

# ESPO ARTS

## Assessment of Regional and Territorial Sensitivity

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This report presents an overview of the results and the analytical approach applied by the project. This Applied Research Project was conducted within the framework of the ESPON 2013 Programme, partly financed by the European Regional Development Fund.

The partnership behind the ESPON Programme consists of the EU Commission and the Member States of the EU27, plus Iceland, Liechtenstein, Norway and Switzerland. Each partner is represented in the ESPON Monitoring Committee.

This report does not necessarily reflect the opinion of the members of the Monitoring Committee.

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# A Executive summary

The need for an in-depth assessment of the territorial and regional effects of EU sectoral policies and directives had already entered the European policy debate during the preparation of the European Spatial Development Perspective (1995-1999). The *Territorial Agenda* of the European Union (May 2007) and the First Action Programme (November 2007) as well as the *Green Paper on Territorial Cohesion* (October 2008) focussed explicitly on the issue of regional diversity.

The impact assessment (IA) procedure at the level of the European Commission was introduced in 2002 and further developed by means of a gradual process that allowed Commission officials and organizations to develop and improve the method. The basic idea behind the IA procedure is that ex-ante impact evaluations of new policy proposals, when carried out parallel to the policymaking process, will improve the original ideas and result in robust, effective, efficient and widely supported policies.

In line with the goals articulated in the EU *Impact Assessment Guidelines*, ESPON ARTS aims to develop a tool by which to analyse the impact of EU legislation that takes the sensitivity of regions into account. The analysis of regional sensitivity to EU directives and policies is intended as a simplified, evidence-based procedure of Territorial Impact Assessment (TIA). TIA is defined as “a tool for assessing the impact of spatial development against spatial policy objectives or prospects for an area”, working at “any spatial scale” and therefore applicable to large projects, plans and programmes (Williams et al., 2000, ECTP/CSD 2001, Böhme & Eser, 2008).

## The task: a methodology for a TIA ex-ante quick check

Based on the experiences within ESPON ARTS, a quantitative tool was developed to quickly gauge the potential impact of EU legislation, policies and directives on regions (hereafter referred to as simply “policy proposals”). The main task was to elaborate a general common framework and a methodology in which assessments concerning particular policy proposals could fit. This ‘quick check’ should be as simple, comprehensible and user-friendly as possible.

Based on the methodological approach an operational procedure was developed showing how to apply the procedure when conducting the **TIA quick check**. The quick check for was tested on 12 EU directives<sup>1</sup> and a more in-depth assessment using this methodology was performed on 3 directives. One of these was carried out

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<sup>1</sup> Directive on air quality (NOx), Water Framework Directive, Seveso Directive, Directive on managing environmental noise, Directive on promotion of use of biofuels, Directive on the environmental liability, Directive on the interoperability of electronic road toll systems, Directive on recognition of qualifications, Directive on critical infrastructure, Directive on sustainable use of pesticides, Directive on clean and energy-efficient road transport vehicles, Directive on the energy performance of buildings;

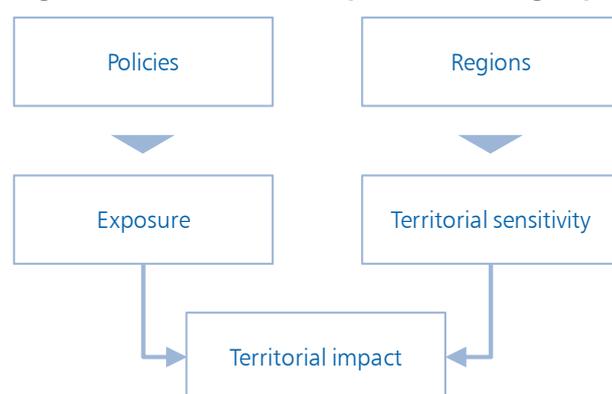
a second time in a workshop setting with experts from the European Commission. The result is a method and procedure that can be applied by policymakers.

## The methodological approach: The vulnerability concept

The TIA quick check is based on the vulnerability concept developed by the Intergovernmental Panel on Climate Change (IPCC). In this case, the effects deriving from a particular policy measure (exposure) are combined with the characteristics of a region (territorial sensitivity) to produce potential territorial impacts. In the TIA quick check the following definitions are used:

- The *exposure* describes the intensity by which EU directives and policies potentially affect European territory through a double logical chain. On the one hand single directives and policies may affect specific classes of regions (*regional exposure*), without reference to the specificity of each region; on the other hand they may affect particular “fields” of the territorial realm, e.g. surface water quality, emissions, sectoral production (*field exposure*);
- The (territorial) *sensitivity* describes how *single* territories/regions are subject and evaluate impacts in specific exposure fields, due to their socio-economic and geographical characteristics and to the social values and priorities they are likely to show;
- The *territorial impact* is the final, likely effect of a given EU policy or directive as a product of exposure and regional sensitivity. The impact can be direct or indirect along specific cause-and-effect logical chains.

Figure A 1: Territorial impact combining exposure with sensitivity



The vulnerability concept of the IPCC also includes the notion of *adaptive capacity*, which describes the ability of a system to adjust to the potential impact, moderate potential damages and cope with the consequences. This concept is not part of the TIA quick check (which is mainly interested in potential impacts), but the results of the TIA quick check would be a good starting point a discussion of the possibilities of regions to adjust to any potential impacts, especially in the context of good governance.

## The result: An excel tool and a procedure for a TIA quick check

As stated, the objective of ESPON-ARTS was to devise a user-friendly methodology that allows one to make a 'quick and dirty' ex-ante analysis of the potential impact of EU legislation, policies and directives on the development of regions. To this end, the methodology combines a standardised indicator-based tool developed in Excel with a means to systematically collect expert knowledge in a workshop setting. The expert contribution serves as input for the analysis and for providing the interpretation of the output of the impact indicators. The TIA quick check can be used in two ways:

- The **standard TIA quick check** uses the indicators and typologies as developed in the ESPON ARTS project. It covers the full range of potential impacts at a general level with common indicators for European NUTS 2 regions.
- The **advanced TIA quick check** enables one to use the methodological framework described above and also allows users to define special indicators describing the exposure to policy proposals combine these with new indicators describing regional sensitivity. In this case, the tool provides the technical framework, but the indicators are defined individually.

### Standard TIA quick check

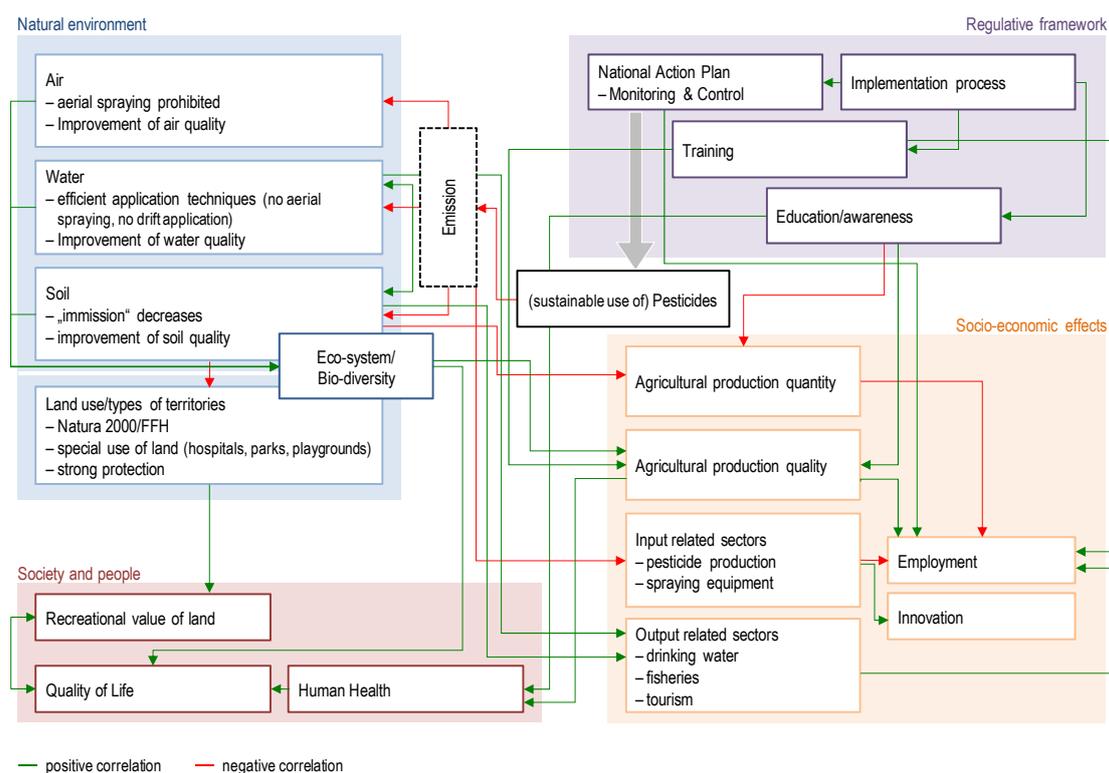
The standardised TIA quick check is done in nine steps using expert knowledge and a set of standardised indicators and types of regions. It can be performed in a workshop atmosphere; preferably with a group of experts in the field of the policy proposal and experts on regional development.

#### (1) The conceptual model: how does a policy influence the development of regions?

In a first step, it is necessary to detect the potential effects of a policy (in the case of ARTS, EU-directives were chosen) on territorial development. Based on a careful study of the actual text of the proposal, the experts then draw a conceptual model that translates the text into cause/effect relations (the *intervention logic*). Not only intended effects, but also unintended and indirect effects are considered, and on as many different fields as possible. This exercise is best done in an informal workshop setting so as to maximize the amount of input.

The cause/effect relationships can then be drawn out. Here, links between all the effects deriving from the policy proposal (*exposure* in the vulnerability concept) and the receptive capacity of a region (*sensitivity* in the vulnerability concept) are made explicit. The result is a systemic picture or flowchart showing the conceptual model of the proposal according to its intervention logic and potential effects (see following example).

**Figure A 2: Conceptual model of the directive 2009/128/EC Directive on the sustainable use of pesticides**



## (2) Dealing with discrete cause/effect chains (branching)

In some cases, a policy will have only one chain of effects. In most cases, there are different, often mutually exclusive alternatives. For example, some policies only set targets, allowing member states to implement their own measures to meet these targets. Depending on the measure, the policy can have quite different territorial impacts. In other cases, the effects of a policy will vary according to type of region. In order to deal with this variability the policy is “branched” into different cause/effect chains, and each one is analysed separately.

## (3) Which types of regions are affected? (regional exposure)

A policy proposal may affect only particular regions (e.g. coastal regions, regions with presence of particular productions or facilities like nuclear power plants etc.) or different types of regions could be affected in different ways. Therefore, it is essential to only include those regions being affected in the analysis. Exposed regions are selected using typologies (e.g. rural/urban, central/peripheral, advanced/lagging, high/low presence of certain sectors). ESPON ARTS provides a set of pre-selected types of NUTS2 regions to choose from, but in theory any typology or selection is possible.<sup>2</sup>

<sup>2</sup> The following types of NUTS2 regions are available at the moment: Agglomerated regions, areas at highest technological/environmental risk, regions with relevant chemical industries, densely populated regions, forest regions, harbour regions, regions with a high density of rail, regions with a high density of road, regions with highest density of rail and road network, regions with highest share

#### (4) What is the intensity of exposure on different fields? (exposure matrix)

In the next step, the conceptual model is translated into a set of indicators that describe the intensity of policy exposure. This is done using a predefined set of thematic fields such as natural environment, regional economy as well as society and people. To do this, the project produced a Directive-Exposure Matrix (DEM) Excel tool which allows data to be entered according to each field.

