a considerable difference for some regions (in particular urban ones). As with the Corine Land Cover, a 2018 value for such an indicator can be calculated, it is proposed to *remove the dataset from the database* and replace it with the new indicator based on CLC.
	Land use: Share of heavy environmental impact	2015	While some changes for the indicator values might have been occurring in the past 6 years, there is no further updated one available. The indicator is valuable and has been used in several workshops in the past, thus it is proposed to *keep the dataset in the database.*
	Land cover: Share of Water areas	2015	There is no significant change in water areas in relation to the size of a NUTS3 region. It is proposed to *keep the dataset in the database.*
	Urban wastewater	2010	The indicator is somewhat outdated, but is the only indicator available in this geographic resolution. It is thus proposed to *keep the dataset in the database.*
	Municipal waste generated	2013	The indicator is somewhat outdated in the light of increase of circular economy practices, increased recycling rates etc. It is however the only indicator available in this geographic resolution, more recent indicators only covering N0 levels. It is thus proposed to *keep the dataset in the database.*
	Days over 30°C	1995	The indicator is considerably outdated and no update seems to be available for the NUTS3 level. It is however the only one collecting this kind of data. The indicator collecting a comparable information which is also up to date is “Heating degree days” from ESTAT, however is harder to understand for workshop participants. It is proposed *to exchange those indicators*.
	Solar energy potential	2012	While the indicator is in need of an update (pointed out in the inception report explicitly), it is still the best one available of its kind in Europe. It is also used on several occasions in workshops, thus it is proposed to *keep it in the database.*

Thematic Field	Exposure Field	Year	Assessment/proposal
	Wind energy potential	2012	While the indicator is in need of an update (pointed out in the inception report explicitly), it is still the best one available of its kind in Europe. It is also used on several occasions in workshops, thus it is proposed to *keep it in the database.*
Governance	Trust in the political system Trust in the legal system	2013 2013	The indicator suffers from both the geographical level (NUTS 2) and the fact that it is outdated. It is however frequently used and covers a very important aspect (governance) which is not covered by numerous indicators. While an update also in terms of geographical resolution would be necessary, it is proposed to *keep it in the database.*
	EAGF & EAFRD: Expenditure in share of GDP	avg. 2004-2008	The indicator is outdated and likely not to be used in future analyses. There is no publicly available database for the 2014-20 period available however. It is proposed to *remove it from the standard indicators.*
	ERDF & CF Expenditure in million Euros	2014	The indicator is based on 2014 data, however those are € budgeted which are spent in the years 2014-2023. The indicator is thus considered still relevant and *should be kept in the database.*
Innovation	Patent applications/mio inhabitants	2012	The indicator is outdated and also discontinued. However, the project team has received access to OECD data with much better thematical and geographical coverage. The project team is in the process of verifying if the data can be publicised through the TIA tool. In the meantime it is proposed to *keep the dataset in the database.*
Natural Hazards	Landslide susceptibility	2012	Due to the calculation method and the broad and qualitative approach there Is likely no significant change in the situation today compared to 2012. Potentially the indicator can be updated/exchanged pending the results of the ESPON TITAN project, which will be reviewed once available. In the meantime it is proposed to *keep the dataset in the database.*
	Sensitivity to floods	2012	In the context of climate change, there is potential for significant changes in the last 10 years regarding those indicators. They are in need of updating, however the concrete ones are not likely to be updated. Potentially the ESPON TITAN project will provide similar indicators which can replace the existing ones. They will be reviewed once available, in the meantime it is proposed to *keep the dataset in the database.*
	Sensitivity to avalanches	2012	In the context of climate change, there is potential for significant changes in the last 10 years regarding those indicators. They are in need of updating, however the concrete ones are not likely to be updated, and the ESPON TITAN project will not include any indicator on avalanches. Nevertheless it is proposed to *keep the dataset in the database.*
	Probability of forest fire hazard	1997-2003	The indicator is outdated and in the context of land use changes and increased risk of droughts and fire hazard is in urgent need of updating. Unfortunately no more recent indicator is available. The results of ESPON TITAN regarding droughts will be reviewed, however it is unlikely that there will be a comparable indicator resulting. As the indicator has been used in the past though, and as the calculation is broad and qualitative, it is proposed to *keep the dataset in the database.*

