Inspire policy making by territorial evidence

European and Macro-regional Territorial Monitoring Tool

Service contract

Final Report

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Abbreviations

EC	European Commission
EGTC	European Grouping of Territorial Cooperation
MRS. ESPON	European and Macro-regional Territorial Monitoring
ESPON	European Territorial Observatory Network
EU	European Union
EUSAIR	EU Strategy for the Adriatic-Ionian Region
EUSALP	EU Strategy for the Alpine Region
EUBSR	EU Strategy for the Baltic Sea Region
EUSDR	EU Strategy for the Danube Region
IDA	International Development Association
IMF	International Monetary Fund
MRS	Macroregional Strategy
OECD	Organisation for Economic Co-operation and Development
ToR	Terms of Reference
UN HDRO	Human Development Report Office of the United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNWTO	United Nations World Tourism Organisation
WEO	World Economic Outlook
WTO	World Trade Organisation

1 Introduction

The aim of this ESPON project is to develop a **practical and operational ESPON European and Macro-regional Territorial Monitoring Tool** (MRS. ESPON) to continuously observe the development trends and patterns taking place in Europe and its four macro-regions. The tool should support European, macro-regional, national and regional policy makers and other macro-regional stakeholders with territorial information, data, maps, graphs, analytical features and short comments. By reading and interpreting the quantitative statistical information in the light of policy objectives and aims, **the results of this activity shall help policy makers to monitor development trends and policy performance**, to identify development opportunities and territorial challenges, as well as to better understand the diversity and position of regions and cities in the heterogeneous European context.

In order to improve the relevance, efficiency and effectiveness of policy making processes, monitoring and evaluation has a strategic role to play. The strong political focus on the territorial dimension in various policies and strategies on one hand and the improved knowledge of territorial structures, trends and scenarios generated by ESPON on another, highlight the needs as well as the opportunities to create a monitoring platform that can provide and promote territorial information, and evidence in relation to European and macro-regional policy objectives on a regular basis.

The main output is a **simple and highly communicative web tool** that provides territorial evidence to stakeholders and policymakers in Europe as well as in the four macro-regions. The overall structure of the tool comprises a European module and one module for each of the four EU macro-regions (Baltic Sea Region, Danube Region, Adriatic-Ionian Region and the Alpine Region). Macro-regions are a form of cooperation between EU member states focussing on specific areas of cooperation that are of joint interest for future development. This tool displays key development trends over time and illustrates the progress made in the implementation of policy objectives as defined in the EU macro-regional strategies and – in the Baltic case – in the VASAB Long-Term Perspective. The tool is made available via the ESPON website and establishes a direct link to the ESPON Database.

The tool provides a **selection of indicators** as a first suggestion to be **further developed in the future**, as the tool is a starting point for the continuous monitoring of the Macro-Regional Strategies. In this sense, some aspects such as **data gaps**, lack of **data at lower regional levels** or lack of **relevant indicators** for certain elements will certainly be overcome in the future as new relevant data is identified through future **stakeholder involvement**. The tool currently contains only **past statistics**, but its structure allows for delivering results of **forecasting studies**, should it be identified such data is useful for illustrating certain aspects.

This Final Report presents the tool and activities related to its construction. The online tool is available at the following link http://mrs.espon.eu. The tool covers, according to the ToR:

- Implementation of the web client design
- Implementation of the European, EUSBSR, EUSDR, EUSALP, EUSAIR modules
- Implementation of queries and analytical tools
- Implementation of the web services and connection of the tool with ESPON 2020 Database Portal as well as EUROSTAT
- A selection of indicators integrated through web services and displayed as interactive and static maps and graphs, complemented by short descriptions.

This report comments on the work done in relation to the final version of the tool including:

- The process of the indicator selection and the reflection on additional indicators for analysing trends, strategies and actions under work packages 3 and 4
- Proposal for planning and developing additional technical solutions or features under work packages 4 and 5.
- Overview of Steering Committee feedback and the stakeholder dialogue

2   Final version of the online tool

This chapter describes the final version of the tool, containing all aspects required in the ToR in relation to **work package 2:**

- Final version of the web client design
- Implementation of the final version for European and all macro-regional modules
- Implementation of the final versions for queries and analytical tools
- Fully functioning web services
- All indicators proposed under work package 3 integrated through web services and displayed as interactive and static maps, featured in analytical tools and complemented by short descriptions that include internal links within the pages of the tool as well as external links to relevant documents
- Development of an administrator component
- Development of help and guidance materials
- Integration of the tool to the ESPON website

A more detailed account of other relevant elements like the back-end development and structure and documentation on the database and the web services is available in the annexes accompanying this report.

2.1   Structure of the web client design

The web client follows a structure aimed to develop a strong user-centric approach and to provide clear links to political dynamics. This is why the structure of the monitoring reflects the governance-set up of macro-regions, political narratives and story lines.

In doing so, the structure addresses the requirements of the project's ToRs, namely:

- Monitoring of territorial trends and structures over time
- Monitoring the macro-regional objectives
- Monitoring the activities of the macro-regional strategies and possible contributions to changes in the macro-regions

Figure 1 shows the landing page of the tool. The five modules are immediately visible (one European and four macro-regional options) that are handled in a parallel manner throughout the tool, including structural details, navigation, and the 'look and feel' of the tool. On the top level, the "MRS" link allows to exploit more general background information on the macro-regional setting and terminology. The second top section remains static throughout the navigation of the tool, allowing switching directly between the different modules. On the bottom of the page, the logos of the macro-regions allow to visit the official homepages of the strategies. Here, the user also can find information about contact and is referred to the legal notice of the ESPON Programme.

Figure 1 Structure of the landing page
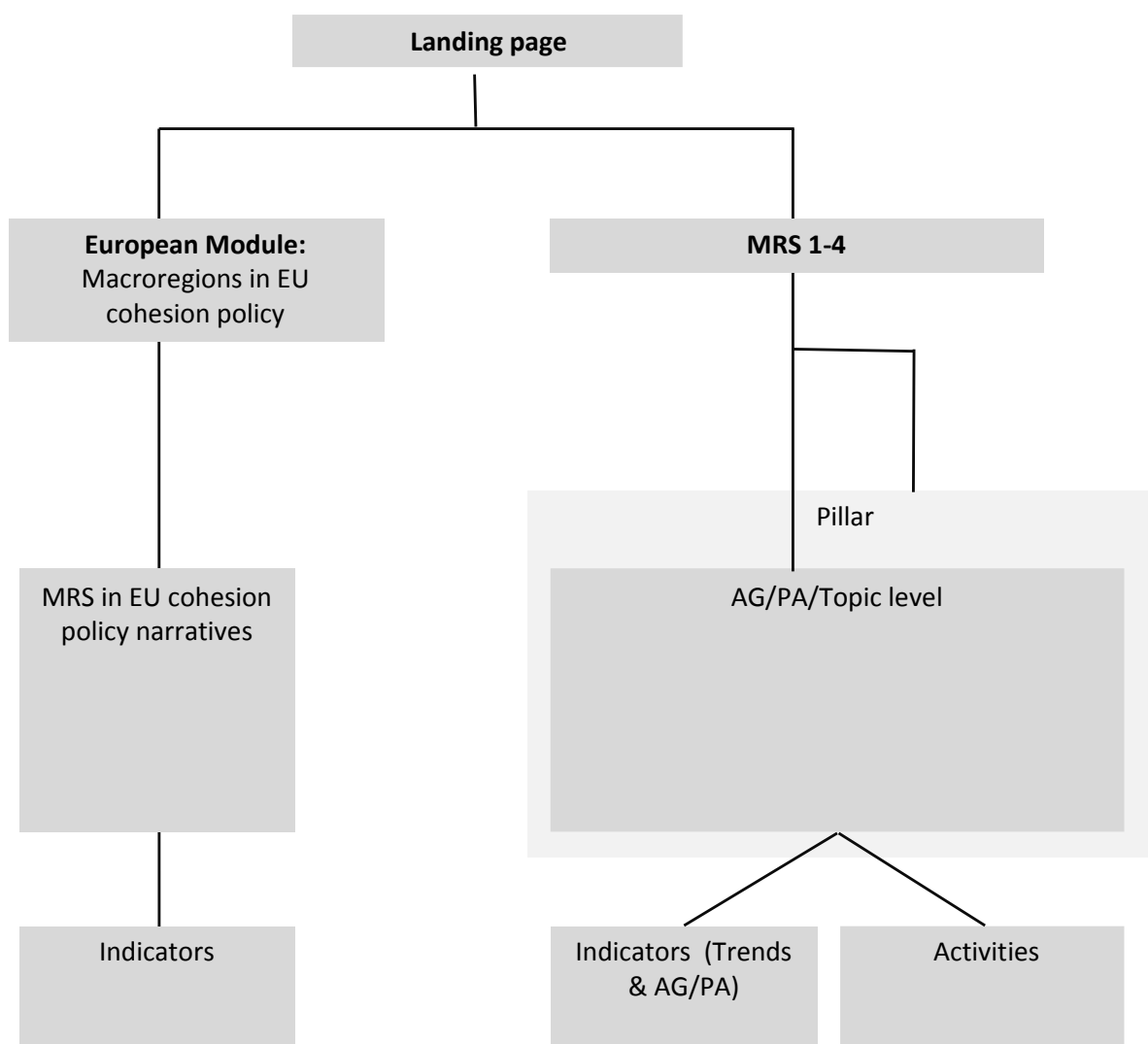
Figure 2 General schematic structure of the tool's modules