**Table A 1: List of exposure fields**

Natural environment				
Soil	Water	Air	Climatic factors	Fauna/Flora/Habitat
erosion	water consumption	pollutants in air	emissions of CO2	biodiversity
pollutants in soil	pollutants in ground/surface water		heavy rain/flood hazard/occurrence of landslides	conservation of natural heritage (landscape diversity)
share of artificial areas/soil sealing				conservation of cultural heritage
Regional economy				
Economic development	Agriculture	Industry	Services	Tourism
economic growth	employment in primary sector	employment in secondary sector	employment in tertiary sector	overnight stays
innovation	% of arable area, permanent grass/crop area			
entrepreneurship				
market barriers				
Society and people				
Social disparities	Demography	Accessibility	Built environment	Governance
disposable income in PPS per capita	out-migration/brain drain/"shrinking" regions	daily accessibility by air	increase of urbanization relative to population growth	efficiency of government/governance mechanisms
equal income distribution	number of people exposed to noise	daily accessibility by waterways	mixed land use	duration or complexity of planning procedures
Employment rate	accident rate in transport accident risk: industry/energy supply healthy life expectancy at birth	daily accessibility by road daily accessibility by rail renewable energy fossil fuel consumption		participation rate societal transfers (e.g. tax added) transnational cooperation between member states

For each field, the level of exposure is defined by expert judgement according to the following classes:

- ++ strong advantageous effect on territorial welfare (strong increase)

of employment in automotive, industrial regions, major airport location, regions with a high share of natural areas, rural regions, shrinking regions, regions with unprofitable farming, urban regions, wealthy regions, regions exposed to PM<sub>10</sub>.

- + weak advantageous effect on territorial welfare (increase)
- O no effect
- - weak disadvantageous effect on territorial welfare (decrease)
- -- strong disadvantageous effect on territorial welfare (strong decrease)
- ? Unknown effect/effect cannot be specified
- +/- direction cannot be specified (diverse effects) – which points to the necessity to branch the directive

These classes are then converted into numerical terms so as to allow further computation.

### (5) What is the territorial impact on regions? (Territorial Impact Matrix, TIM)

Once the Directive Exposure Matrix in the previous step has been filled in, the impact values are calculated using predefined sensitivity adjustments. These are determined for each field and called the Regional Sensitivity Matrix. The Territorial Impact Matrix (TIM) calculates the impact for each thematic exposure field and for each NUTS 2 region (= 42 fields x 287 NUTS 2 regions) and sorts the results into 9 classes:

**Table A 2: Scale of potential territorial impact**

	very high positive impact		minor negative impact
	high positive impact		moderate negative impact
	moderate positive impact		high negative impact
	minor positive impact		very high negative impact
	no exposure		

### (6) Do the results make sense? (plausibility and quality check)

The results calculated in the territorial impact matrix should then be checked for plausibility. Usually the results show that a proposal only impacts a few thematic fields. The results should be discussed with the experts along two lines:

- Does the selection of regions provide a plausible picture? If not, the selection of the types of regions may need to be modified.
- Is the relationship between the different fields of exposure plausible? If not, the expert judgment about the intensity of exposure may need to be modified.

Once adjustments are made, the Territorial Impact Matrix (TIM) can be recalculated with the new values.

### (7) Which regions are hit in which fields? (mapping the results)

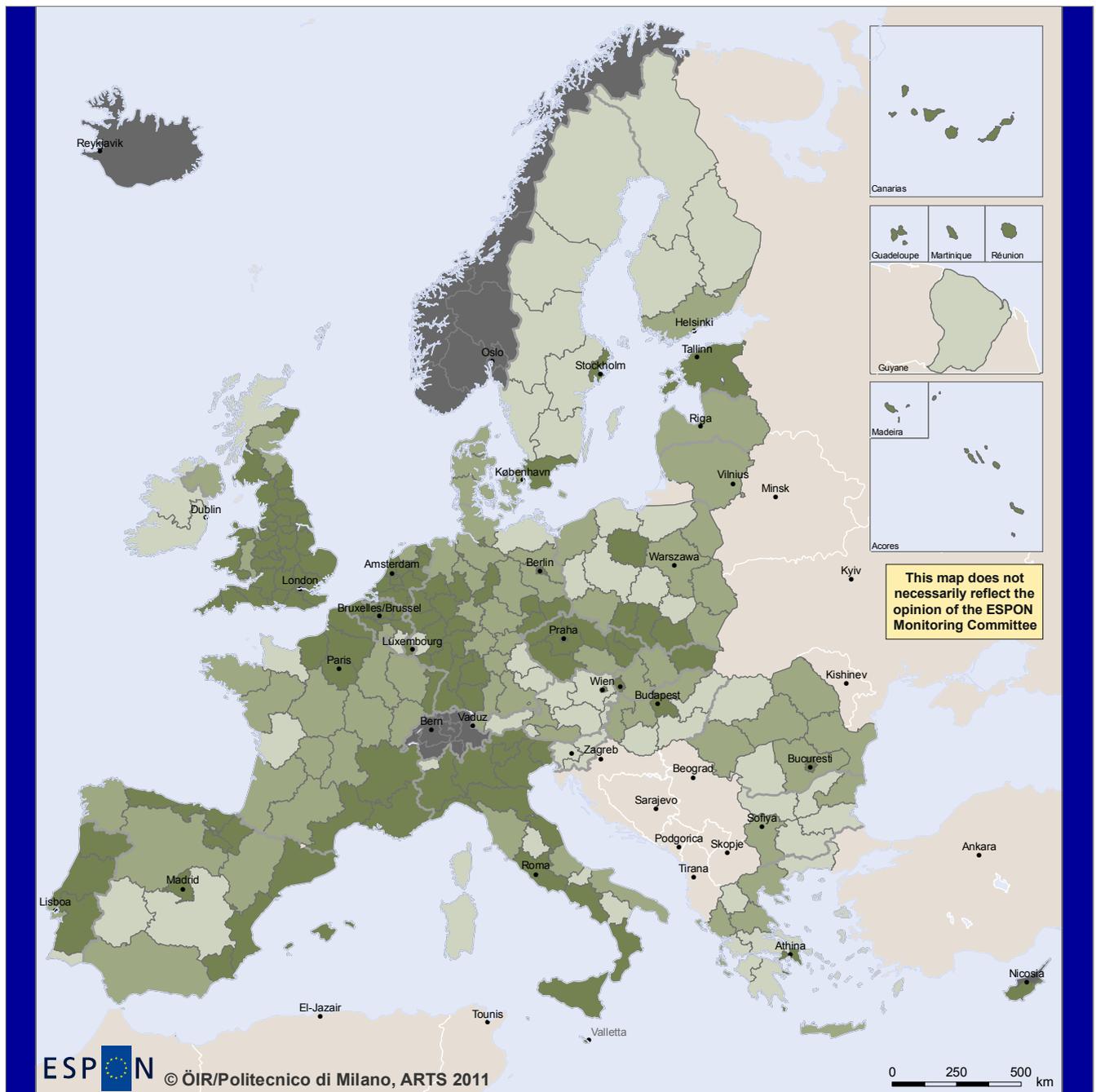
When the results are reliable, maps showing the impact of different indicators can be drawn up. This can be followed by another plausibility check. In the trial run using 12 directives, several TIMs were recalculated after scrutinising the final maps.

#### Map A 1: Example for mapping the expected territorial impact for one indicator

[following page]

# Regions affected by Directive on managing environmental noise branch b

## Number of people exposed to noise (F25)




 EUROPEAN UNION  
 Part-financed by the European Regional Development Fund  
 INVESTING IN YOUR FUTURE

Regional level: NUTS 2  
 Transformation and Compilation of Data based on:  
 ESPON Projects, EUROSTAT, EEA Corine Land Cover,  
 5th Cohesion Report, BOKU University, DG AGRI  
 © EuroGeographics Association for administrative boundaries

### Positive Impact



Types of regions affected: urban, agglomerated, densely populated, high density of road, high density of rail, major airport location

### **(8) What are the policy implications? (adaptive capacity discussion)**

The maps showing the regionally differentiated territorial impact serve as the starting point for a subsequent discussion on policy implications, which focuses on both the positive and negative impacts. Furthermore, the issue of potential adaptive capacity should be raised, as well as governance strategies to facilitate a successful implementation.

### **(9) How to communicate the results (write-up)**

Based on the results of the territorial impact assessment and the expert discussion, a short report can be drawn up (including maps on relevant indicators) to serve as the first “quick check” of territorial impact. This report aims at communicating the results of the ex-ante analysis to the relevant audience.

## **The advanced TIA quick check**

The advanced TIA quick check enables one to assess the impact of a policy proposal along self-defined thematic fields using new indicators for exposure and sensitivity of regions. The TIA-tool provides the technical setting for linking the exposure and sensitivity indicators, but the indicators themselves need to be defined individually. As with the TIA quick check, the tool allows one to calculate the impact in these fields using the same nine steps.

### **(1) The conceptual model: How does a policy influence the development of regions?**

As with the standard TIA quick check, it is necessary to detect the potential effects of a policy on territorial development by translating the text into a conceptual model and drawing out the cause/effect relationships (the *intervention logic*).

### **(2) Are there discrete cause/effect chains? (branching)**

Like the standard TIA quick check, different cause/effect chains can be analysed separately.

### **(3) Which types of regions are affected?**

The advanced TIA quick check allows one to define specific types of regions that could be affected. The user has to fill the Regional Exposure Matrix (REM) by indicating for each NUTS 2 region if it is classified as being part of that specific type of region.

#### **(4) What are the fields of exposure and how can the sensitivity of regions towards this exposure be described?**

Based on the conceptual model, the fields of exposure can be defined freely. However, it is important to define for each field of exposure the following indicators:

- One indicator should describe the potential exposure deriving from a policy proposal. This indicator will be filled into the Directive Exposure Matrix.
- One Indicator describing the sensitivity of a region. This indicator has to be normalized in a predefined range before filling it into the Regional Sensitivity Matrix.

#### **(5) What is the territorial impact in European regions? (Territorial Impact Matrix, TIM)**

Based on the Directive Exposure Matrix and the pre-defined sensitivity of the regions the territorial impact can be calculated automatically into 9 classes of impact.

#### **(6) Do the results make sense? (plausibility and quality check)**

The results calculated in the territorial impact matrix allows for a first plausibility check. All values, typologies of regions and decisions about the exposure can be changed at this stage. The modified Territorial Impact Matrix (TIM) is then recalculated with the new values.

#### **(7) Which regions will be hit in which fields? (mapping)**

When the results are reliable, maps showing the impact along the different indicators can be drawn up. This can be followed by another plausibility check.

#### **(8) What are the policy implications? (discussion)**

The maps provide the framework for the subsequent discussion on policy implications. The territorial patterns of both the positive impacts and negative effects are examined and discussed. Furthermore, the question on the potential adaptive capacity could be started as well as governance issues.

#### **(9) How to communicate the results (reporting)**

Based on the results of the territorial impact assessment and the expert discussion, a short report should be drawn up including maps on relevant indicators. This communicates the results of the ex-ante analysis to the relevant audience.

### **Options for policy development**

The Commission's Impact Assessment (IA) practice qualifies as one of the best opportunities to get TIA implemented at the EU level. The TIA as developed in ESPON ARTS could serve as a first pre-check on the expert level of the Commission and add the territorial dimension to the Commission's Impact Assessment procedure.

It can be used for a first ex-ante analysis of policy proposals in two ways:

- Analysing the full range of potential impacts at a general level the **standard TIA quick check** helps to identify the relevant thematic that are effected by a policy proposal. Based on common indicators for European NUTS 2 regions it allows to select the regions with a potentially high positive or negative impact. This information helps to set a focus an further and more detailed impact analysis.
- The **advanced TIA quick check** allows users to define special indicators describing the exposure to policy proposals and to combine these with indicators describing regional sensitivity. As the tool provides the technical framework, but the indicators are defined individually, the advanced TIA quick check can serve for a more detailed analysis of a specific potential impact of policy proposals.