Thematic Field	Exposure Field	Year	Assessment/proposal
Societal wellbeing	Crimes recorded by the police	2010	The indicator is somewhat outdated, but is the only indicator available in this geographic resolution. It is thus proposed to *keep the dataset in the database.*
	Housing: Number of rooms per person	2014	The indicator concerns an aspect that does not change quickly, but rather shows slow changes over time. A timeframe of 7 years is thus not particularly problematic and still reflects the situation today in most regions. It is thus proposed to *keep the dataset in the database.*
	Perceived social network support	2014	As the indicator is survey based and not frequently updated, it is problematic to replace with a comparable one. The broad qualitative approach and assessment methodology means that only major imbalanced changes would cause an issue when trying to capture todays situation. However, there have been considerable disruptions in peoples social networks and physical/virtual contact with other people in the context of the Covid-19 pandemic. It is thus proposed to *keep the dataset in the database*, however still review common sources for an updated indicator.
	Self-evaluation of life satisfaction	2014	The Covid-19 pandemic has caused a major disturbance in many peoples lives in terms of most aspects relevant for life satisfaction, be it leisure, work, private or professional life. The indicator thus certainly does not reflect the situation in the regions today, however no updated one has been published so far. It is proposed to *keep the indicator in the database*, however reflect on the timing when using it within a workshop setting.

Source: Consortium (2021)

Most indicators used are either not completely outdated (e.g. within 5 years some indicators will not show that much change, thus can still be used and considered to reflect the current situation of the regions) or are of high thematic relevance because they have been used in several workshops, or because they cover fields which cannot otherwise be covered by proxies. In particular Governance but also Society related indicators suffer from slow updates (e.g. due to infrequent surveys which are the basis of multiple of those indicators), however not a large amount of indicators is available for those fields in the first place. Therefore in many cases, the decision was made to keep them in the database.

3.2 Dataset of the sub-tool for the Urban TIA

For the Urban TIA tool based on Functional Urban Areas, the exposure fields have been updated to the extent possible, unfortunately many of them are project based and have not received an update so far. A number of highly specialised datasets is available at this level, which oftentimes are only collected in relation to specific projects. In order to keep the Urban TIA tool functioning and relevant, some more leeway was given regarding the up-to-dateness of the datasets. Generally, most datasets are however available for 2014 or later, thus not considerably outdated at this point in time. Table 3.3 shows the 31 standard indicators for FUA which were integrated into the TIA tool in the latest version

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

Thematic Field	Exposure Field	Year available in tool
Accessibility	Potential accessibility by transport infrastructure	2020 (projection)
	Average travel distances	2010
Demography	Population density	2020 (projection)
	Population weighted density	2020 (projection)
	Old age dependency ratio	2018

Thematic Field	Exposure Field	Year available in tool
	Young age dependency ratio	2018
	Urbanisation level	2010-2030
	Net migration	2014
Economy	Economic performance (GDP/capita)	2014
	Economic performance (GVA/capita)*	2014
Education and Skills	Educational attainment of 30-34-year olds, primary education	2015
	Educational attainment of 30-34-year olds, secondary education	2015
	Educational attainment of 30-34-year olds, tertiary education	2015
	Participation rate in education and training	2015
	Early leavers from education and training	2015
Environment	Recreational areas	2020 (projection)
	Concentration of PM_{10}	2020 (projection)
	Concentration of NO_2	2020 (projection)
	Removal capacity of PM_{10}	2020 (projection)
	Removal capacity of NO_2	2020 (projection)
Health	Crude birth rate	2018
Infrastructure	Urban form efficiency	2011
	Length of local roads per inhabitant	2014
	Road safety	2014
Land use and conservation	Share of green infrastructure	2020 (projection)
	Hectare of green infrastructure per capita	2020 (projection)
	Built-up areas per inhabitant	2011
	Annual land take per inhabitant	2010-2030
Innovation	Share of R&D personnel and researchers	2015
Natural Hazards	Urban Flood Risk	2020 (projection)
Social disparities	Unemployment rate	2018

Source: Consortium (2021)

Apart from updates of existing datasets, the main additions to the data are made based on the ESPON FUORE project which calculated a number of indicators. The datasets collected for the urban audit have been screened as well. It was revealed however 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. Those are in particular indicators relating to population structure, living conditions, household structures, urban transport. labour market etc.

Further indicators which were proposed to be integrated in the initial phase of the project were dropped upon review in the indicator collection phase. Those are listed in Table 3.4 including the reason for dropping them from the selection.