Figure 2 shows the structure of the tool in a schematic way. The important idea is the parallelism and – thus – corporate style. The top level introduces the political objectives as such, whereas the lowest level contains the monitoring options in the strict sense. In between, the interface between political and territorial dynamic is explained in more detail: The European module focuses on the Cohesion Policy objectives of the funding period 2021-2027, and provides narratives on how MRS contribute to it, whereas the MRS level focuses on the objectives on the level of the pillar/objective and/or the priority area/policy area/action groups etc.

The strength of this approach is to have an accessible navigation through a continuum of political and territorial dynamics that allows also to move between different modules easily.

Before commenting on the five modules in more detail, we comment on the general approach of monitoring on the indicator level.

2.2 Indicator selection

As the territorial area covered by the MRS. ESPON tool is vast and diverse and includes non-EU-countries, it is obvious that data quality and availability differ largely over the different territories and scales.

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In order to establish a meaningful and user-friendly indicator set, the project is based on a two-step approach. In a first step, it was necessary to select the most appropriate indicators for a 'long list' and to categorise their potentials and limitations.

This scoping of indicators from the reviewed sources (see annex document for more details) followed the next criteria:

- Policy relevance. The selected indicators have to measure in a direct or indirect way the political objectives. This has to consider that some of the political objectives explicitly mention specific indicators (for instance the EUSDR PA1A calls for an "Increase [of] the cargo transport on the river by 20% by 2020 compared to 2010" and Eurostat offers this specific indicator). Other objectives can hardly be linked to quantitative indicators (e.g. PA3 of EUSDR postulating "green tourist products along the Danube Region" for which no specific indicator can be defined).
- Geographical coverage. We prioritise indicators that include a wider coverage in number of countries, ideally covering all countries included in the different macro-regions. This is especially relevant for non-EU member states that tend to be not included in the European data repositories.
- Geographical level. The availability of data on regional level is a critical point.NUTS3 is preferred whenever possible, but at least NUTS2 has to be offered as macro-regions are mainly defined at this level. The selection also considers availability at other territorial levels (Functional Urban Areas, Cities, trans-national cooperation areas, cross-border regions). Some of these territorial levels can be derived from NUTS3 indicators, but it is preferred if the indicator already exists for them from an official source.
- Time coverage. Some indicators have long time series in order to be able to show trends over time (i.e. preferably indicators available for at least 15 years in order to cover the period before the economic crisis of 2008). A second requirement in terms of time is that the indicators as few gaps as possible. Moreover, it is useful to have data for the most recent years ("timeliness") , as it happens for certain indicators that they are available with a time lag of several years (meaning that values for recent years 2016-2019 are not available, for instance GDP figures for 2017 have not been available until 2019).
- Reliability. For the selection of indicators, we give priority to data sources that were already identified on the ToR and the inception phase. These sources are considered to be the most reliable, and include EUROSTAT, ESPON database, JRC database, Keep database and the official national statistical institutes. If necessary, data from other sources such as projects or papers will also be considered.
- Updating periodicity. Priority is given to indicators that are updated more regularly, ideally on an annual basis, in order to guarantee a proper coverage of future years.
- Access to the data. Priority is given to data sources that allow automatic retrieval of the data through online web services, as this guarantees that the tool is fed with the most up-to-date values. The second-best option is the possibility to use data as a database, sheet or pdf directly from an online source.

This scoping exercise led to a broad indicator basis for all modules. At the same time, several indicator sets are not sufficient with regard to data quality, others tend to be redundant, and for a few priority areas, no statistical data was available at all. This is why a second step of data selection, complementation and finalisation ensures a good usability of the tool.

This second step transforms the mentioned long list into a narrower selection based on three main criteria: The indicators…

1. …have to cover a reasonable level of data availability (at least one indicator on the regional level, at least one level covering the complete perimeter including third countries)
2. …have to be meaningful in particular with regard to the political objectives of the macroregional strategy and they are sound and reliable with regard to spatial monitoring in general

3.   …are not too similar or redundant (e.g. not similar versions of age indices)

Across the four macro-regions, applying this approach leads to having approximately three indicators per AG/PA/Topic. It is important to mention that the selection results have been object of review in the course of the stakeholder dialogue, and remain open for amendments and potential selection of new or additional indicators in the future after the finalisation of this service contract, and until the Final Report.

The indicators selected in this process are incorporated in the tool and available for displaying in maps and graphics on the five modules.

The process of incorporating an indicator in the system consists of:

- Declaring the metadata of the indicator (source, years, territorial nomenclature and version, units, comments…)
- Declaring the URL needed for retrieving the data through web services (the tool supports direct access to ESPON database and EUROSTAT)
- Including data from sources not reachable via web services (this implies preparing a table with the territorial units, years and values)

A detailed explanation of this procedure is provided in 2.11.2.

2.3   European module

In the European module, indicators are assigned to the objectives of the new Cohesion Policy. The MRS. ESPON tool will actively be used in the 2021-2027 EU funding period, which is currently launched under the new Commission of Ursula van der Leyen. This is why the tool reflects the general policy themes that will guide the EU Cohesion policy in the years to come. These "policy objectives" are according to the Common Provision Regulation (https://ec.europa.eu/commission/sites/beta-political/files/budget-may2018-common-provisions_en.pdf) the following:

- a smarter Europe through innovation,

- a greener, carbon free Europe,

- a more connected Europe (with strategic transport and digital networks),

- a more social Europe (delivering on the European Pillar of Social Rights and supporting quality employment and skills) and,

- a Europe closer to citizens (with the support of locally-led development strategies and sustainable urban development).

The indicators of the European module offer territorial trends and structures over time. Besides the pan-European overview, a comparison between the macro-regions is offered within this module.