The result of TIA quick check could feed in into the further stakeholder driven process of the Commission's Impact Assessment.

### **Issues for further analytical work and research**

The results reached in this project confirm that a quali-quantitative methodology is absolutely necessary when dealing with an ex ante assessment of the territorial impact of policy proposals covering all European regions and a wide array of impact dimensions. It is possible to devise and design a simple methodology even in a complex and wide field like the one at stake. The operational application to 12 different and diversified Directives confirms this flexibility of the TIA quick check.

Nevertheless, the results of the TIA on the selected Directives show clearly what kind of additional analytical work is still needed:

- Additional indicators are required in order to cover all relevant fields of territorial development.
- An extended list of pre-selected types of regions matrix would be necessary to sharpen the analysis of the regional exposure to policy proposals.
- Compared to the NUT2 level statistical information on the list of indicators as well as on regional typologies at NUTS 3 level would help to get territorially more detailed results.
- A solution for describing cumulative effects easy and reliable would be interesting to get also an overview about "cumulative" impacts of a policy proposal in each region.
- The analysis focuses an depicts the impact of the EU legislation within single region. Additionally also spillover effects and cross border effects could be analysed.

# B Report

## 1 Main results, trends, and impacts

The need for an in-depth assessment of the territorial and regional effects of EU sectoral policies and directives had already entered the European policy debate during the preparation of the European Spatial Development Perspective (1995-1999). The *Territorial Agenda* of the European Union (May 2007) and the First Action Programme (November 2007) as well as the *Green Paper on Territorial Cohesion* (October 2008) focussed explicitly on the issue of regional diversity.

The impact assessment (IA) procedure at the level of the European Commission was introduced in 2002 and further developed by means of a gradual process that allowed Commission officials and organizations to develop and improve the method. The basic idea behind the IA procedure is that ex-ante impact evaluations of new policy proposals, when carried out parallel to the policymaking process, will improve the original ideas and result in robust, effective, efficient and widely supported policies.

In line with the goals articulated in the EU *Impact Assessment Guidelines*, ESPON ARTS aims to develop a tool by which to analyse the impact of EU legislation that takes the sensitivity of regions into account. The analysis of regional sensitivity to EU directives and policies is intended as a simplified, evidence-based procedure of Territorial Impact Assessment (TIA). TIA is defined as “a tool for assessing the impact of spatial development against spatial policy objectives or prospects for an area”, working at “any spatial scale” and therefore applicable to large projects, plans and programmes (Williams et al., 2000, ECTP/CSD 2001, Böhme & Eser, 2008).

Within ESPON ARTS a quantitative tool was developed to quickly gauge the potential impact of EU legislation, policies and directives on regions (hereafter referred to as simply “policy proposals”). The main task was to elaborate a general common framework and a methodology in which assessments concerning particular policy proposals could fit. This ‘quick check’ should be as simple, comprehensible and user-friendly as possible.

The core result is a standardised TIA quick check that is based on an Excel tool and can be done in nine steps using expert knowledge and a set of standardised indicators and types of regions. It can be performed in a workshop atmosphere; preferably with a group of experts in the field of the policy proposal and experts on regional development.

## The contribution of the tool to the ESPON five-level approach

The ESPON programme and its projects are supposed to provide evidence on territorial impacts of sector policies, which will make it possible over time to strengthen an integrated territorial approach. This shall improve the coordination and mutual synergies between sector policies and create added value for regional policy and territorial cohesion. Impact studies are in particular relevant for collaboration at Community level, but will as well be of use for national and regional authorities. This study is one of the corner stones in this respect as European territorial diversity needs to be discussed at different geographical scales in order to nourish policy thinking at all administrative levels, from general appreciations at European scale such as core-periphery, North-South, East-West to the more detailed insights at regional/local scale, such as functionality of urban regions, rural-urban relations of low or high population density, accessibility and hazard risks, cross-border territories and specific geographically handicapped areas.

The ESPON Operational Programme (ESPON 2007) states as operational objectives for applied research projects amongst others that these projects are supposed to provide information supporting the assessment of the territorial impacts of policies and monitoring of policy achievements allowing a better understanding of cause-effects relationships at *European* as well as *national, regional, cross-border, transnational* levels. This need is also known as the five level approach of ESPON. The study at hand addresses all five levels in different ways and will contribute to this approach:

**European level:** the benefits of this tool on the EU level are quite obvious. It provides an overall harmonized assessment of potential territorial impacts of any policy (directives, regulations) all over Europe. The tool allows for the checking of various policy variants and in the case of EU directives the assessment of territorial effects through the various national implementation schemes.

**National level:** the benefits and use of the tool on the national level will be in its simple and test-like character. Member States are confronted with a situation of choosing among various approaches when implementing EU policies (especially in the case of directives). The territorial impacts – e.g. in terms of increasing or decreasing territorial disparities – are of special interest. The tool presented in this study will allow Member States to test various approaches of policy implementation and compare their effects with each other – thus arriving at a best compromise solution.

**Regional level:** on the regional level the benefits of the tool are definitely the provision of information for various stakeholders in European policy implementation on the regional scale (e.g. regional administrations, regional planning authorities). The assessment of territorial effects of EU policies in a harmonized way allows for comparisons of regional effects all over Europe – thus allowing the regional level

stakeholders to deduct information on the performance of their own region vis-à-vis all other regions in Europe. Learning effects may be derived from such an exercise.

***Transnational/cross-border level:*** on these territorial levels the benefits of the tool are to be seen in the comparability of effects across borders. Through this quality the harmonization of national/cross-border approaches for the implementation of EU policies becomes possible. Cross-border regions as well as neighbouring countries may harmonize their approaches in policy implementation in order to prevent negative spill-over effects from different approaches in implementation (e.g. through evasive actions within border regions).

### **The approach developed**

The TIA quick check is based on the vulnerability concept developed by the Intergovernmental Panel on Climate Change (IPCC). In this case, the effects deriving from a particular policy measure (exposure in the vulnerability concept) are combined with the characteristics of a region (territorial sensitivity in the vulnerability concept) to produce potential territorial impacts.

This methodological approach was translated into an operational procedure combining a standardised indicator based tool developed in Excel with a methodology to collect expert knowledge in a workshop atmosphere. The application of the tool is done in nine steps:

- The conceptual model: how does a policy influence the development of regions?
- Dealing with discrete cause/effect chains (branching)
- Which types of regions are affected? (regional exposure)
- What is the intensity of exposure on different fields? (exposure matrix)
- What is the territorial impact on regions? (Territorial Impact Matrix, TIM)
- Do the results make sense? (plausibility and quality check)
- Which regions are hit in which fields? (mapping the results)
- What are the policy implications? (adaptive capacity discussion)
- How to communicate the results (write-up)

The quick check for was tested on 12 EU directives<sup>3</sup> and a more in-depth assessment using this methodology was performed on 3 directives. One of these was carried out a second time in a workshop setting with experts from the European Commission.

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<sup>3</sup> Directive on air quality (NOx), Water Framework Directive, Seveso Directive, Directive on managing environmental noise, Directive on promotion of use of biofuels, Directive on the environmental liability, Directive on the interoperability of electronic road toll systems, Directive on recognition of qualifications, Directive on critical infrastructure, Directive on sustainable use of pesticides, Directive on clean and energy-efficient road transport vehicles, Directive on the energy performance of buildings,

## 2 Key analysis and findings

### 2.1 Introduction

#### The vulnerability concept

The terminology in the ToR in ESPON ARTS is rooted in the vulnerability concept developed by the IPCC<sup>4</sup> and broadly discussed in the impact assessments in natural sciences, especially concerning climate change. This approach allows one to assess the impact of a policy by combining the exposure deriving from the effect of a policy measure and the territorial sensitivity (of regions).

However, the definitions between the ToR and the IPCC approach differ. In ESPON ARTS we retain the IPCC definitions in order to be able to better communicate the TIA concept with this scientific community.

The concept of vulnerability consists of four core elements: exposure, sensitivity, territorial impact and adaptive capacity:

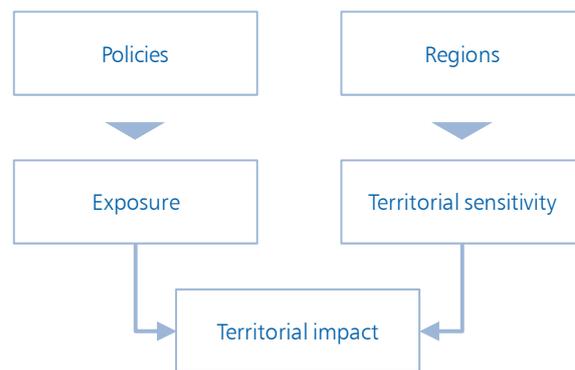
- “**exposure**” describes the intensity by which EU directives and policies potentially affect European territory through a double logical chain. On the one hand single directives and policies may affect specific *classes of regions* (“**regional exposure**”), without reference to the specificity of *each* region; on the other hand they may affect particular “fields” of the territorial realm, e.g. surface water quality, emissions, sectoral production (“**field exposure**”);
- (territorial) “**sensitivity**” describes how *single* territories/regions are subject and evaluate impacts in specific exposure fields, due to their socio-economic and geographical characteristics and to the social values and priorities they are likely to show;
- “**territorial impact**” is the final, likely effect of a given EU policy or directive as a product of exposure and regional sensitivity. The impact can be direct or indirect along specific cause-and-effect logical chains.
- The “**adaptive capacity**” is the ability of a system to adjust to the likely territorial impact, to moderate potential damages, to take advantage of opportunities, or to cope with the consequences (IPCC, 2007). Thus, adaptive capacity is closely linked with governance aspects. It can also be negative, such as rigid systems.

ESPON ARTS focuses on analysing the impact. It does not consider the (possible) adaptive capacity of a territory. However, as we also discuss governance issues in the projects, aspects of the adaptive capacity of territories are taken into account in a qualitative way.

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<sup>4</sup> Intergovernmental Panel on Climate Change

**Figure B 1: Territorial impact combining exposure with sensitivity**



Looking at the effects to be analysed on the exposure-side in ESPON ARTS two distinct elements/processes are taken into account:

- (a) **a direct and intentional impact of EU directives**, which is proportional to the presence of the territorial assets involved in sectoral EU LPDs.
- (b) **an indirect and mainly unintentional or unexpected impact of the directives**, concerning positive or negative side effects.

The relevance of the last process is linked to main characteristics of the regional context:

- (I) the *complexity and differentiation* of the socio-economic context,
- (II) the *redundancy* of potential internal and external linkages,
- (III) the local *governance structure*, as “*domestic territorial characteristics and governance systems act as a filter and interface*” between EU directives and territorial actual impacts (Zonneveld, Waterhout, 2009). Results of the same EU intervention are likely to be highly differentiated among regions and territories according to territorial specificities and national/regional/local governance systems. Therefore we speak here about “filtered” impacts.

All the preceding tasks were carried out on a sample of 12 directives. From these, 3 cases were selected in a second time for more in-depth analysis.

## 2.2 The standard TIA quick check tool and the procedure

The objective of ESPON-ARTS was to devise a user-friendly methodology that allows one to make a ‘quick and dirty’ ex-ante analysis of the potential impact of EU legislation, policies and directives on the development of regions. To this end, the methodology combines a standardised indicator-based tool developed in Excel with a means to systematically collect expert knowledge in a workshop setting. The expert contribution serves as input for the analysis and for providing the interpretation of the output of the impact indicators. (The methodological background is described in the next chapter and in detail in the scientific report.)