Table 3.4: Indicators from ESPON FUORE not included in the Urban TIA database

Thematic Field	Indicator	Reason
Innovation	Patent applications/mio inhabitants	Download of the dataset not possible
Social disparities	People at risk of poverty or social exclusion	Too many unplausible values
	Disposable income of private households	Too many unplausible values
	Gender balance employment	values for (male/female) employment rate not correct → all values are smaller than 0

Source: Consortium

3.3 Datasets of the sub-tool for the Cross-Border TIA

The core element of the Cross-Border-TIA module are the comparative indicators the project team calculated as a basis for standard indicators. Other than stock indicators provided e.g. by Eurostat, these have 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 3.5) which are updated to the latest available data and the NUTS 2021 version. In most cases, indicators connected to a concrete LPDs effect however have to be calculated for the respective workshop and the specific topic in question, as also the type of indicator (CB Product, difference, lower or higher) depends on the questions to be answered by the TIA.

Table 3.5: Dataset currently integrated in the sub-tool for the Cross-Border TIA

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

Source: Consortium (2021)

So far, no specific cross-border workshop has been requested and conducted in the current project, thus no additional CB-indicators have been calculated which can be checked for their applicability as standard indicators.

The currently ongoing study Providing Public Transport in Cross-border Regions — Mapping of Existing Services and related Legal Obstacles is expected to potentially provide additional indicators relating to the accessibility of CB-regions. The study is in its final phase, however it is uncertain it results are available before closing of the project at hand. The project team thus has established contact with DG REGIO regarding access to the data provided by the study potentially ahead of publication. If the datasets can be received in time they will be checked on their potential to calculate an indicator relating to public transport accessibility for CB regions. This could significantly improve the exposure fields currently available and also likely can be included as a standard indicator in the tool.

3.4 Typologies included in the TIA Tool

All typologies in the tool currently have been updated to the NUTS 2021 version. There are no issues linked to region changes for those typologies, as all regions e.g. in case of splits or new regions could be clearly assigned to the existing typologies. For fuzzy typologies, the same methodology as for recalculating exposure fields has been applied. Table 3.6 presents the list of typologies and sources included in the TIA tool.

Table 3.6: Typologies included in the TIA Tool

Typology	Description	Source
Predominantly urban	The typology is applied to NUTS level 3 regions of the European Union (EU) to Statistical Regions level 3 of the EFTA and Candidate countries; A similar typology is applied by the OECD to Territorial Level 3 (TL3) regions of its member countries. It is a based on the share of the regional population living in rural grid cells (in other words the rural population) and urban clusters. Based on the share of the rural population the regions are then classified into the following three groups: predominantly urban region: the rural population accounts for less than 20 % of the total population	Eurostat, 2021
Intermediate	The typology is applied to NUTS level 3 regions of the European Union (EU) to Statistical Regions level 3 of the EFTA and Candidate countries; A similar typology is applied by the OECD to Territorial Level 3 (TL3) regions of its member countries. It is a based on the share of the regional population living in rural grid cells (in other words the rural population) and urban clusters. Based on the share of the rural population the regions are then classified into the following three groups: intermediate region: the rural population accounts for a share between 20 % and 50 % of the total population	Eurostat, 2021
Predominantly rural	The typology is applied to NUTS level 3 regions of the European Union (EU) to Statistical Regions level 3 of the EFTA and Candidate countries; A similar typology is applied by the OECD to Territorial Level 3 (TL3) regions of its member countries. It is a based on the share of the regional population living in rural grid cells (in other words the rural population) and urban clusters. Based on the share of the rural population the regions are then classified into the following three groups. predominantly rural region: the rural population accounts for 50 % or more of the total population.	Eurostat, 2021
Metropolitan region	The NUTS-3-based typology of metro regions contains groupings of NUTS-3 regions used as approximations of the main metropolitan areas. No exact information on the space that has been classified seems to be given.	Eurostat, 2021
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, 2021
Island region	A typology of NUTS3 regions entirely composed of islands	Eurostat, 2021
Mountain region	A typology of NUTS3 regions based on mountain areas (areas defined in the DG REGIO study on mountain areas)	DG Regio, 2016; updated by Eurostat in 2021
> 50 % of population live in mountain areas	A typology of NUTS3 regions based on mountain areas (areas defined in the DG REGIO study on mountain areas)	DG Regio, 2016; updated by Eurostat in 2021
> 50 % of surface are in mountain areas	A typology of NUTS3 regions based on mountain areas (areas defined in the DG REGIO study on mountain areas)	DG Regio, 2016; updated by Eurostat in 2021
> 50 % of population and 50 % of surface are in mountain areas	A typology of NUTS3 regions based on mountain areas (areas defined in the DG REGIO study on mountain areas)	DG Regio, 2016; updated by Eurostat in 2021
Major island < 50,000 inhabitants	A typology of NUTS3 regions entirely composed of islands	DG Regio, 2016
Major island between 50,000 and 100,000 inh.	A typology of NUTS3 regions entirely composed of islands	DG Regio, 2016