The module is organised following the same layout of the landing page, but this time the boxes of the main section provide direct access to the five policy areas and a sixth box provides direct to a page with background information on European regional policy.
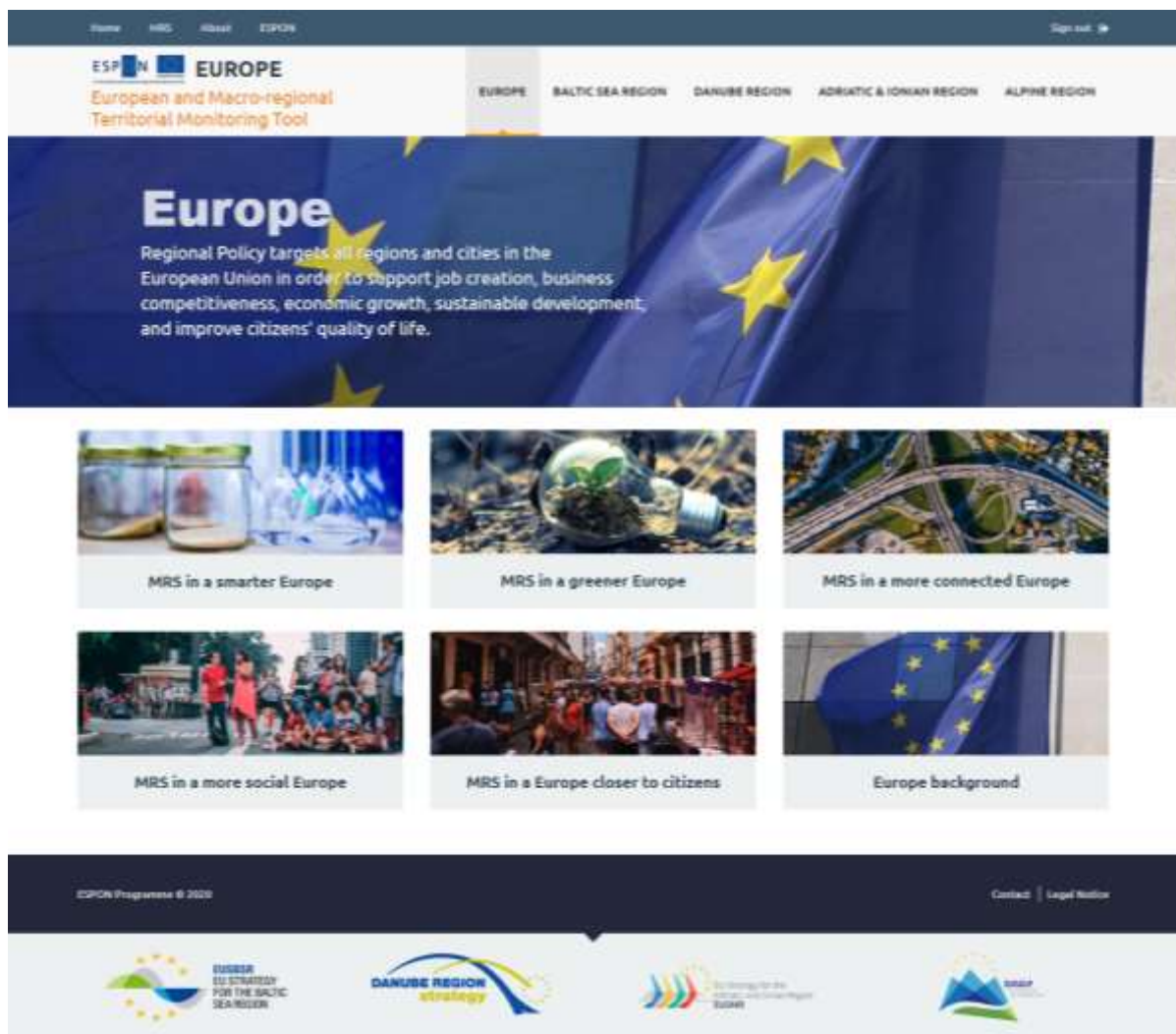
Figure 3 Structure of the main page of the European module

Within the European module, information is organised hierarchically on a tree at the left-hand side of the screen, providing direct access to all elements. The main headers of the five policy areas fold and unfold automatically upon clicking them.

For each policy area there is:

- A description of the policy area following the structure
    - (1) Theme and goals of the policy area,
    - (2) Political background and initiatives,
    - (3) Contribution of MRS to policy objectives and
    - (4) Commenting on the learning points from indicators.
- Positioning of the regions: an interactive scatter plot of a selected indicator that shows the status of regions and their relation against averages for EU and the MRS
- Selection of indicators: they include a map and a text describing the indicator and the policy relevance and analysis. The indicators are accompanied by a text alongside three themes (1) Information on the Indicator and data; (2) Description of the territorial trends and patterns and (3) a comment on the political dimension.
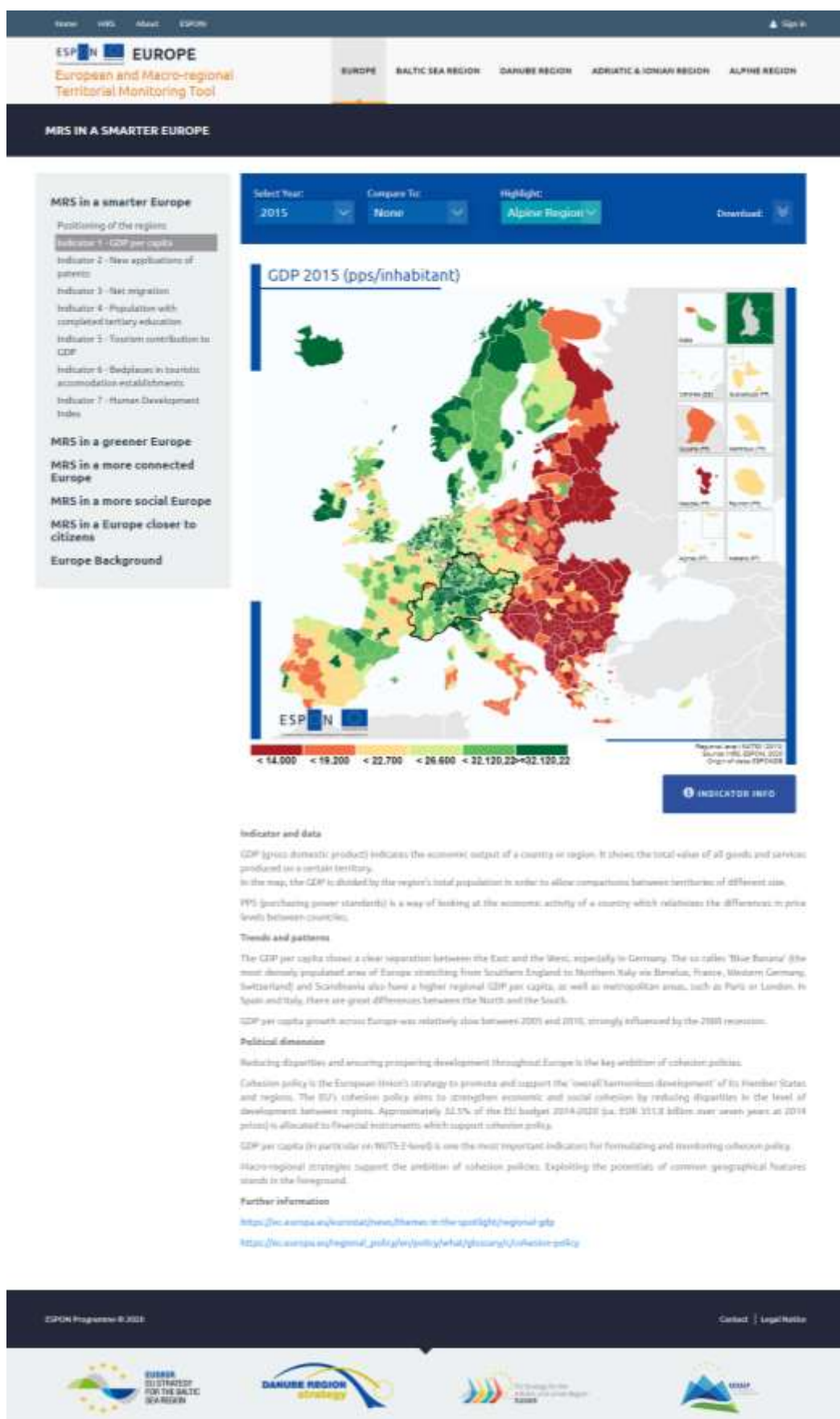
Figure 4 Example of indicator page for the European module
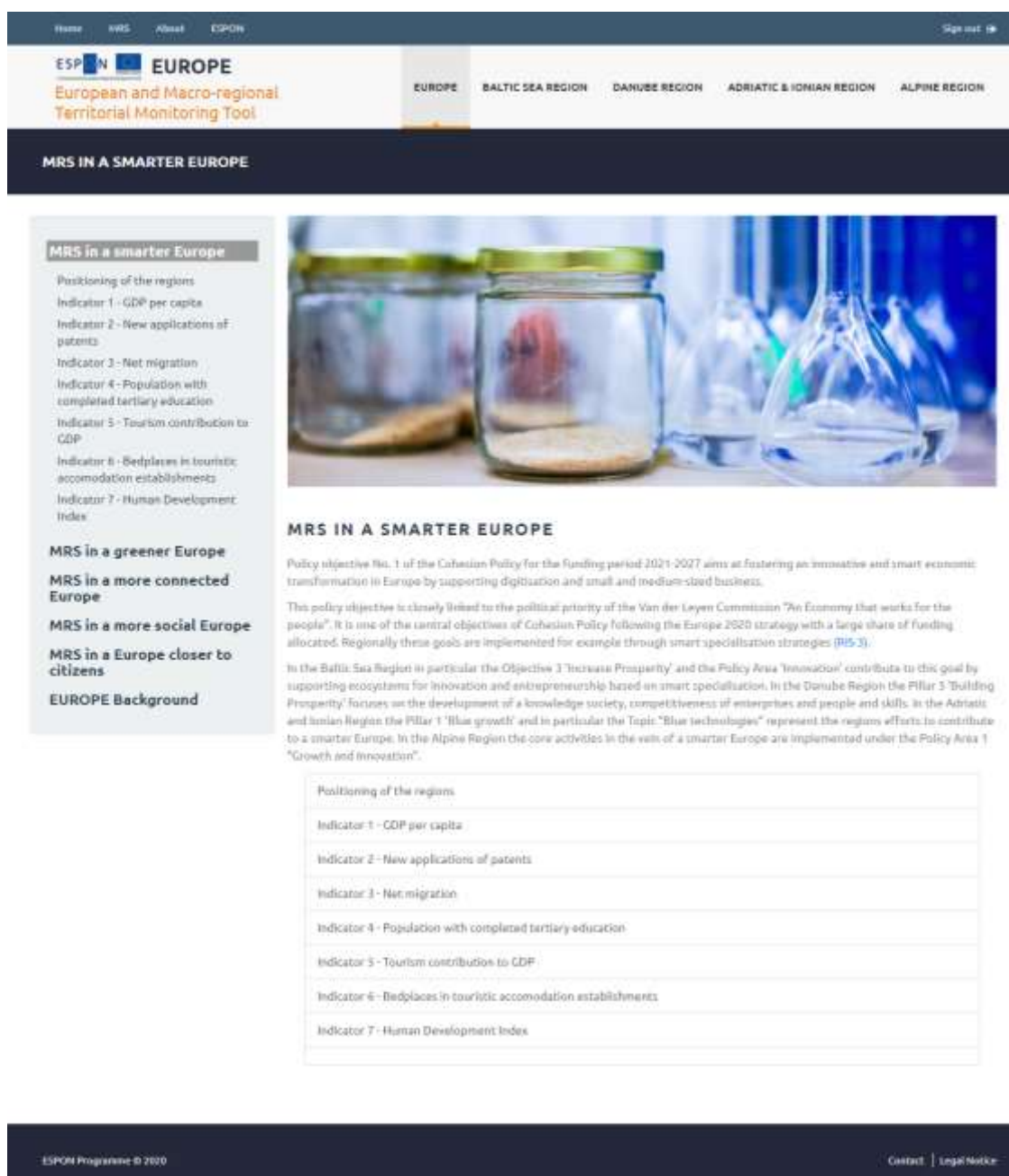
Figure 5 Structure of a policy area in the European module