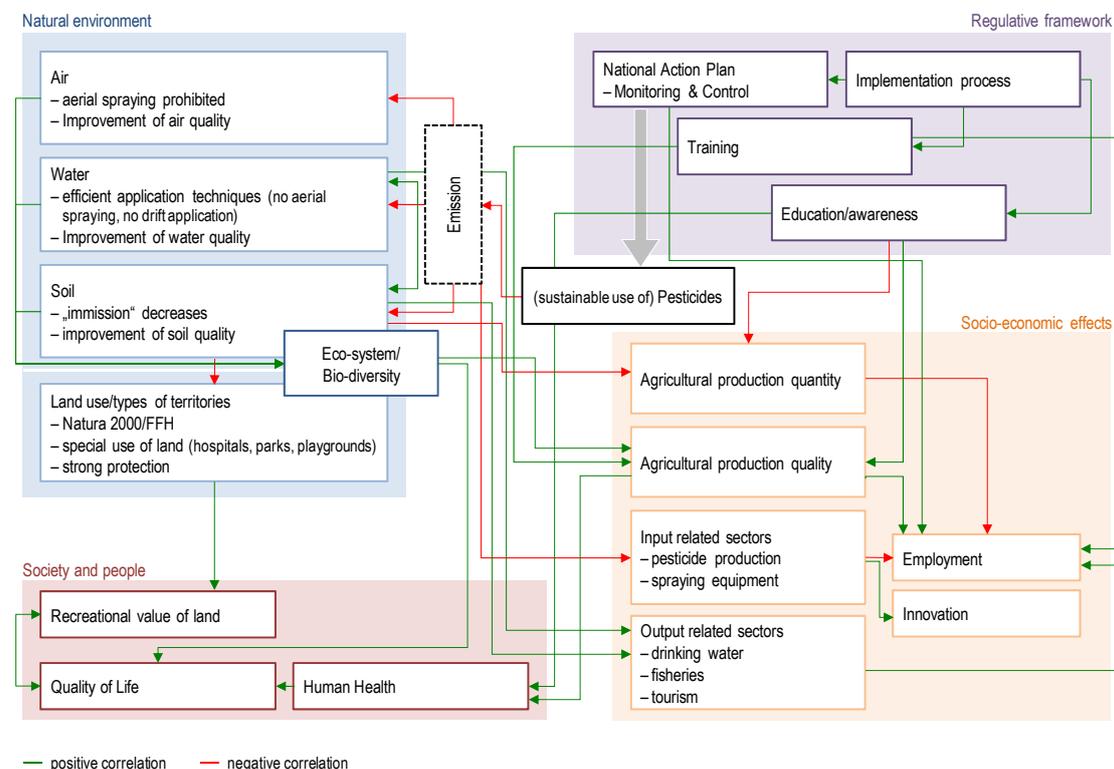
The standardised TIA quick check is done in nine steps using expert knowledge and a set of standardised indicators and types of regions. It covers the full range of potential impacts at a general level with common indicators for European NUTS 2 regions. It can be performed in a workshop atmosphere; preferably with a group of experts in the field of the policy proposal and experts on regional development.

### 2.2.1 The conceptual model: how does a policy influence the development of regions?

In a first step, it is necessary to detect the potential effects of a policy (in the case of ARTS, EU-directives were chosen) on territorial development. Based on a careful study of the actual text of the proposal, the experts then draw a conceptual model that translates the text into cause/effect relations (the *intervention logic*). Not only intended effects, but also unintended and indirect effects are considered, and on as many different fields as possible. This exercise is best done in an informal workshop setting so as to maximize the amount of input.

The cause/effect relationships can then be drawn out. Here, links between all the effects deriving from the policy proposal (*exposure* in the vulnerability concept) and the receptive capacity of a region (*sensitivity* in the vulnerability concept) are made explicit. The result is a systemic picture or flowchart showing the conceptual model of the proposal according to its intervention logic and potential effects (see following example).

**Figure B 2: Conceptual model of the directive 2009/128/EC Directive on the sustainable use of pesticides**



### **2.2.2 Dealing with discrete cause/effect chains (branching)**

In some cases, a policy will have only one chain of effects. In most cases, there are different, often mutually exclusive alternatives. For example, some policies only set targets, allowing member states to implement their own measures to meet these targets. Depending on the measure, the policy can have quite different territorial impacts. In other cases, the effects of a policy will vary according to type of region. In order to deal with this variability the policy is “branched” into different cause/effect chains, and each one analysed separately.

### **2.2.3 Which types of regions are affected? (regional exposure)**

A policy proposal may affect only particular regions (e.g. coastal regions, regions with presence of particular productions or facilities like nuclear power plants etc.) or different types of regions could be affected in different ways. Therefore, it is essential to only include those regions being affected in the analysis. Exposed regions are selected using typologies (e.g. rural/urban, central/peripheral, advanced/lagging, high/low presence of certain sectors). ESPON ARTS provides a set of pre-selected types of NUTS2 regions to choose from, but in theory any typology or selection is possible.<sup>5</sup>

### **2.2.4 What is the intensity of exposure on different fields? (exposure matrix)**

In the next step, the conceptual model is translated into a set of indicators that describe the intensity of policy exposure. This is done using a predefined set of thematic fields such as natural environment, regional economy as well as society and people. To do this, the project produced a Directive-Exposure Matrix (DEM) Excel tool which allows data to be entered according to the field.

For each field, the level of exposure is defined by expert judgement according to the following classes:

- ++ strong advantageous effect on territorial welfare (strong increase)
- + weak advantageous effect on territorial welfare (increase)
- O no effect
- - weak disadvantageous effect on territorial welfare (decrease)
- -- strong disadvantageous effect on territorial welfare (strong decrease)
- ? Unknown effect/effect cannot be specified
- +/- direction cannot be specified (diverse effects) – which points to the necessity to branch the directive

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<sup>5</sup> The following types of NUTS2 regions are available at the moment: Agglomerated regions, areas at highest technological/environmental risk, regions with relevant chemical industries, densely populated regions, forest regions, harbour regions, regions with a high density of rail, regions with a high density of road, regions with highest density of rail and road network, regions with highest share of employment in automotive, industrial regions, major airport location, regions with a high share of natural areas, rural regions, shrinking regions, regions with unprofitable farming, urban regions, wealthy regions, regions exposed to PM<sub>10</sub>.

These classes are then converted into numerical terms so as to allow further computation.

**Table B 1: List of exposure fields**

Natural environment				
Soil	Water	Air	Climatic factors	Fauna/Flora/Habitat
erosion	water consumption	pollutants in air	emissions of CO2	biodiversity
pollutants in soil	pollutants in ground/surface water		heavy rain/flood hazard/occurrence of landslides	conservation of natural heritage (landscape diversity)
share of artificial areas/soil sealing				conservation of cultural heritage
Regional economy				
Economic development	Agriculture	Industry	Services	Tourism
economic growth	employment in primary sector	employment in secondary sector	employment in tertiary sector	overnight stays
innovation	% of arable area, permanent grass/crop area			
entrepreneurship				
market barriers				
Society and people				
Social disparities	Demography	Accessibility	Built environment	Governance
disposable income in PPS per capita	out-migration/brain drain/"shrinking" regions	daily accessibility by air	increase of urbanization relative to population growth	efficiency of government/governance mechanisms
equal income distribution	number of people exposed to noise	daily accessibility by waterways	mixed land use	duration or complexity of planning procedures
Employment rate	accident rate in transport	daily accessibility by road		participation rate
	accident risk: industry/energy supply	daily accessibility by rail		societal transfers (e.g. tax added)
	healthy life expectancy at birth	renewable energy		transnational cooperation between member states
		fossil fuel consumption		

The list of exposure fields as seen above is the result of comprehensive literature research covering impact assessment methodologies and the expert knowledge in the TPG. The selection and attribution to the three dimensions was finalized after a feedback loop to ESPON CU.

### 2.2.5 What is the territorial impact on regions? (Territorial Impact Matrix, TIM)

Once the Directive Exposure Matrix in the previous step has been filled in, the impact values are calculated using predefined sensitivity adjustments. These adjustments

describe the sensitivity of a region and are normalized in the range 0.75 to 1.25. They are determined for each field and called the Regional Sensitivity Matrix.

The Territorial Impact Matrix (TIM) calculates the impact for each thematic exposure field and for each NUTS 2 region (= 42 fields x 287 NUTS 2 regions) and sorts the results into 9 classes:

**Table B 2: Scale of potential territorial impact**

	very high positive impact		minor negative impact
	high positive impact		moderate negative impact
	moderate positive impact		high negative impact
	minor positive impact		very high negative impact
	no exposure		

### **2.2.6 Do the results make sense? (plausibility and quality check)**

The results calculated in the territorial impact matrix should then be checked for plausibility. Usually the results show that a proposal only impacts a few thematic fields. The results should be discussed with the experts along two lines:

- Does the selection of regions provide a plausible picture? If not, the selection of the types of regions may need to be modified.
- Is the relationship between the different fields of exposure plausible? If not, the expert judgment about the intensity of exposure may need to be modified.

Once adjustments are made, the Territorial Impact Matrix (TIM) can be recalculated with the new values.

### **2.2.7 Which regions are hit in which fields? (mapping the results)**

When the results are reliable, maps showing the impact of different indicators can be drawn up. This can be followed by another plausibility check. In the trial run (see chapter 2.6.3) using 12 directives, several TIMs were recalculated after scrutinising the final maps.

### **2.2.8 What are the policy implications? (adaptive capacity discussion)**

The maps showing the regionally differentiated territorial impact serve as the starting point for a subsequent discussion on policy implications, which focuses on both the positive and negative impacts. Furthermore, the issue of potential adaptive capacity should be raised, as well as governance strategies to facilitate a successful implementation.

### **2.2.9 How to communicate the results (write-up)**

Based on the results of the territorial impact assessment and the expert discussion, a short report can be drawn up (including maps on relevant indicators) to serve as the

first “quick check” of territorial impact. This report aims at communicating the results of the ex-ante analysis to the relevant audience.

## **2.3 The methodology behind the TIA quick check**

### **2.3.1 The conceptual model of a directive**

As a first step it is necessary to translate the text of a directive into cause/effect chains which describe the “intervention logic” of a directive. These relationships are depicted as flowcharts showing the links between the regulation laid down in the directive, its specific targets and the different fields in which it will potentially show direct or indirect effects (“field exposure” in this project’s definition).

This conceptual model comprises the establishment of relationships between all relevant model components and the drawing of systemic borders. The elements of the model are selected carefully so that they show a direct relation to the system reality (in our case the causes and effects of EU directives on territorial impacts) and therefore allow for traceability for the user of the model, taking also into account data availability. It enables one to picture cause/effect relations as well as positive and negative feed-back loops of a directive on the development of regions. In the case of EU Directives, model modules were identified as ‘Natural environment’, ‘Regional economy’, ‘Society and people’ and ‘Regulative framework’. Each contains several components that were identified as part of the system; these components later become the impact dimensions of TIA (“impact fields”). Links between the components were drawn, indicating indirect or direct negative and positive relations.<sup>6</sup>

### **2.3.2 The statistical and assessment tools**

One of the goals of the project is to build a “K/SS” (“keep it short and simple”) operational methodology (as simple, comprehensible and user-friendly as possible) in order to define in quali/quantitative and comparative terms the sensitivity of European regions to EU directives. As all European regions have to be considered and many directives investigated, it is helpful to use a statistical and quantitative methodology, as it was done in previous ESPON exercises on Territorial Impact Assessment, namely in the Tequila Models.