Typology	Description	Source
Major island between 100,000 and 250,000 inh.	A typology of NUTS3 regions entirely composed of islands	DG Regio, 2016
Island with 250,000 – 1 million inhabitants	A typology of NUTS3 regions entirely composed of islands	DG Regio, 2016
Island with >= 1 million inhabitants	A typology of NUTS3 regions entirely composed of islands	DG Regio, 2016
Cross-border regions	Typology of cross-border regions based on DG Regio	DG Regio, 2016
Fuzzy – Primary Industries: Share of EU Local GDP exposed to Brexit	The measure gives the share of regional GDP contained in trade flows between EU exporters and UK importers.	Chen, W. et al. (2017). The continental divide? Economic exposure to Brexit in regions and countries on both sides of The Channel.
Fuzzy – Manufacturing: Share of EU Local GDP exposed to Brexit	The measure gives the share of regional GDP contained in trade flows between EU exporters and UK importers.	Chen, W. et al. (2017). The continental divide? Economic exposure to Brexit in regions and countries on both sides of The Channel.
Fuzzy – Construction: Share of EU Local GDP exposed to Brexit	The measure gives the share of regional GDP contained in trade flows between EU exporters and UK importers.	Chen, W. et al. (2017). The continental divide? Economic exposure to Brexit in regions and countries on both sides of The Channel.
Fuzzy – Services: Share of EU Local GDP exposed to Brexit	The measure gives the share of regional GDP contained in trade flows between EU exporters and UK importers.	Chen, W. et al. (2017). The continental divide? Economic exposure to Brexit in regions and countries on both sides of The Channel.
Fuzzy – Share of EU Local GDP exposed to Brexit	The measure gives the share of regional GDP contained in trade flows between EU exporters and UK importers.	Chen, W. et al. (2017). The continental divide? Economic exposure to Brexit in regions and countries on both sides of The Channel.
Fuzzy – Border Regions (Terrestrial, Population within 25km)	Share of populuation within 25 km from a border region	SWECO, t33, Politecnico di Milano, Nordregio, OIR calculation
Border Regions (Maritime)	Typology of maritime border regions based on DG Regio study	SWECO, t33, Politecnico di Milano, Nordregio

Typology	Description	Source
Border Regions (Terrestrial)	Typology of terrestrial border regions based on DG Regio study	SWECO, t33, Politecnico di Milano, Nordregio
Fuzzy – Mountainous Areas (share of the total area)	Fuzzy Typology: Share of a NUTS3 region that is covered by mountainous terrain based on the EUROSTAT manual on territorial typologies. Calculation by using a digital elevation model (DEM).	EUROSTAT, 2016
Fuzzy – Mountainous Areas (population living in mountainous areas)	Fuzzy Typology: Share of the total population of a NUTS3 region that is living in mountainous areas based on the EUROSTAT manual on territorial typologies. Calculation by using a digital elevation model (DEM) and population grid data.	EUROSTAT, 2016
Fuzzy – Urban Areas (population living in urban areas)	Fuzzy Typology: Share of the total population of a NUTS3 region that is living in urban areas based on the EUROSTAT manual on territorial typologies.	EUROSTAT, 2016
Fuzzy – Rural Areas (population living in rural areas)	Fuzzy Typology: Share of the total population of a NUTS3 region that is living in rural areas based on the EUROSTAT manual on territorial typologies.	EUROSTAT, 2016
Fuzzy – Agricultural Regions	Typology of regions based on the share of the Utilised Agricultural Area (UAA) on the total area of the region	DG AGRI
Fuzzy – Border distance	Fuzzy Typology: Normalised distance from the midpoint of a NUTS 3 region to the next closest border. In case a region is at a border, it gets the value 1.	ÖIR calculation
Fuzzy – Urban Fabrics	Fuzzy Typology: Share of urban fabrics (continuous and discontinuous urban fabrics) on the total area of the region	Corine Land Cover, Eurostat, 2018
Fuzzy – Industrial, commercial and transport units	Fuzzy Typology: Share of industrial, commercial and transport units on the total area of the region	Corine Land Cover, Eurostat, 2018
Fuzzy – Total residential and industrial land	Fuzzy Typology: Share of residential (continuous and discontinuous urban fabrics) and industrial land on the total area of the region	Corine Land Cover, Eurostat, 2018
Fuzzy – Forest areas	Fuzzy Typology: Share of forest areas (broad leaved, coniferous or mixed forest) on the total area of the region	Corine Land Cover, Eurostat, 2018