Benchmarking

The European module contains the option for "Positioning of the regions". This takes up the ToRs call for benchmarking. The purpose of this tool is to understand how a particular region is developing from a comparative perspective and how broad the range of development patterns is. The figure shows the example of GDP per capita. Due to the ongoing technical implementation processes, this is still a premature version, but the general idea has proved to be possible and will be fully implemented for the final version.

The figure combines showing the level of each region and the development over recent years. By hovering over the points of the figure, the respective name and value becomes visible. It is possible to activate and deactivate the different categories and thus, compare selected types of territories.

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Figure 6 Example of "Positioning of the regions" graphic
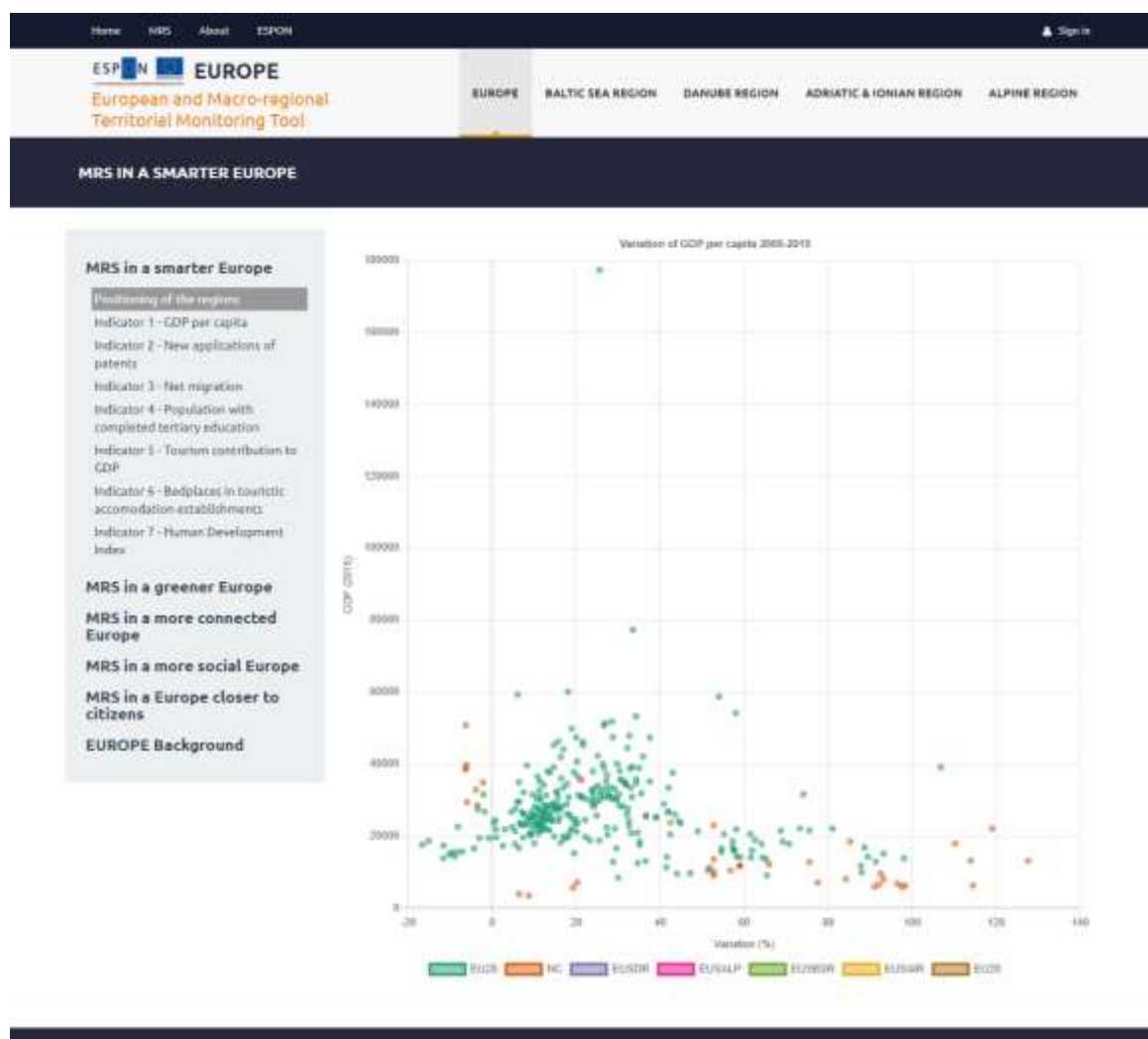
2.4 Macro-regional modules

For the macro-regional modules, the tool offers indicators that are aligned to the macro-regional governance structure with a clear focus on Priority Areas/ Policy Areas / Action Groups / Topics[1]. More concretely, this means that on the landing page of each macro-region, the tool directly displays this political level as it is the most concrete, and active policy area. The pillar level, which is relevant for all MRS, is also present in all cases outlining a general description of objectives.

In coherence with that approach, the MRS module structure also assigns the objectives and relevant activities to the respective PA/AG/Topics. Consequently, the indicators reflect on the territorial trends and structures over time of the PA/AG/Topic-theme and, in that, complement the general trends presented in the European module. This means that the requirements of the ToRs are implemented in a more implicit but policy relevant way, and therefore more user-centric approach. This has the

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[1] This political level exists in all MRS, but the wording differs: For the Alpine MRS (EUSALP) "Action Groups (AGs)", for the Baltic MRS (EUBSR) and the Danube MRS (EUDSR) "Priority Areas (PAs)", for the Adriatic-Ionian MRS (EUSAIR) "Topics"

advantage that on the landing page of each MRS, users can directly see the PA/AG/topics structure as well as the Pillar structure and access their relevant area of interest.

Within the MRS modules, information is organised hierarchically on a tree at the left-hand side of the screen, providing direct access to all elements. The main headers of the Pillars/Action Groups/Priority Areas/Policy Areas fold and unfold automatically upon clicking them.

For each PA/AG there is:

- A description of the PA/AG and its specific objectives and targets
- A description of the activities being implemented or foreseen in the PA/AG
- Selection of indicators: they include a map and a text describing the indicator and the policy relevance and analysis

Figure 7 Example of landing page for AG1 in the EUSALP strategy

The structure of the macro-regional tool is organised in the same way as the European module, ensuring easy navigation and a systematic corporate structuring as well as linking political backgrounds with territorial monitoring. This is also true for the commenting of the maps: The commenting is structured in

(1) Information on the Indicator and data;

(2) Description of the territorial trends and patterns and

(3) Comments on the political dimension.