Three concepts, previously defined, represent the logical pillars on which the quantitative methodology is built: field exposure, regional exposure and sensitivity. Their combination gives the territorial impact as final result.

The starting point of the operational methodology is given by three sets of elements:

(a) a common set of 41 exposure fields  $f$ , the same for all directives,

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<sup>6</sup> This was done for all 12 selected directives and not only for the directives selected for the in depth analysis as required by the ToR.

- (b) a common set of regions r (at NUTS 2 level in this project),
- (c) a common set of 12 EU Directives d (as agreed with the ESPON CU).

Exposure fields relate to different dimensions of environment, economy, society and territory. They were defined on the basis of the EU Directive on Impact Assessment (2009) and the best existing experiments on TIA (Table B 1), and represent a common frame for impact assessment of any Directive. Of course, only a smaller number of fields is influenced by each single Directive.

Given the fact that three dimensions are involved – exposure fields, regions and directives – the problem at hand looks statistically complex and has to be simplified without missing relevant information or trivializing the procedure. The full methodology is presented in the Scientific Report; here the operational and user friendly procedure is presented, avoiding technicalities and scientific complexities.

For each Directive, the methodology resides in the construction and combination of **three elements**: intensity of field exposure, identification of exposed regions and definition of regional sensitivity. Taking into consideration a single Directive, the methodology **implies** the following logical steps:

- **A**: the selection of the fields influenced by the Directive;
- **B**: the definition of the intensity of exposure of each field to the Directive,
- **C**: the definition of the typologies of regions exposed to the Directive;
- **D**: the definition of the sensitivity of each region to single impact fields ;
- **E**: the combination (multiplication) of the previous elements leading to the likely territorial impact.

#### **A: the selection of the fields influenced by the Directive**

On the basis of the conceptual model for each Directive, pointing out the logical chain between the Directive, its targets and the likely direct and indirect impacts (Figure B3), a subset of the full list of 41 fields is selected – usually 5-6 direct effect fields and 2-3 indirect effect fields.

#### **B: the definition of the intensity of exposure of each field to the Directive**

Still on the basis of the conceptual model for each Directive, the intensity of exposure of each selected field is assessed by expert judgement. The regional dimension is absent here.

The experts choose between strong or weak advantageous resp. disadvantageous effect on territorial welfare, no effect as well as unknown effect. These classes are then converted into numerical terms.

In this project, the Exposure values are indicated by positive and negative scores<sup>7</sup>, as follows:

1.5 = high positive exposure intensity

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<sup>7</sup> The sign of exposure intensity scores is assigned looking at the likely direction of field indicators when exposed to a directive. In the Directive/Exposure Matrix (see Scientific Report) it is clearly indicated whether an increase in the indicator has to be considered a benefit or a cost.

- 1 = low positive exposure intensity
- 0 = no exposure
- 1 = low negative exposure intensity
- 1.5 = high negative exposure intensity
- ? = unknown exposure

As most directives state the standards that need to be met but not the means to achieve them, or point out different policy tools and strategies, a separate impact measurement must be performed for the most important or likely strategic paths. The assessment is thus split into different “branches” which are treated as single sub-directives. In fact, the effects of the directive on a single exposure field (e.g. air quality) could be different in the different branches of the logical chain, and impact differently on different classes of regions. For example, a directive supporting the production of electric engines for cars will improve the air quality in regions where the new cars will be adopted, but may worsen air quality in regions where the new cars will be produced, due to increases in emissions from plants and transport involved<sup>8</sup>.

In this case, the directive splitting in two branches is treated as two separate sub-directives (Directive Xa and Xb). Of course, at the end of the elaboration process, the results of the two branches are summed up term by term in a single Territorial Impact.

### **C: the definition of the typologies of regions exposed to the Directive**

Each directive addresses specific issues, spatial conditions or production sectors; all these targets involve specific classes of regions which are identified. In fact, a directive could touch only particular regions – e.g. coastal regions, peripheral regions, regions with presence of particular productions or facilities like nuclear power plants or else – and not be relevant at all for other regions. As a consequence, only some classes of regions are considered<sup>9</sup>.

Only regions directly affected by the directives are considered; indirect and side effects, both expected and generally unexpected, are supposed to take place only inside the regions directly affected and not to spill-over the regional borders. The ESPON typologies can be used as a basis for the possible types of regions affected by the directive. However in some cases it might be useful to add more specific types like regions with a high share of employment in a particular sector.

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<sup>8</sup> The exposure intensities indicated for each field are organised as a vector (for each Directive) in the Directive/Exposure Matrix, which presents the usual 41 fields on rows and the different Directives on columns (see the Scientific Report).

<sup>9</sup> Operationally, in a side table, regions are classified into different categories, potentially exposed, according to the ESPON definitions: rural/urban, central/peripheral, coastal/mainland, advanced/lagging, high/low presence of sectors or specific productions considered by some directive, presence of protected natural areas, .... – The indicators and thresholds for considering a region exposed/non-exposed is given in the Scientific Report, section 3.4.

In this project, the regional exposure is indicated in a dichotomic, simplified way: Yes or No<sup>10</sup>. Two possible elaborations of the method could be envisaged in the future, though:

- considering also interregional *spillover effects* (very difficult to model for the entire European territory), and
- considering the *intensity of exposure* in the single regions. This second refinement is easier to handle, and could be introduced in future projects in case a single directive is in depth explored in its territorial impacts.

In this case, the exposure field dimension is absent.

#### **D: the definition of the sensitivity of each region to single impact fields**

In this step, the general sensitivity of each region to single exposure fields is defined, i.e. the attention and importance attributed in each region to each exposure field (an element which was taken into consideration in the previous Tequila models). No reference to any specific directive is made here. This sensitivity depends on socio-economic and geographical characteristics of the single regions, their social values and the political priorities attached to the different policy fields. A region might be particularly sensitive to economic impacts (on GDP or employment levels), given its relative backwardness; another could be particularly sensitive to environmental impacts given the presence of very sensitive natural or mountain areas; a further region could be very sensitive to impacts on congestion given its present high level of traffic density and traffic jams.

Regional sensitivity to each exposure field is estimated in a quantitative way using relevant statistical indicators from a regional database. In general, on the basis of expert judgement and data availability, a region is hypothesized to be sensitive to “pressure” indicators in direct proportionality to the present pressure condition (e.g., in the field of emissions, air or water quality: the higher the present emissions the higher the sensitivity to further emissions), and sensitive to status conditions in inverse proportionality (e.g. in the field of GDP and employment: the higher the per-capita income the lower the sensitivity to further increases in this variable). Details are given in the relative table in the Scientific Report, section 3.4<sup>11</sup>.

In this case, the directive dimension is not present.

In further research works, the regional sensitivity indicators could encompass the effect of regional reaction or adjustment capability with respect to the potential effects

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<sup>10</sup> The regions identified as exposed or not exposed to each Directive are organised into a second (0/1) matrix, the Regional Exposure Matrix, with regions on rows and Directives on columns (see the Scientific Report).

<sup>11</sup> The data on regional sensitivity are organized in a third matrix, the Regional Sensitivity Matrix, with fields on rows and regions on columns. See the Scientific Report. Each term of this matrix has the form of a correction coefficient, amplifying or reducing the potential impact of directives on each exposure field in each region (given by the multiplication of the indicators built in step B and C: intensity of field exposure to a Directive confirmed by the regional exposure (0/1) to the same Directive). It was decided to allow a correction of  $\pm 25\%$  to potential impact: therefore the coefficients range from 0.75 to 1.25 in the entire array of regions and are proportional to the specific sensitivity indicators chosen for each exposure field.

of EU directives, taking into consideration the internal governance structure and performance in each region. In the present research project this last issue is only tackled in theoretical terms.

### **E: the definition of the likely territorial impact**

The likely territorial impact of a Directive on European regions is computed in quantitative terms by combination (multiplication) of the different indicators built in the previous steps.

Territorial impact of a Directive  $d$  on field  $i$  in region  $r$  is equal to:

- a – intensity of exposure of field  $i$  to directive  $d$  (Steps A and B),
- b – confirmed by regional exposure of region  $r$  to Directive  $d$  (Yes/No) (Step C),
- c – multiplied by the coefficient of sensitivity of region  $r$  to impact field  $i$  (Step D).

Territorial impact of any single Directive can therefore be mapped for each exposure field (one map per field).

## **2.4 Territorial/regional impact of EU directives**

As it is easy to understand, the logics of the methodology which is built for this project is simple, and its conceptual operationalisation easy. Formal operationalisation, of course, needs an accurate and in-depth work on the logics of each Directive and the availability of the relevant statistics.

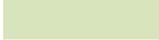
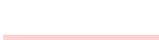
The data problem is crucial, but it did not prevent a fully acceptable elaboration in the case of the 12 Directives which were selected. Of course, the needed statistical information is not always directly available and careful inquiries and inter-institutional cooperation is crucial.

The needed information for computing Territorial Impacts were built by the research group through empirical investigation and statistical elaborations on:

- an example of 12 test Directives
- all European regions of EU 27 countries. The other countries of the ESPON space are not considered, because not required to implement EU Directives like Member Countries;
- the checklist of 41 Exposure Fields, defined for any directive on the basis of the Commission's suggestions in its *Impact Assessment Guidelines* (January 2009: SEC(2009)92) and other considerations concerning data availability and possibility of impacts definition.

As a consequence of the scores attributed field exposure (-1.5, -1, 0, 1, 1.5) and regional sensitivity (0.75 to 1.25), the final scores emerging as Territorial Impacts are continuous scores ranging from -1.875 to + 1.875. This is translated into the following scale:

**Table B 3: Scale of potential territorial impact**

	very high positive impact	$\geq 1.5$
	high positive impact	1.2-1.49
	moderate positive impact	1-1.19
	minor positive impact	0-0.99
	no exposure	0
	minor negative impact	-0.99-0
	moderate negative impact	-1.19—1
	high negative impact	-1.49—1.2
	very high negative impact	$\leq -1.5$

A further elaboration concerns the possibility of calculating a “cumulative” impact of a directive on each region, considering all impacts on the different fields together. Two solutions exist in this case:

- basic summation: counting all fields in which the impact on the region was considered “high”: is the solution utilised in the present project;
- weighting: computing a weighted multi-criteria impact index, in the same way as in the ESPON Tequila Models. This solution implies the definition of a shared system of weights for the single impacts (through expert judgement, policy maker’s priorities, etc.) and of some thresholds beyond which compensation among impacts is excluded (the FLAG methodology in the Tequila 2 model). This is something left to possible future extensions of the project.

If the indicators built in each steps are organised in matrices (as indicated in some footnotes and explained in a detailed way in the Scientific Report), the full methodology can be summarized in a sequence of three Matrices, giving rise by multiplication to the final Territorial Impact Matrices.

## **2.5 Using the tool for an advanced TIA quick check**

The methodology developed in ESPON ARTS as described above allows users to assess the impact of a policy proposal along self-defined thematic fields using new indicators for exposure and sensitivity of regions. The TIA-tool provides the technical setting for linking the exposure and sensitivity indicators, but the indicators themselves need to be defined individually. This advanced TIA quick check enables one to calculate the impact in these fields using the same nine steps as in the standardised TIA quick check.

Compared with the standardised TIA quick check only two steps need modifications based on a more detailed expert knowledge:

### **Modification of step 3: Which types of regions are affected?**

The advanced TIA quick check allows one to define specific types of regions that could be affected. The user has to fill the Regional Exposure Matrix (REM) by assigning each NUTS 2 region either an '0', indicating that a region is not that type of region, or '1', classifying a region as being part of that specific type of region.

### **Modification of step 4: What are the fields of exposure and how can the sensitivity of regions towards this exposure be described?**

In the next step, the conceptual model is translated into a set of indicators that describe the intensity of policy exposure.