Source: Consortium

For the final version of the tool, four additional fuzzy typologies are to be calculated., the Corine Land Cover dataset which allows targeted calculations of typologies on every NUTS level has been agreed as being able to provide some standard typologies. The 44 classes[6] have been screened and based on the potential applicability to multiple TIA circumstances. The table below presents the selected classes, for which the share of the total regions surface will be calculated as fuzzy typology.

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

Table 3.7: Additional Fuzzy typologies (Corine)

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

Source: Consortium

4 Workshops and trainings conducted

4.1 Workshops conducted

In the period from the start of the project, 3 individual TIA workshops linked to the project have been conducted. Due to the ongoing Covid-19 crisis, all workshops had to be held in a virtual format and no in-person activities took place. The lessons learned for such workshops have proven valuable and allow for a more efficient planning and implementation in the future.

The workshops were conducted based on requests from the Committee of the Regions to support the work on several of their studies. Furthermore, within each workshop new methodological elements developed for the current TIA tool update have been tested on their practicability in a workshop setting, on the participants willingness to take up those elements and on the comprehensibility of more complex methods such as composite indicators. Even though the methodological approaches themselves have not been discussed with the participants, valuable feedback could be gathered.

Table 4.1: Workshops conducted

Title	Client	Type
Cross-border health threats	Committee of the Regions	General TIA
2030 climate targets	Committee of the Regions	General TIA
Cohesion as a value in the context of the environmental, digital and societal transformation	Committee of the Regions	General TIA

Source: Consortium

Results of the workshops in terms of input to methodological elements have been taken up in the further development and discussions. In particular Cross-Border elements and related fuzzy typologies are relevant for further developing the Cross-Border portal. Furthermore, the application of composite indicators has proven that they can be meaningful for the TIA Quick Check and that participants do approve of them.

4.2 Trainings conducted

Training activities are an important element of the TIA project as they raise interest from stakeholders and potential applicants of the TIA Quick Check. They allow for a better understanding of the methodology by the participants and can encourage future activities. Training sessions are implemented flexibly and based on the clients concrete requirements. While a “standard” training in the form of a half-day workshop session has been conceptualised which covers an overview over the main elements of the TIA Quick Check and a brief simulation in practice, this can be adapted in length, depth and topics.

Just as for the actual TIA workshops, the trainings had to be held in online format. The tools and materials used (such as e.g. the virtual whiteboard and the voting software) are the same as for the TIA workshops. The trainings however had to leave out some elements which are usually requested, namely the “hands on” experience with the tool. In a physical meeting, the participants would be given access to the tool and guided through steps for setup and tool inputs with the help of the trainers. Such a direct support could not be implemented in a virtual setting. Participants were thus given access to the tool following the training, but would have to explore on their own.

Table 4.2: Trainings conducted

Title	Client
Training for interested audience in the Baltic Sea Region using the revision of the TEN-T guidelines as an example	Ministry of Environmental Protection and Regional Development of the Republic of Latvia
Training for interested audience in the context of a 2-day conference in the context of the Territorial Agenda 2030 pilot action on Region-focused Territorial Impact Assessment	Polish Ministry of Development Funds and Regional Policy

Source: Consortium

While one activity was implemented as a standard training showcasing some of the tools features and giving some background explanations to participants, the second activity was implemented in the context of a larger conference on Territorial Impact Assessment methodologies with presentations for all major methodologies applied in the EU. Furthermore, topics of territorial relevance of particular regions such as Cross-Border regions, rural regions or outermost regions were discussed, all of which are already addressed through the ESPON TIA Tool, however to a varying degree.