Figure 8 Example of an indicator page for the EUSALP module

2.5 Technical aspects: Queries and analytical tools

Data is organised thematically in the tool, either by policy theme or macro-regional governance element (Pillar, Priority Area…). The system allows querying the database by selecting the geographical extent (specific Macro-region, EU, or others that could be defined), the statistical units (NUTS0/1/2/3, LAU depending on the availability of data) and the time (from the available years for each indicator).

The user can access the data contained in the tool in different ways:

- Through the hierarchical structure of themes available in the European module
- Through the hierarchical structure of pillars/priority/policy areas on the "monitoring the objectives" section

For many maps of the interface, the system has a common dashboard of tools that allows further exploring the data:

- Changing the year for the data (from the available ones for a given indicator)
- Recalculating the values of the indicator to compare a given year to another

Most maps, graphics, tables and metadata on indicators are automatically created from real data contained in the database. This means that the data behind them can always be accessed and downloaded. To that end, a common set of exporting tools is provided:

- Generate data table from a map, graph or table (.xlsx), which includes also information on the indicator's metadata
- Generate image from a map or graph (.png, .svg, .pdf), in the case of a pdf also including the metadata of the indicator

2.6 Technical aspects: Web services

Data is retrieved from several sources at the same time and processed as a single data file using a web service. Usually it will be the result of merging values from ESPON 2020 Database or Eurostat with data stored on the local database of the MRS. ESPON tool. This is needed in order to complement data with values for territorial units that are not included on the main databases. The main advantage of this setup, is that the tool is able to deliver always the latest available data from the original sources directly. Thus all data exchange on the tool is controlled through web services:

- Incoming web services (for retrieving data)
    - Retrieve and process ESPON 2020 Database indicators example
    - Retrieve and process EUROSTAT indicators example
    - Retrieve and process MRS. ESPON local database indicators example
- Data serving web services (to feed the front-end or for using in other tools)
    - Main structure (MRS elements such as Pillars, PA, AG…) url
    - Indicator metadata example
    - Map geometries example

2.7 Technical aspects: ESPON Map Kits

The tool makes use of the ESPON map kits to display data. However, the map kits are developed originally for desktop GIS and the tool uses a different kind of technology, so the contents of the map kits have been translated into json elements that configure the online visualization. This includes:

- Reference background countries
- Map insets for outermost regions
- Geometries for displaying data (NUTS0/1/2/3, LAU…)
- Reference perimeters of the MRS: these are automatically shown for the maps in the MRS modules and can be activated manually by the user on the European module

2.8 Technical aspects: Integration of the tool in ESPON servers

The tool has been integrated in the ESPON servers and is accessible currently from an ESPON URL: mrs.espon.eu

2.9 Technical aspects: Administration module

The tool has a dedicated administrative module for executing maintenance operations on the system. It can be accessed from this dedicated URL and requires a specific login in order to ensure protection.

This is a stand-alone module organised with a menu providing direct access to the elements of the interface:
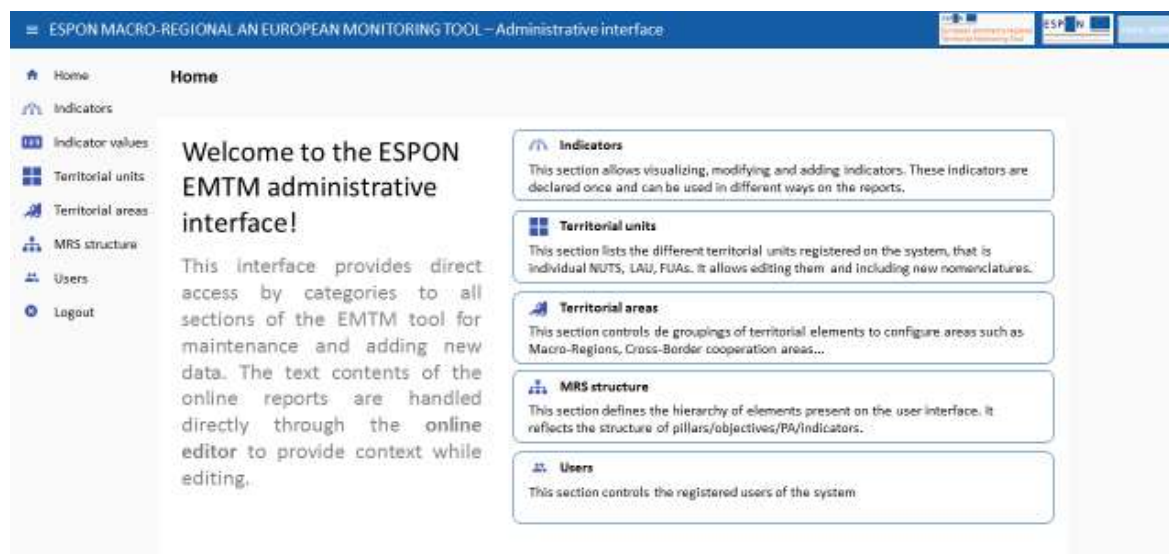
Figure 9 Landing page of the administrative interface

The different sections allow undertaking all needed management tasks:

- Declaring new indicators
- Updating data for indicators not linked via web service to the original source
- Modifying metadata or links of existing indicators
- Managing the territorial nomenclatures declared in the system
- Adding new nomenclatures (for instance the NUTS2021 when they become available)
- Managing the structure of elements of the web interface (that is the policy areas, pillars, AG, PA)
- Management of registered users

The system offers a practical way of updating the contents of the tool in terms of texts and images, via an online editor that allows direct manipulation via an HTML editor. This has the advantage of being very simple to use and does not require expert knowledge as it behaves similar to a text processor like MSWord. This feature is available with the proper credentials.

Figure 10 Online editing of a narrative

A more complete description of the administrative module is available in the technical document accompanying this report.

2.10 Guidance: help materials, manuals and instructions

The tool is accompanied by materials providing information on the use of the tool. Some of it is embedded in the online tool itself, while other elements are available as separate documents or online resources.

- A short introductory text for the home page describing the structure and aims of the tool. This is available in a specific section accessible from the home page (direct access in this url)
- An introduction to the Macro-Regional strategies and its specific terminologies. This is available in a specific section accessible from the home page (direct access in this url)
- Leaflet of the tool, presenting use cases (this is a simplified user guide). Separate document attached to this report **MRS. ESPON Promotion Leaflet.pdf**.
- A "Tips and tricks" section in the form of guided examples on the guidance section of the online tool.
- A user manual. Separate document attached to this report **MRS. ESPON User Guide.pdf**
- A short video introducing and promoting the structure and aims of the tool will be prepared for the final report, once the tool is in its final stage of development.

2.11 Updating and maintenance strategy and guidance
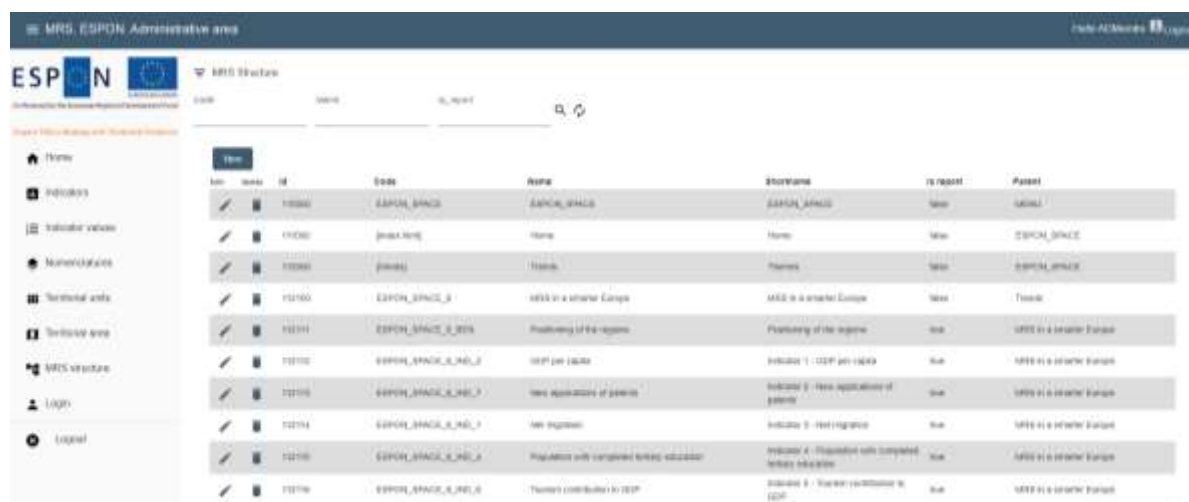
The MRS. ESPON tool is a complex system with many elements to consider but has been built with the objective of facilitating its update.