One indicator describing the potential exposure deriving from an LPD. – This indicator will be filled in into the Directive Exposure Matrix (DEM). For each defined field the exposure of a directive is defined by expert judgement in a qualitative attitude along the following classes: high positive exposure intensity (strong increase)/low positive exposure intensity (increase)/no exposure (no effect)/high negative exposure intensity (strong decrease)/low negative exposure intensity (decrease), unknown effect (unknown).

One Indicator describing the sensitivity of a region. This indicator will be normalized in the range 0.75 to 1.25. – This indicator will be filled in into the Regional Sensitivity Matrix (RSM). The normalization follows a linear procedure and normalized values range from 0.75 up to 1.25. Basically, normalized sensitivity indicators represent coefficients that can increase (if greater than 1) or decrease (if lower than 1) each directive's impact on a specific field. For this step the following definitions are needed:

- $X_{norm_i}$  the normalized value of the sensitivity indicator for impact field i
- $X_i$  the original value of the sensitivity indicator for impact field i
- $X_{min_i}$  the minimum original value of the sensitivity indicator for impact field i
- $X_{max_i}$  the maximum original value of the sensitivity indicator for impact field i
- Then, normalization follows this formula:
- $X_{norm_i} = 0.75 + ((1.25 - 0.75) * ((X_i - X_{min_i}) / (X_{max_i} - X_{min_i})))$

## **2.6 The result of the tests Territorial/regional sensitivities of EU directives**

### **2.6.1 Selection of case study directives**

The relevance filter was developed as a tool to screen policies in order to arrive at a selection of 12 territorially relevant directives. The implementation of the relevance filter led to 28 directives to be considered for further analysis. Following a discussion

with the CU an ensemble of 12 directives were chosen<sup>12</sup> and analysed in terms of their effect on regional exposure. This final selection consisted of the following directives:

- (1) Council Directive 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air (Directive on air quality)
- (2) Council Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy (Water Framework Directive)
- (3) Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances (Seveso Directive)
- (4) Council Directive 2002/49/EC of the European Parliament and of the Council relating to the assessment and management of environmental noise (Directive on managing environmental noise)
- (5) Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport (Directive on promotion of use of biofuels)
- (6) Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage
- (7) Council Directive 2004/52 on the interoperability of electronic road toll systems in the Community
- (8) Council Directive 2005/36/EC on the recognition of professional qualifications (Directive on recognition of qualifications)
- (9) Council Directive 2008/114 on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection (Directive on critical infrastructure)
- (10) Council Directive 2009/128/EC on the establishing a framework for Community action to achieve the sustainable use of pesticides (Directive on sustainable use of pesticides)
- (11) Council Directives on the promotion of clean and energy-efficient road transport vehicles (Directive on clean and energy-efficient road transport vehicles)
- (12) Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (Directive on the energy performance of buildings)

The examination of two directives (no 6: directive on the on environmental liability and no 7: directive on the interoperability of electronic road toll systems) showed that no regional differentiation was possible. For these two directives the conceptual model about their intervention logics was set up and the directive exposure matrix was completed, but no further regional differentiated analysis was conducted.

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<sup>12</sup> After consultation with the ESPON MC the Directive on the control of major-accident hazards was included due to its highly differentiated territorial impact. It was exchanged with the Directive on the promotion of electricity produced from renewable energy sources in the internal electricity market. Since this directive focuses on the promotion of renewable energy, it is assumed to be similar in their regional territorial impact to the directives on the promotion of clean and energy-efficient road transport vehicles and on the promotion of the use of biofuels or other renewable fuels for transport.

## 2.6.2 In depth analysis of selected case study directives

### Directive relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air

This directive is one of the daughters of the 1996 Air Quality Framework directive. It mandates the measurement of air quality and designates minimum air quality standards that apply universally.

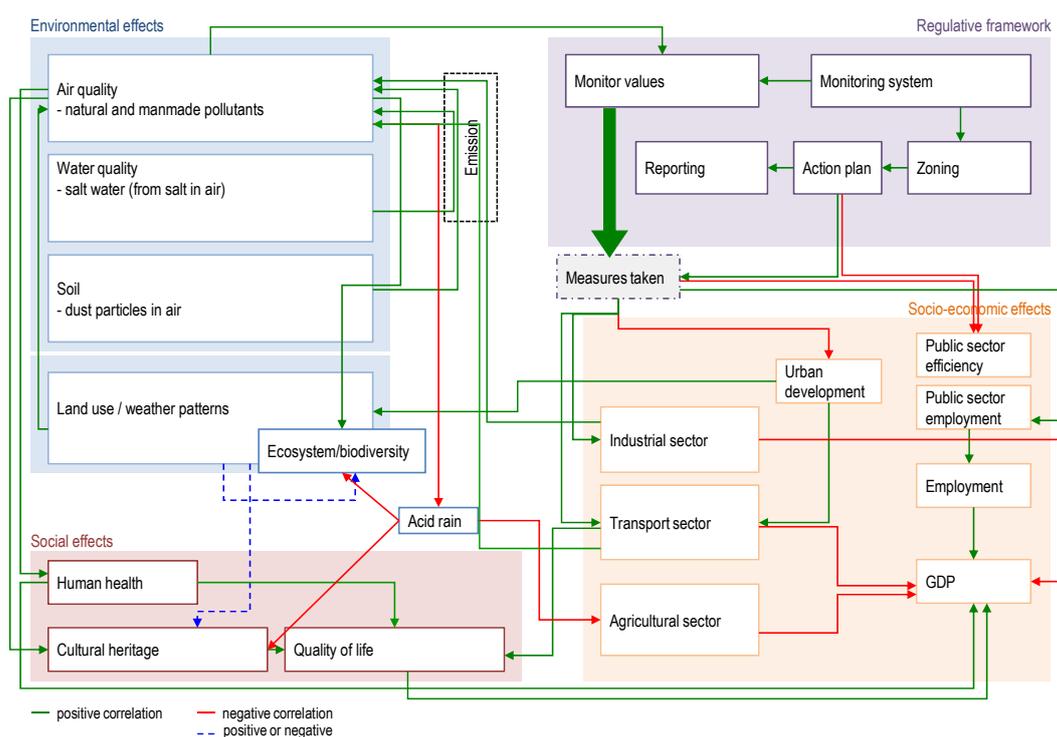
#### (a) Conceptual model, logical chain and exposure

This directive does not specify policy options in cases where pollution levels exceed maximum levels. Member states are free to decide for themselves which steps to take to improve air quality in these areas. In practice, a wide range of measures can be implemented, each of which can form its own branch. These include redirecting traffic to less-polluted areas, reducing traffic volumes, stimulating modal shift to public transport and cycling/walking, planting trees, building walls and tunnels. It can also include measures like prohibiting spatial developments in areas that exceed cut-off values to prevent the generation of extra traffic and the exposure of more people (Tennekes and Hornis 2008, VROM-Council, 2008). Other measures can be targeted at reducing emissions by industry or agricultural facilities. From the various measures sketched out above, two were selected for branching: (a) traffic measures in areas exceeding limits and (b) at-source emissions measures for industry.

With regard to branch a, the assumption is that the measures are successful in reducing traffic in non-compliance areas, and hence in reducing emissions of sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air. Indirect effects are perceptible in the environment due to less contamination of soil and water and a reduction of acid rain (which also harms historical buildings, and hence cultural heritage, and natural habitats of species and agricultural crops). Traffic reduction measures are also seen as potentially improving urban quality of life, human health, and hence, indirectly, promote economic growth. It could also reduce economic activity in the same urban areas. This could either harm growth or just shift it to more sustainable modes, which may actually have a positive effect on the economy. The measures are expected to increase the complexity of spatial projects in urban areas, which could also negatively impact economic growth.

Branch b (imposition of extra industrial emissions controls and/or toughening existing ones), is expected to improve air quality. As with branch a, this will have positive effects on environmental indicators and natural/cultural heritage via acid rain. The directive may also stimulate innovation of cleaner production methods. On the other hand, these measures are expected to drive up costs for concerned industries, which can negatively impact economic growth.

**Figure B 3: Logical chain of the directive**



**(b) The regions affected by the directive**

All regions in Europe will be affected by the directive in so far that all are obliged to *measure* air quality. However, only areas where the thresholds have been exceeded will experience impacts caused by the nationally or locally implemented ‘measures’ stemming from this directive. To account for this, the regions selected were those with high levels of PM<sub>10</sub>. Generally, this concerns the Benelux, north Italy and some regions in eastern Europe (see exposure map for branch a). In contrast, branch b affects regions that have a relatively large share of industry, regardless of whether the air quality meets the directive’s standards or not (see exposure map for branch b using manufacturing as an indicator). As stated above, these are just two of the ways in which this directive can be branched, as the directive does not specify which measures should be taken to reduce the regulated substances in the air.

A map depicting regions affected in each branch can be found in A5.

**(c) The territorial impact of the directive**

The cause/effect relationships identified in the logical chain were subsequently translated into expected changes on specific indicators for each branch. These comprised the input for the model calculating territorial impact. For branch a, the model results show that the main impact of the directive is on the natural

environment, specifically air quality (F6)<sup>13</sup>, the objective of the directive. This variable contained the highest values for both branches. The model predicted especially high impacts in cities such as Bucharest (RO), Slaskie (PL), Brussels and Közép-Magyarország (HU) as a result of the regional sensitivity. More indirect effects on the environment regarded pollutants in ground and water (F2 and F5). Since measures to reduce air pollution by vehicles generally results in less emissions in general, we also assumed that CO<sub>2</sub> will be reduced (F7) as well. Due to the anticipated reduction of acid rain, the model results produced positive scores on cultural heritage (F11). We see high values of this variable in Tuscany. Branch b has very similar results regarding the regions impacted by improved air quality, which is not surprising because the regional sensitivity is the same for both branches; therefore, the most concerned regions are the same in both branches.

For both branches, impacts on the regional economy are generally seen as negative, due to the investments required to implement the directive. The model results show that the impact on economic growth (F12) is most significant in areas where the regional sensitivity is highest, namely the poorer regions (see map below). The top five most hit regions are all in Romania and Bulgaria for both branches (although not the same ones). For branch a there is some slight positive impact on services (F20) due to the need for setting up measurement systems, drafting air quality plans in non-compliance zones and consultants.

The impact on society and people mainly regards the health benefits generated by breathing cleaner air for both branches. This is expected to contribute positively to healthy life expectancy (F28). Undoubtedly due to the regional sensitivity adjustment, the regions that show the highest impact according to the model are Latvia, Estonia, Észak-Magyarország (HU), Sud-Est (RO) and both Ciudad Autónoma de Ceuta and Ciudad Autónoma de Melilla (ES). For branch b, life expectancy is primarily impacted in Romanian regions, again, being influenced by the regional sensitivity aspect of the model.

Finally, the air quality directive was not expected to have a major impact on accessibility. For branch a, an indirect negative effect on road accessibility (F31) is expected from measures to reroute traffic or attempt to reduce the amount of vehicles travelling in polluted areas. According to the model run, the regions where this factor has the greatest impact includes, Canarias (ES), Ciudad Autónoma de Melilla (ES), Malta, Cyprus and Iceland. For branch b the effects are non-existent.

A few words can be said as regards the cumulative impacts. As regards branch a, the highest positive impacts were found in Romania and Hungary due to the sensitivity correction. The negative impacts of this branch were too low to show up in the cumulative analysis. As regards branch b, the main positive effects were found in

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<sup>13</sup> These abbreviations are related to the corresponding exposure fields and indicators in the TIM. (For a detailed description see scientific report, chapter 3.5.

Estonia and Romania, again mainly due to the sensitivity correction. Only one region in Romania was marked as having a high negative impact, due to its sensitivity.