5 Further activities and developments

5.1 Ongoing developments

5.1.1 Fuzzy typologies

Implemented typologies

Fuzzy typologies as a means of better tailoring the assessments towards specific regional properties and levels of affectedness have been added to the tool in the last development phase and were applied in several workshops. In general they were well received, however workshops participants often shy away from using them due to the assumed limitations of such a typology. The project team has trialled new fuzzy typologies in the workshops conducted, however those typologies were in no case accepted by the participants, who preferred to stick to standard typology of all regions in all cases.

The project team has however added 5 typologies as standard which were selected based on an assessment of the assumed need or added value for such typologies. The quality criteria for typologies are more rigid than for exposure fields, as data gaps are much more critical. A region with no data available in an exposure field will only lose a piece of information in the assessment for a single exposure field, while a region with no data available in a typology will lose information for the whole TIA. Therefore all datasets which were considered as a basis for a typology were checked according to the following criteria:

- **Completeness:** Only complete datasets with no data gaps in the relevant areas are a sound basis for creating typologies. For standard typologies in the TIA Tool, the dataset has to cover at least 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. Datasets which show a heavily skewed distribution to either side or which contain strong outliers lead to uninterpretable results.
- **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.
- **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, 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 share of a specific land cover category respectively aggregate of land cover categories on the total area of a region are used for calculating the Fuzzy typology. The typologies selected are listed in Table 3.7

Additionally, two typologies relating to often requested application cases, namely focused assessments for Cross-Border regions as well as “rural proofing” for EU legislation have been developed as well. For Cross-Border regions, some considerations are already outlined in section 5.2 for a particular workshop on Cross-Border health threats, an additional typology depicting the relevance of a border for a region throughout Europe was needed. This was not covered by the existing typologies, as they all focus on regions directly at the border. Therefore, a typology based on the actual distance of a regions midpoint to a border was calculated, which includes all regions of Europe. The typology was not selected in the workshop, but implemented in the tool nonetheless.

For “Agricultural Regions” a typology based on the Utilised Agricultural Area per region (as a share of the total area) calculated by DG AGRI for the CAP context indicators has been used. This allows to address

actual “agricultural regions” and complements the existing fuzzy typologies for rural regions, which are based on population in rural grid cells.

Further methodological developments for fuzzy typologies

In the context of the project two new approaches to fuzzy typologies have been developed which are intended to be tested in workshop settings. They pick up the concept of fuzzy typologies but take an approach to calculating them which goes beyond what is currently done in terms of content or complexity. The two approaches 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.

Unfortunately, all workshops conducted in the current projects did not allow for such specialized typologies, as they either related to a rather broad topic with multiple policies involved in the assessment (workshops on “2030 climate targets” and “cohesion as a value”) or a specialized LPD for which another type of fuzzy typology was necessary and the two approaches would not lead to meaningful results.

There are still TIA workshops to be conducted in the context of the ongoing project though, and the project team intends to trial the approaches in those. However as the topics of those workshops are always determined based on the request of clients (e.g. Committee of the Regions, DG REGIO), it can be the case that the upcoming workshops are not fitting the proposed approaches. In that case, the project team proposes to add the guidance on how to calculate such typologies to the moderators guide only. It is not advised to include such specialized typologies as standard typologies without a concrete LPD they relate to and have been tested on.

5.1.2 Composite indicators

Composite indicators as a methodological concept are already outlined in section 2.3.1. They are one of the main additions in the TIA tool update project aiming at better tailored assessments for LPDs and also supposed to overcome data shortages on certain issues where mainly general, but few specific indicators are available. Similar to fuzzy typologies, they were developed and tested in practice in the TIA workshops conducted to assess their applicability in practice. Furthermore, their acceptance by the workshop participants was assessed, as they might be not as straight forward and comprehensible as other indicators. For each of the three workshops, at least one indicator was considered and subsequently prepared and suggested in the workshop.