In order to make sure that the system us updated there are several tasks that need to be undertaken. The following elements offer a description of the foreseen tasks that should be implemented most frequently (if changes occur). Please do refer to the technical guidance manual for more details on how to implement these tasks:

2.11.1 Keeping the MRS structure up to date

As the Macro-Regional strategies are alive and in a process of continuous revision, for example when the action plans are revised, it becomes necessary to ensure that the tool reflects their latest structure in terms of Pillars/PA/AG/Target.

To this end, the system allows for an easy update of the structure through the administrative interface. In concrete terms, the section **MRS structure** provides direct access to the tools needed for this update:

Figure 11 Admin interface – managing the MRS structure

Several actions might be necessary here:

- **Change the naming of an existing element**. For this we click on the edit button of the element and change the texts on the emerging window. Changes are automatically visible on the web interface.
- **Changing the parent of an existing element**. If an indicator, Action Group, Priority Area, would have to be moved under a new heading, we can do that by clicking on the edit button of the element and choosing the appropriate element from the list of available parents.
- **Adding a new element**. If a strategy adds a new Pillar, PA or AG, by clicking on Add element we can include a new entry in the table which can be nested under any existing element or that can later become the parent for other elements.
- **Deleting an existing element**. If an element is not needed anymore it can be removed from the system. If the element is a parent the user has to place the children elements into a new parent.

Through these operations one can for instance rename a Pillar, include a new Action Group or add a new indicator to an existing Priority Area.

2.11.2 Keeping indicators up to date

The tool offers the most recently available data at the moment of its delivery to ESPON EGTC. However, the indicators might become outdated over time as new data is released.

For indicators from the ESPON database and EUROSTAT, the update of the tool works automatically, as they are linked via web services and any change in the source is automatically presented in the tool. This means that changes in previous values are automatically updated and that new years are also automatically included and available for representation.

Nevertheless, some maintenance might still be needed. For example EUROSTAT tends to change the version of geometries associated to a given indicator, but this is not informed in any way via the web service and thus the MRS. ESPON tool needs to adapt the nomenclature version too or there would be a mismatch between data and geometries.

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- **Changing the nomenclature version of EUROSTAT indicators**. Whenever a map based on an indicator with EUROSTAT as a source stops displaying values, there is a need to check at EUROSTAT if the indicator has changed the nomenclature version. This can be done by going to the link available in the field "link" on the section **Indicators** of the administrative interface. Then we need to update all maps using the involved indicator and declaring the proper nomenclature. This is done in the section **Reports** of the administrative interface.
- **Changing the year of a map or graphic to the most recent one**. If EUROSTAT or ESPON database publishes newer data, the system can use it. For this there is a need of changing the year displayed on a map in the section **Reports** of the administrative interface.

For indicators that have been manually added to the system, maintenance might be required for adding new years or by updating previous values. This is also relevant for including data of forecasting exercises, which could be made available as an indicator for any MRS.

- **Adding data for new years in indicators not linked via web services**. This task is done using the section **Indicator Values** of the administrative interface and involves preparing the new data using the template provided by the interface (to ensure that the correct territorial units are involved).
- **Updating old values**. This task is available at the **Indicator Values** section of the administrative interface. It involves using the template provided, deleting the units not required and uploading the new values to the system.

The system allows representing values as labels to display qualitative data. It needs to be stored as numerical values but it is possible to assign qualitative labels afterwards. One example of such element is http://mrs.espon.eu/emtm-tool/EUSBSR/objectives/reports.html?id=122113 where data is stored as 0 or 1 and then assigned a label "bad quality" / "good quality". The technical documentation explains how to include such labels for any indicator. The number of possible categories is not limited.

2.11.3 Keeping nomenclatures up to date

Even though the tool contains all sets of geometries needed to display the indicators available in the system, the changes in EUROSTAT or the need of adding new indicators might make it necessary to include new nomenclatures (for example NUTS2021 when they become available or a different FUA layer)

To that end, the administrative interface allows declaring a new nomenclature using a guided process.

- **Adding a new nomenclature**. This task is available in the section **Nomenclatures** of the administrative interface. It allows declaring a new nomenclature and upload the geometries associated to it

2.11.4 Managing territorial areas

The mapping engine uses a special query that filters just the necessary data and geographical units for creating a map. This means there is a need for maintenance of the elements included in the perimeters used on the tool.

In practical terms this means that if a MRS changes its perimeter (like was the case for EUSAIR that included North Macedonia in April 2020) or there is a need of mapping a specific set of territorial units, the system needs to be aware of these changes.

- **Modifying a territorial area**. The section **Territorial Areas** of the administrative interface provides the means to modify the list of territorial units linked to a given perimeter.
- **Creating a new territorial area**. This section **Territorial Areas** also allows defining a new area with an arbitrary number of territorial units linked to it. The new area will automatically be available for defining the extent of any map on the tool.

2.11.5 Keeping descriptions up to date

The tool offers many policy descriptions linked to the MRS components and indicators. If these change, then the descriptions need to changed accordingly. This task involves drafting a new text and changing it by using the online editor. Alternatively, the text can also be changed using the administrative interface via the **Reports** section.

3 Stakeholder dialogue and Steering Committee feedback

3.1 Stakeholder dialogue design

The objective of the MRS ESPON tool is to help policy makers to monitor development trends on the macro-regional scale by combining information from various platforms, statistical institutions and showcasing macro-regional activities. The ambition is to provide a simple and highly communicative web tool that will be used, appreciated, and – potentially – further developed by relevant stakeholders. The overall goal is not to duplicate information and monitoring approaches but ensure complementarity and serve as a platform to link to other ongoing activities in the MRS. Against this background, three phases of stakeholder involvement were implemented throughout the project's lifetime. Whilst the first phase served exploratory purposes, the second phase addressed individual macro-regional stakeholders, aiming to reflect on the tool as such. In a third phase, stakeholders from the Priority/Policy Area level and the National Coordinator level in the macro-regions were contacted, as well as a broader set of stakeholders involved in macro-regions.

1st phase: Presentation of tool and awareness raising

In the first half of the project, a series of political committees and technical experts were contacted in order to better understand the needs with regard to monitoring options and the possibilities for cooperation on data deliveries. The project was presented at several events to raise awareness for the tool and ensure early involvement of interested and relevant stakeholders. At the same time, it became obvious that a broad participation in the early project phase tended to be of limited efficacy and, thus, was postponed towards the end of the project.

2nd phase: Bilateral stakeholder exchange and steering committee involvement

In the second phase, a sample of contacts aimed to discuss the new preliminary tool and raise awareness for the opportunities for different use cases. Further, the goal was to discuss the main political dynamics within the four macro-regions, to present the logic behind the selection of indicators and the meaningfulness of indicators and to discuss political narratives and trend developments. These aspects were linked to the modifications of the project consortium as the experts for macro-regional development changed in early 2020.

The stakeholder process also served to request missing data and to address the benchmarking tool as well as the ongoing activities in macro-regions. An important part of the individual conversations was to reflect on potential use cases in the future, and to identify a "wish-list" of stakeholders for the tool. Some comments were directly taken on board and implemented in the tool, some comments remain under consideration for potential take-up in a new phase of the project, and some comments will unfortunately not to be considered for implementation. Another important aspect of these conversations was to identify potential avenues for future collaboration and further development of the tool.

In this phase stakeholders who have a general role in the macro-regions, such as National Coordinators and the political representatives on the level of the presidencies play an important role, as well as that VASAB was consulted. In this process, the consortium built on existing contacts between ESPON and previously involved experts, in particular the steering committee, on contacts of

the new consortium members from FAU and Cambridge. This bilateral stakeholder dialogue was implemented mainly in May and the first half of June 2020.

3rd phase: Thematic consultation and broader participation

In the third phase, towards the delivery of the final report, the consortium reached out to a wider set of MRS stakeholders. This phase of involvement addresses in particular the Priority Area/Policy Area/ Action Group level and further National Coordinators. Exemplary, the project consortium contacted PAs where monitoring activities are ongoing or other forms of data representation, and where the EMTM tool can link to. Due to time limitations this exercise cannot be exhaustive, but paves the way for ensuring the technical set-up of the tool will later on allow for a broader take-up. Hence, this phase hands over to later outreach activities. The overall aim is to raise awareness for the tool and to summarise ideas for the opportunity to further develop the implemented parts in the coming years.