#### **(d) Insights for policy options**

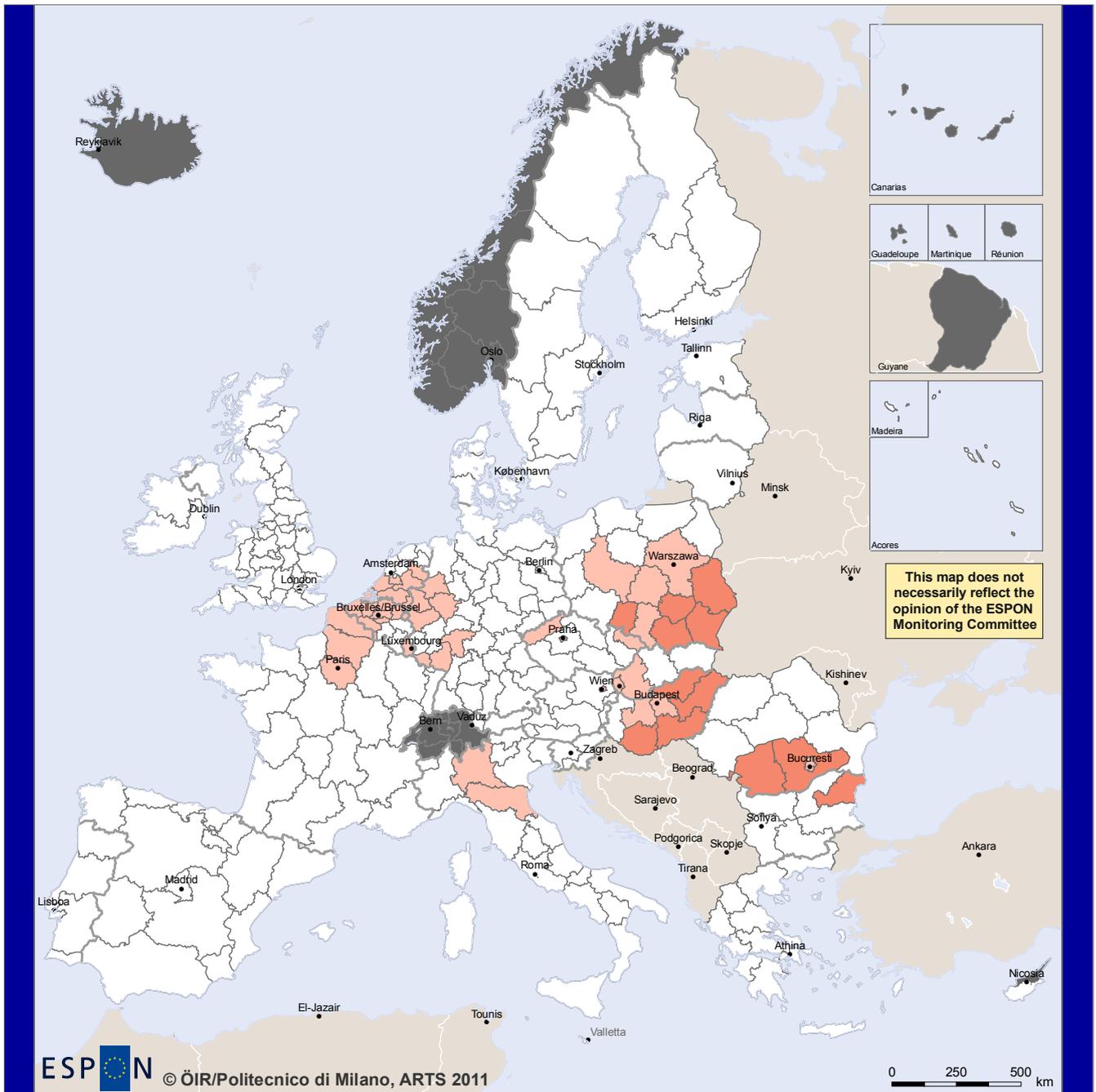
When examining the cumulative impacts, it seems prima facie as if the positive impacts are more widespread than the negative, both geographically as well as in magnitude, and for both branches. While not necessarily untrue, policymakers should be restrained from drawing hasty conclusions from these results for a number of reasons. First, the air quality directive was only worked out for two branches (based on possible measures by member states), and as a pilot run. Inclusion of more or different branches would undoubtedly have changed the discussion on policy implications. Second, no policy-relevant weighing was carried out (e.g. a negative score on mixed land-use counted the same as life-expectancy) in the summation. Third, some variables are strongly correlated (e.g. economic growth, employment, innovation, etc.) and usually amplify one another in the cumulative effects. Finally, it should be stressed that cumulative impacts were not specified according to whether it concerns the environment, society or economy, and are therefore of only limited value for policymakers concerned with trade-offs between these categories. It is largely for these reasons that the cumulative maps were omitted from the report.

**Map B 1: Territorial Impact of Directive 1 (branch a) on economic growth (GDP/capita)**

**Map B 2: Territorial Impact of Directive 1 (branch b) on pollutants in air**

[following pages]

# Regions affected by Directive on air quality branch a Economic growth (GDP/capita) (F12)



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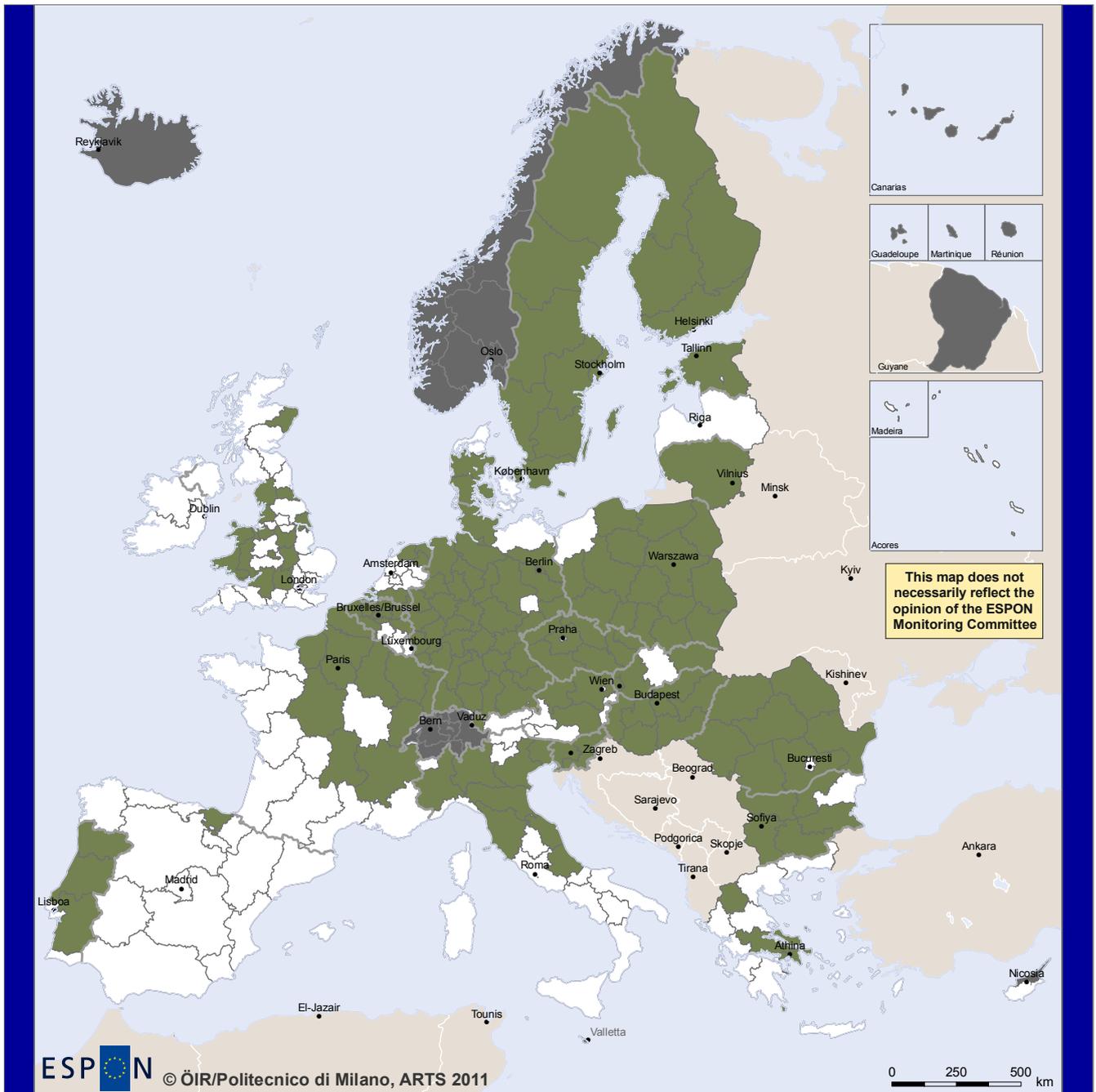
Regional level: NUTS 2  
Transformation and Compilation of Data based on:  
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## Negative Impact



Types of regions affected: high particulate air pollution

# Regions affected by Directive on air quality branch b Pollutants in air (F6)



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## Positive Impact



Types of regions affected: industrial regions

On the other hand, this analysis brings some issues to the fore that otherwise may have been neglected in the policy debate.

First, territory matters. The analysis shows that directives have more impact in some regions than others and that positive and negative impacts are geographically differentiated. Second, decisions of member states and regions matter. Via branching we saw that different measures/strategies will have different territorial impacts in different places. Governance can greatly amplify or mitigate these impacts. Third, regions differ according to their sensitivity. For instance, a region in a precarious economic situation was assumed to be more sensitive to regulations that harm economic growth and regions with fragile ecosystems more sensitive to pollution or nature fragmentation. The analysis of the air quality directive mainly highlighted areas in new member states as being sensitive, both positively and negatively. One could also posit an alternative definition of sensitivity, namely, that areas that are most sensitive are those closest to the threshold values of the directive — regions with worse air quality will conceivably have to implement more far-reaching measures and hence be more impacted.

According to the assessment we can consider the differences in territorial impact between the two strategies inherent in branches a and b. The nature of both branches is roughly similar: positive environmental impacts and modest negative economic impacts, implying a trade-off. It is more interesting to consider the kinds of regions being exposed, because this may have implications for governance. In branch a, it is those regions exceeding the standards that are exposed and must implement traffic measures. These are generally urban areas governed by municipalities authorized to implement such measures. Branch b is potentially less straightforward because even regions that have relatively clean air are impacted due to the presence of any polluting industry. This branch would require national coercive policy, and may create tensions between business interests and the regions that depend on them, and national policy.

### **Directive relating to the assessment and management of environmental noise**

This directive mandates that member states make noise maps and action plans for agglomerations, major roads, major railways and major airports. Exceeding limit values shall cause competent authorities to consider or enforce mitigation measures<sup>14</sup> such as land-use planning, systems engineering for traffic, traffic planning, abatement by sound insulation measures and noise control of sources.