Table 5.1: Developed composite indicators

Composite indicator	Description	Source
economic sectors at risk of the Covid-19 pandemic	This composite indicator shows the risk level of the Covid-19 pandemic to the regional economy. The total number of employment of each sector by NACE Rev. 2 activity has been grouped by the level of risk “medium“ and “high”. Then the normalised share of employment in these two risk categories has been weighted with 1 (medium risk) or 2 (high risk). The risk level has been assessed as follows: medium: mining and quarrying, construction, transportation and storage, financial sector high: manufacturing, wholesale and retail trade; repair of motor vehicles, accommodation and food service activities, real estate activities, administrative and support service activities, arts, entertainment and recreation; other service activities, activities of household and extra-territorial organizations and bodies	Eurostat, risk assessment by Spatial Foresight (2020), OIR calculation
Accessibility by air and road	This composite indicator consists of summing the normalised indicators "accessibility by air" (weighted with the factor 2/3) and "accessibility by road" (weighted with the factor 1/3).	S&W Spiekermann & Wegener, Urban and Regional Research, OIR calculation
Green Innovation	Sum of 1) share of patents in environment-related technologies on total SMEs and 2) share of SMEs that introduced product or process innovations on total SMEs	OECD, RIS 2019, ESPON SME, calculation of indicator by OIR

Source: Consortium (2021)

Two of the above indicators are (“Economic sectors at risk of the Covid-19 pandemic” and “Accessibility by air and road “) are less complex as the sub-indicators which were combined are based on the same methodology and represent different aspects of a specific topic. The third indicator (“Green innovation”) can be considered more complex, as it combines two sub-indicators which are based on different sources and are not in the same thematic field.

The indicators were well received by workshop participants and no methodological concerns were raised. Two of the indicators (“Economic sectors at risk of the Covid-19 pandemic” and “Green Innovation”) were selected in their respective workshop and provided useful results for the impact assessment. The third indicator (“Accessibility by air and road”) was declined as it was considered not fitting the effect the workshop participants had in mind and taken down in the systemic picture.

These results are considered as proof of concept and consequently composite indicators will be considered in all future workshops as well. To support in the creation of such indicators, the project team has developed an easy-to-use excel tool which allows the calculation of composite indicators by anyone with basic excel skills. The guidance is added to the moderators guide as well, including caveats and restrictions of relevance when applying composite indicators in a Territorial Impact Assessment.

5.2 Proposed future developments

5.2.1 Cross-Border-Portal

Updating the cross-border portal is one of the additional functionalities which have been proposed by the project team in the initial phase of the project. The updates would aim at making the portal applicable to more circumstances and to allow for better tailoring to the different kinds of users which might be interested in using it. The project team has consulted with the responsible unit of DG REGIO on this, bringing forward the following conclusions:

- “maximum flexibility” is not the approach to be followed, as the aim is to create comparable and meaningful results. It is thus suggested to identify the most relevant use cases, e.g. assessments for Interreg

programmes, assessments across Interreg programmes or assessments for functional border regions, and design typologies and indicators to their needs. Individual user-created content can be used for further tailoring the tool if an experienced user has the need for it

- "Functional" regions on a general, pan-European level can best be approximated by actual, physical links between regions across borders. While functional relations such as through commuters would be even more relevant, that data is simply not available in the spatial resolution required. Thus links such as through border crossings, railways or roads can be used as a proxy
- Policy relevance is highly important for the TIA tool, thus administrative regions, programme regions etc. form a good basis of assessments in the context of LPDs. This is especially relevant for actors such as INTERACT, but might also be relevant on a more regional level.

There are ongoing projects which potentially can provide meaningful insights and a solid data base for such delineations, in particular the study "Providing public transport in cross-border regions. Mapping of existing services and related legal obstacles" launched by DG REGIO and supposed to finish this summer. As there are no interim reports published, the project team did not receive access to the data produced. As soon as it is available the datasets can be reviewed for input to the CB-portal. A similar project, "Comprehensive analysis of the existing cross-border rail transport connections and missing links on the internal EU borders" has been conducted in 2018, however with less depth and only focusing on railway connections.

Based on the above considerations, the following additional updates of the CB-Portal are proposed:

- In consultation with ESPON EGTC select 3 relevant cases of CB assessments (taking as a starting point the first bulletpoint above) for which the portal shall provide standard solutions
- For each solution, produce a specific typology that allows to target the assessments
- Implement each typology into the CB-portal (other than for typologies in the general TIA tool this requires updating the shapefiles as well)

5.2.2 Concept for an Outermost Regions portal

The concept for an outermost Regions portal has been put forward in the course of the project, and still remains a possibility for implementing as an additional functionality. The interest in such a portal was emphasised in the training activity conducted on the Territorial Agenda 2030 in the context of the project. 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 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.

Annex [separately]

A.1 Draft version of the updated part of the guidance document for moderators

A.2 Draft version of the updated part of the guidance document for administrator module

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