3.2 Key results from stakeholder dialogue

This section provides a condensed overview of the stakeholder reactions and requests for amendments. The project team was able to take-up some of the comments still in the project period, whereas other requests for monitoring options might only be implemented in future.

In general, stakeholder conversations were held in confidence allowing for open and honest feedback and provide room for discussion of further development. An anonymised and more detailed list of comments was provided to ESPON to ensure that a long-term development considers the results of the stakeholder consultation process. This section presents the general appreciation of the restructured tool, a summary of comments that were taken up, as well as a summary of aspects to consider in future and aspects that unfortunately will remain out of the tool's scope.

General appreciation

The general feedback of stakeholders towards the restructured tool was very positive highlighting the intuitive set-up, the user-friendliness, the easy accessibility, and the orientation of the tool towards the governance structure of MRS. In general, it was appreciated that the tool provides contextual information of the territorial development within macro-regions. They also acknowledged that the tool itself can only complement ongoing monitoring activities within the different Priority Areas/Policy Areas/ Action Groups. Furthermore, it was appreciated that the tool brings data from different data sources together, and will allow for a long-term monitoring of spatial trends in the macro-regions. It was appreciated that the tool goes beyond a reproduction of Eurostat as where possible and available the data covers the ESPON Space and the relevant macro-regional perimeter or VASAB perimeter. Yet, this was not possible for all indicators, and it was noted that continuous effort is needed to increase the data basis and continue to include data from Non-EU Member states. Further, as is often the case, it was noted that further indicators shall be represented on more detailed NUTS levels. Here, the stakeholders felt the dilemma between allowing for more detailed data to be taken up versus ensuring representation of data for all countries differs. In general, the stakeholder accepted the project's approach to favour a representation of all MRS countries at the expense representing lower NUTS levels.

A general remark was made that the tool can facilitate discussions about further indicators that are needed, and initiate cooperation across statistical offices with support from macro-regional steering groups. Further it was highlighted that the orientation of the European Module towards the New Cohesion Policy objectives is very much appreciated.

An important part of the stakeholder conversation was as well to manage expectations. The tool itself presents spatial development trends that shall be relevant for a long-term development perspective of MRS. While MRS are dynamically developing, and for example actions and goals may change almost on an annual basis, the objective of the EMTM tool is maintain and develop a data basis that remains relevant and provides contextual data. The activities section, and the texts about the political dimension of the tool shall relate to what is being done in the MRS and how this contributes to the overall goals. Further indicator development, targeting and alignment with the macro-regional goals is an ongoing aspiration of the tool. The proposed set of indicators shall be considered as a starting point.

Implementation of aspects raised in consultation

During the stakeholder conversations numerous aspects were raised. The following examples are indicative for some aspects that have been implemented on the tool:

- Some missing or incomplete data was checked and uploaded
- Texts in the description of PAs have been added
- A general description of macro-regions and the macro-regional vocabulary was included
- The role of the projects funded through other funding sources was clarified. Links to all projects have been provided.
- A description of the innovative functions of the tools has been provided
- Further indicators have been taken up both in the European Module as well as in individual PAs
- Inclusion of total numbers in addition to percentages in the 'comparison' function of indicators.
- Inclusion of a background section on the individual macro-regions, where links to the Action Plans are provided, beyond the general description of MRS
- Description of complementarity with other monitoring MRS-internal activities
- …

A series of proposals has been helpful but might only be implemented in future.

Open points for the future are shown as examples

- *The revision of EUSBRS ACTION Plan and reflection on the tool*
- *Allow PACs to comment on the texts provided for the indicators and PAs, and to contribute to further indicator selection.*
- *Develop collaboration with MRS stakeholders to outline the Activities sections*
- *Contact with national statistical offices where possible shall be considered*

Against the background of the highly dynamic character of macro-regional cooperation and the series of ideas for further development of the tool, it is important to keep the tool updated and flexible. More concretely, the outreach activities of the event will have a strong participatory function, and for example to ensure complete representation of data for the whole MRS need the support of the MRS stakeholders. On the technical side, the enrichment of the tool has to remain possible also in the coming years.

4 Delivery of maps (vector (ai), geodatabase)

The online tool produces automatically all maps of the project, meaning that no desktop GIS is involved. Consequently, there is no classical geodatabase associated to the project. Instead, the tool has a POSTGRESQL database that contains geometries and some of the data, but not all of it, as many indicators are retrieved live from external sources like ESPONDB or EUROSTAT through web services.

However, the maps are available in vector format from the interface of the online tool. Currently any map on the system has an icon at the top right corner (see Figure 12) that offers the option of downloading the data used for creating the current map (in excel format) and to download the map itself in vector format. The chosen format is SVG, an open source vector container that can be opened by any design program. The map is also available in PDF (which is also a vector format) and in PNG (a common image format useful for inserting on a document)
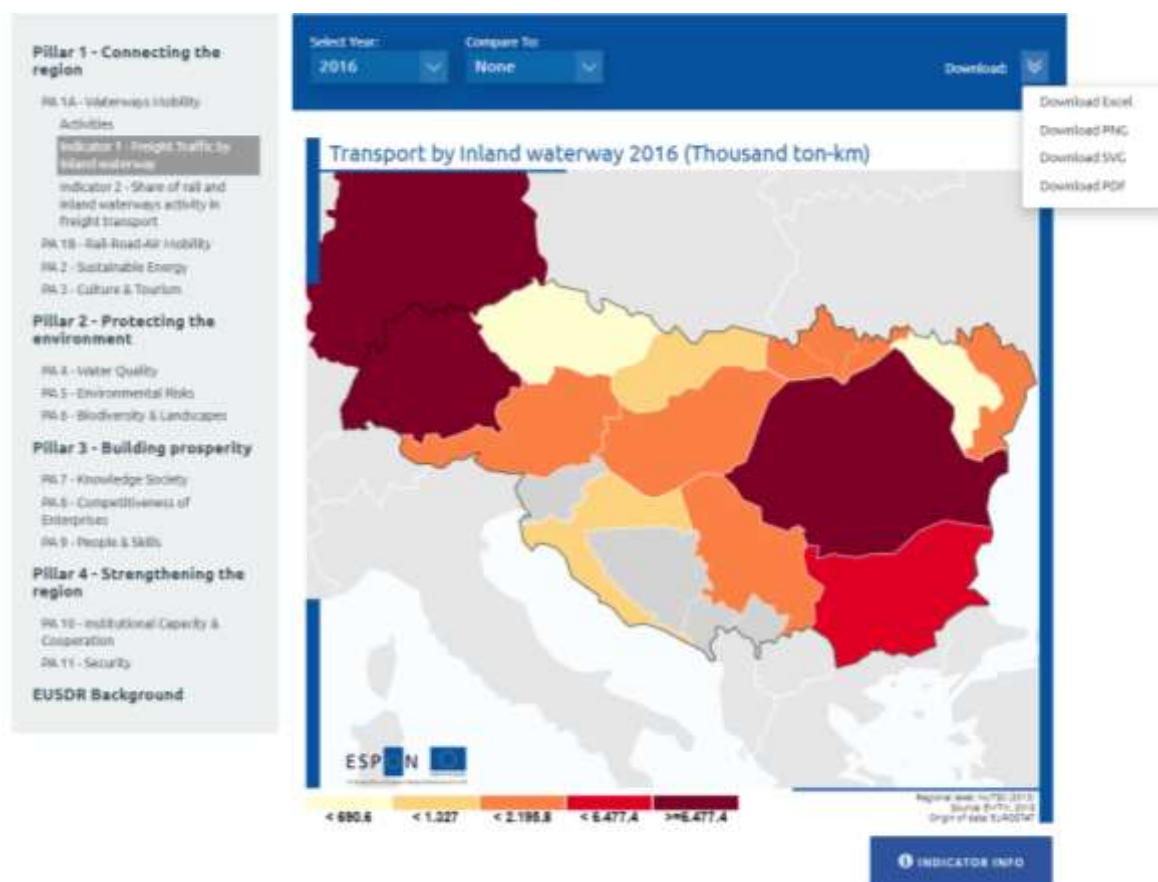

Figure 12 Downloading a map from the online tool

A set of maps with the updated extents of the MRS in ESPON mapkit template is delivered accompanying the report in .ai and geodatabase format.

5 Proposal for selecting indicators and collecting additional indicators for analysing trends, strategies and actions under work package 4

During the stakeholder consultation a number of elements has been identified as possible improvements of the tool.

Three main areas show promise for being a good extension of the tool in order to link it more to upcoming policy developments:

- The upcoming territorial agenda update
- The smart specialization strategies
- The Sustainable Development Goals

This work will integrate our understanding of macroregional policy-aims, and the ESPON and Macroregional databases, with the EUROSTAT and JRC experience developing SDG indicators, and studying interlinkages and spill-overs, as well as with the SDG Index and Dashboards Reports.

We think this is a good complement to the work done that will enrich the tool and help support the macroregional dialog.

6 Proposal for planning and developing additional technical solutions or features under work packages 4 and 5

6.1 Technical solution for MRS. ESPON tool data sharing

While the MRS. ESPON tool has various ways for data and maps downloading in different formats it is mostly targeted to the individual user interested in regional strategies. Considering that MRS. ESPON tool data is available through web services, we think that it would be beneficial to create an ESPON package of documentation, geometries and software which could make all this data available to the community. The package could promote the use of ESPON data to create new visualizations, embed ESPON maps in other websites and generally extend the reach and impact of the MRS. ESPON tool and other ESPON tools.

The package should include the following components:

- GeoJSON version of the ESPON Mapkit
- Public MRS. ESPON tool JSON API
- ESPON JavaScript library

6.1.1 GeoJSON version of the ESPON Mapkit

The ESPON mapkit (Figure 13) is the basis for all maps produced by ESPON and although it is available as shapefiles there is no GeoJSON version of it which can be used to create interactive visualisations in web applications. We propose the creation of a modular service that will publicly serve the ESPON mapkit as GeoJSON or TopoJSON files ready to be included in the ESPON JavaScript library presented below. The service will return the geometries for different administrative units and versions thereof, in layers, which could be used to create highly detailed, interactive and scalable ESPON maps.

The GeoJSON version of the ESPON Mapkit will also be beneficial for other ESPON projects.

Figure 13. The ESPON mapkit

6.1.2 Public MRS. ESPON tool JSON API

MRS. ESPON tool data is now available through web services to the MRS. ESPON tool front-end. We propose to create a public JSON API which could be used by third parties to better disseminate ESPON data. The API could expose, in a centralised and formalised way, all MRS. ESPON tool data and, if needed, the data from other ESPON projects. The API could communicate automatically with the ESPON JavaScript library, described below, and produce interactive choropleth maps or charts ready to be embedded in web pages. The data could also be used stand alone by other visualisation tools, dashboards and applications.
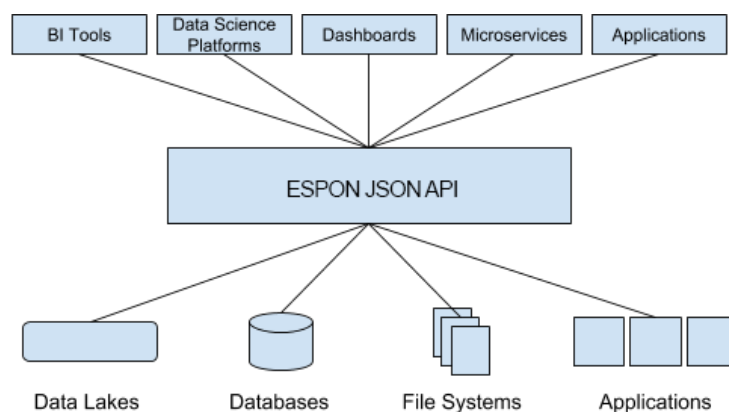

Figure 14. ESPON JSON API

The JSON API should be thoroughly documented and modular to be able to support any type of source data.

6.1.3 ESPON JavaScript library

The ESPON Javascript library could be used by developers to easily develop interactive ESPON maps and charts. The library will make use of the geometries and data exposed through the two aforementioned services.

The library will be configurable through carefully selected parameters so that the developers will have full control of the outcome.

We propose to host the library on GitHub (https://github.com/) where other members of the community will be able to contribute to the development of the library.

6.2 Graphical visualization tools for the administrative interface

The administrative interface contains all necessary elements for a proper maintenance of the system. Nevertheless there is room for improvement in terms of the interaction with the administrator.

To that end we propose to develop a graphical interface that uses maps, based on the current mapping engine, but with additional features so that it is available for the tasks of management of:

- territorial nomenclatures (visualize new nomenclatures being uploaded)
- territorial units (display on a map the selected elements)
- territorial areas (selection of territorial units linked to an area via a map by means of clicking)

6.3 Offer a "sandbox" environment

The tool offers a very wide range of indicators, organised thematically according to the governance of the MRS. However, it is feasible to prepare a specific entry point to allow the user prepare custom made maps or graphics based on the available richness of data of the tool.

To that end we propose setting up a specific section that provides all the tools to prepare a map or graphic making use of the indicators contained on the system.

7 Future of the tool

7.1 Technical developments

The technical development comprises the complementation of data wherever helpful. This is in particular true for data of non-member-states.

More generally speaking, new kinds of data are to be expected, due to the big-data-thematic and due to ongoing efforts in a series of institutions (Eurostat, JRC, macro-regions themselves). It is important to offer the most meaningful data sets that are available.

It goes without saying the maintenance of links (in particular to data-bases) has to be ensured on a regular base.

7.2 Reflecting the political dynamic

It is of crucial importance that the MRS. ESPON tool will be further developed also on the content side. Beyond technical maintenance and completion this means to reflect the political and institutional dynamic.

The Annex on the "Results of the stakeholder dialogue" comments this in more detail. The most important aspects can be summarised in the following points.

The object of the MRS. ESPON project is a young and dynamic cooperation format. It is of key importance the take the relevant political development in the tool, both on the level of the individual macro-regions and on the European region. For the latter one, it will be important to reflect on the linkages between the Green Deal and the macro-regional scale. The same is true for the new Territorial Agenda that is supposed to be established in late 2020, and also for the Covid-19-recovery process, important developments are to be expected.

On the level of the macro-regions, it is important to refer to new action plans and further strategic documents. On the level of the PA/PACs it is important to take up project activities etc. This can often happen via the linkages to the respective webpages. However, a certain revision of the texts and comments within the tool will be necessary.

It is important to also link the context – in particular the priorities of the transnational INTERREG programmes and sectoral policies. With regard to the ESPON project, it will be important to link or include results from other projects, in particular those with a prospective character ('scenarios').

7.3 Ensuring a participative process

In order to reflect the evolution of the MRS dynamic, the monitoring system strongly depends on the interest and commitment of stakeholders throughout the multi-level governance system. Ensuring a participative process has a series of implications:

- The macro-regional dynamic involves a large number of stakeholders from all levels and sectoral dimensions of the political system. It was not possible to involve all of them during the project implementation phase, also due to the restructuring of the participation process. This is why the outreach activities will have to be oriented less towards pure dissemination activities but has to consider a participatory approach that allows to take up feedback also in the tool (e.g. by adding links, modifying texts etc.).
- Future input of the MRS stakeholders can be considered on the tool in terms of corrections, addition of indicators or inclusion of new data and information. In particular for those cases

where the stakeholders intend to take the initiative, the email address mrs@espon.eu serves as single-entry-point.

- Concretely speaking, it seems more important to organise workshops with MRS stakeholders (in particular PACs) than to prepare many newsletter texts. Here a stakeholder process shall consider individual web-consultations with PACs to discuss potential further indicators and representations of the existing texts.
- It is important to organize a follow-up process after this project, and consult with PAs and NCs in particular when it comes to the development of indicators. In parallel, the European Commission should be approached with regard to take up the EMTM tool information for the third implementation report.

Throughout the stakeholder dialogue, a series of events was mentioned where the MRS. ESPON project results might very well fit. Presenting during these events would certainly improve the visibility and facilitate the further development that would have to be more in smaller groups.

To ensure the follow-up process and the further developments it needs someone with a clear responsibility for the tool.

7.4 Technical implementation

The guidelines accompanying this final report provide information on how to undertake changes through the different administrative tools.

It is foreseen that the continuous dialog with stakeholders provides feedback for:

- Including **new indicators**: whenever relevant data is available and identified, new indicators can be assigned to elements of the MRS. The procedure is explained in 2.11.2 and in the administrative guide
- Changing the elements that configure the Pillar/PA **structure of each MRS**: whenever the action plans of the MRS are updated, changes might be needed in order to include modifications of the structure or description of the elements that configure each MRS. The procedure is explained in 2.11.1 and in the administrative guide
- Updating the contents of the **reports**: for example by adding most recent years for data in the maps/graphics, changing the text descriptions to highlight other aspects of the data… This is explained in 2.11.2, 2.11.5 and in the administrative guide