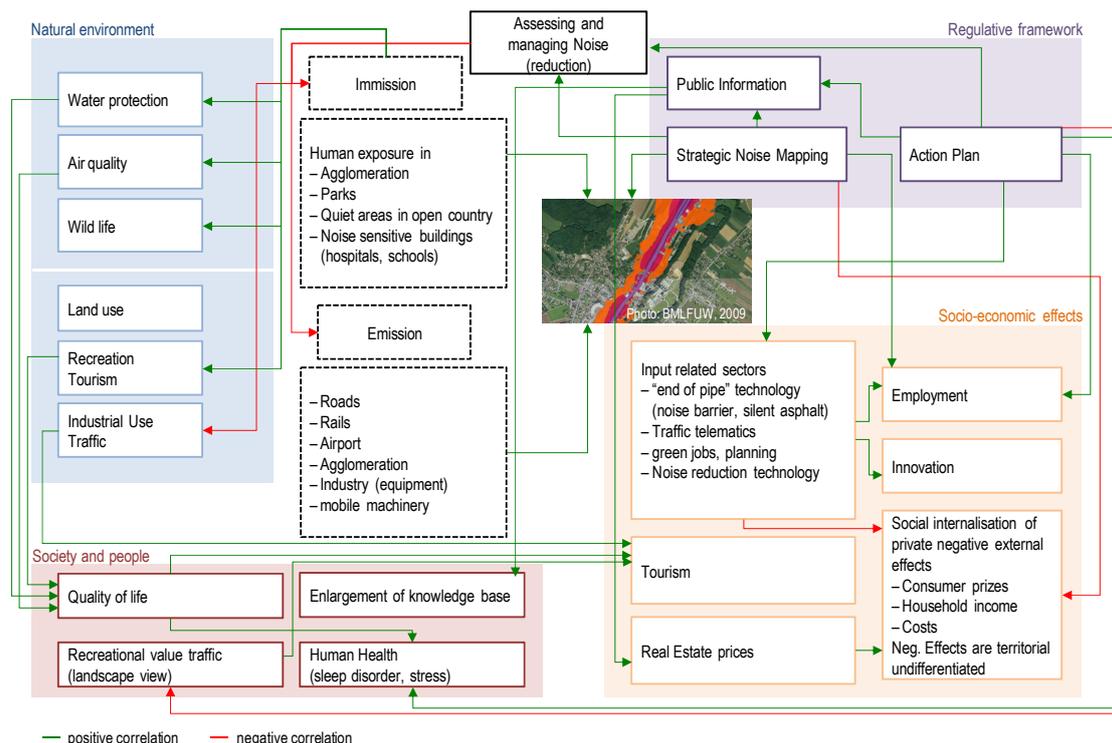
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<sup>14</sup> Limit values may differ for different types of noise (road, rail, air-traffic, industrial, etc.) as well as for different surroundings and sensitiveness of the population. They can also be different for existing situations and new ones (e.g. new or changed noise sources or surroundings);

### (a) Conceptual model, logical chain and exposure

This directive requires member states to determine exposure to environmental noise through noise mapping and to develop action plans to prevent or reduce this noise. The public becomes involved in this process, not only by having access to information but also by being given the opportunity to participate in the preparation of the action plans. These provisions aim at increasing the efficiency of governance by providing information and empowering the people. At the same time, these additional procedures increase the complexity of public sector administration.

**Figure B 4: Logical chain of the directive**



Generally the directive leaves the member states a great amount of leeway – the specifications in the action plan determine the directive’s potential territorial effects.

Different logical chains were created depending on the different kind of measures that can be chosen in the particular action plan. Although usually a package of measures is implemented, in order to allow for a comparison of individual policy alternatives logical chains for each type of measure were examined.

Branch a follows the cause/effect chain of implementing traffic planning measures or providing incentives to reduce noise exposure. These measures include traffic management systems (telematics), speed limits but also driving bans (e.g. at certain times, on specific days or roads or related to certain types of vehicles) but also non

traffic issues alike noise limits for industrial sites. Other measures in this branch consider incentives for low noise vehicles, rail access track charge or toll roads.<sup>15</sup>

Other mitigation measures can be undertaken by land-use planning, which is considered branch b. This includes establishing noise zones around industrial sites, routing of rail tracks, roads or aerodrome siting as well as setting rules regarding the orientation of buildings and land-use restrictions in fragile areas or next to sensitive buildings.

Branch c follows the logical chain of introducing technical measures of sound insulation or noise-reduction at the source. These can concern highway noise barriers, silent asphalt, broadband rail and wheel dampers, active noise filters, etc.

Each branch and its inherent specifications in the action plan will determine the directive's potential territorial effects. In that sense, branch a will influence the accessibility by road, rail and air negatively if traffic is restricted by measures like night traffic bans (branch a). Measures like speed limits or traffic telematics lead to reduced fossil fuel consumption and road accident rate.

The decline of fossil-fuel consumption reduces CO<sub>2</sub> emissions and other pollutants. This will have knock-on positive effects for the quality of water, soil and air and also mitigates damage on masonry thus indirectly helping to conserve cultural heritage. Measures specified in the action plans aim primarily at reducing the number of people exposed to noise. Less noise also provides better habitat conditions and helps to sustain biodiversity. Positive effects on the environment and noise levels produce strong positive direct effects on health, and leads to increased recreational value of land, thus attracting more visitors.

Effects on economic growth and subsequently employment in the secondary sector and disposable household income do not all point in the same direction. They can be either positive or negative; their net effects are incalculable within the scope of this project. On the one hand, the measures implemented in this branch could compromise just-in-time logistics, which should increase storage costs for transport industries, and extra revenue for storage companies. The burden of expenditure will likely be passed on to the consumers who experience a decline in disposable income. While this development would lead to a decrease in GDP/capita, on the other hand economic incentives for the use of low-noise vehicles may stimulate research and development in low-noise technology. This can have a positive impact on innovation and subsequently on the economy. Together with the construction and management of storage facilities this may provide jobs in the secondary sector.

Following the reasoning of branch c, the production of sound insulations or other technical means of noise reduction will entail higher energy consumption by industry which in turn causes higher CO<sub>2</sub> emissions. Also the construction of noise barriers will harm views of the landscape.

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<sup>15</sup> These measures can lead to a shift of traffic to other routes or other modes of transport. The territorial impact of these indirect effects was not included in this examination

Positive effects can be expected on the regional economy. It can produce innovations in sectors dealing with noise prevention and control (e.g. noise barriers, silent asphalt, active noise filters) and boost economic growth and employment in industrial and service sectors related to research and development, mapping and tourism. With regard to branch a, the technical measures applied mitigate noise strongly, benefitting human health and by means of better habitat condition supports sustaining biodiversity.

The positive economic developments together with declining health expenditures will have positive effects on disposable household income. This positive development concerns mainly workers in the secondary and tertiary sector, which contributes to an unequal income distribution.

In comparison to branch a and c, branch b has few territorial effects. Measures in land-use planning also fulfil the implicit aim of the directive to reduce the number of people exposed to noise. The land-use measures to reduce noise will probably result in a separation of functions. Industries and other relatively noisy land uses will have to be located afar from sensitive buildings or fragile areas, the routing of major roads or rail tracks may have a negative effect on accessibility. Sites in quiet areas are developed for sensitive buildings that are followed by new settlements. The spread of built-up area increases the share of artificial surfaces and fragments the landscape, which influences natural heritage negatively.

#### **(b) The regions affected by the directive**

Regardless of which cause/effect chain is examined, the measures are implemented only in areas where there is a high exposure to noise, usually caused by high traffic volumes. We identified the regions likely to be affected by the directive by aggregating those that fall either in an urban or agglomerated area, those in the top 10 percentile of population density distribution, in the top 25 percentile of density of road and rail and regions with an airport carrying over 500,000 passengers per year.

When applying these filters on NUTS 2 regions, almost all (276 out of 287) European regions were identified. By this methodology, only remote regions are unaffected by this Directive, namely Burgenland (AT), Niederbayern and Oberpfalz (DE), Castilla-La Mancha (ES), Guyane (FR), Dél-Dunántúl (HU), Basilicata and Molise (IT), Swietokrzyskie (PL), Sud (RO), Slovenia (SL). A map depicting regions affected in each branch can be found in A5.

#### **(c) The territorial impact of the directive**

The directive's primary objective is to reduce the number of people exposed to noise (F25). Strong positive impacts on this field in all branches mirror this effort. A reduction of exposure to noise is also deemed beneficial for human health, so a high positive effect on the healthy life expectancy (F28) was indicated for all exposed

regions. Although the impact intensity ranges from moderate to very high, in the case of healthy life expectancy high intensity dominates, whereas for noise a very high intensity of impact prevails. The effects are even stronger in branches a and c due to the stronger beneficial impact on these fields.

Following the implementation of transport-planning measures and provision of incentives (branch a) the effects on road fatalities (F26) are generally positive but limited, although Sterea Ellada in Greece sticks out as being impacted highly due its present sensitivity to road accidents.

Branch a's impact on the environment is consistently positive and limited. Most impacts are minor and only in a very few cases moderate and high. An example of the latter is the case in Ciudad Autónoma de Ceuta (ES) on soil and water quality (F2, F5), in Bucharest (RO) on air quality (F6), Inner London on CO<sub>2</sub> emissions (F7), highly sensible Tuscany on cultural heritage (F11) and the Canarias on biodiversity (F9). This pattern is also noticeable when following branch c.

Landscape planning measures (branch b) influence the environment slightly negatively. Urban regions – being already quite sensitive to soil sealing (F3) and urban sprawl (F35) are hit more than others. Measures like the construction of transport routes (branch b) and the implementation of technical measures (branch c) like noise barriers will influence landscape diversity (F10), primarily in Greece due to the sensitivity adjustment. The higher CO<sub>2</sub> emissions (F7) in branch c generally have only minor effects on the regions with the exception of Inner London and Brussels, which have a very high vehicle concentration.

In case of measures relating to traffic bans (spatial and/or temporal) or landscape planning, negative impacts on the accessibility by road, rail (F31, F32) are expected. Although mainly minor, peripheral regions like Malta and the Canarias are impacted.<sup>16</sup> Negative impacts on accessibility by air (F29) are generally stronger – the regions most influenced are found in Greece, Romania and Bulgaria. A consequence of branch a is a decrease in fuel consumption (F34), leading to positive albeit limited impacts on the hit regions. A more pronounced positive effect is visible in Greece, Spain, Portugal and Italy, where the sensitivity is very high. The opposite is true when considering branch c where an increase in industrial productivity increases demand for fuel.

In contrast to the other branches, the positive effects of productivity gains from the implementation of technical measures (branch c) on the regional economy can be noticed across all concerned regions. Most pronounced are the effects on entrepreneurship (F14) and employment in the secondary (F18) and tertiary sector (F19). Although in the case of entrepreneurship, only Greece profits significantly less than other regions, the territorial impact on employment is more differentiated. While the positive effects on employment in industry benefit eastern regions the most (with

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<sup>16</sup> This impact only concerns accessibility by road, since neither Malta nor the Canarias have a railway system.

Czech regions leading the way) and western city regions come in last, the opposite can be said about the effects on employment in services. The positive impact on the economy also shows up on tourism (F20) although on a smaller scale, with moderate impacts on Regions in Poland, Romania and Bulgaria. Generally the employment rate (F23) is impacted positively but moderately in all regions, with the exception of French Guyane, Guadeloupe and Reunion, where the sensitivity and thus the impact is higher. The positive effect on innovation (F13) is most evident in southern Germany and Vienna (Austria), where it can be considered as moderate to high.

When discussing the impact on economic growth (F12), it becomes obvious that poorer regions profit more than wealthier ones: most of Romania and Bulgaria, many regions of Poland, Hungary's East and Východné Slovensko in Slovakia show a moderate to high positive impact. A similar positive impact on disposable household income (F21) can be noted in Bulgaria and Romania, while other regions are hit only modestly. These outcomes are the product of the sensitivity measure. Still, the imbalance in employment shows on a negative impact on the income distribution (F22) in southern European regions in Greece, Malta, Corse, Italy, Spain but mostly in Portugal.

In general, not many high negative impacts are to be expected from any of the three branches of the directive on environmental noise. Branch a evokes high negative impacts on accessibility by air in some regions of Greece and one in Bulgaria, while at branch c they are mostly concentrated in Portuguese regions on income distribution. The highest negative impacts in branch b regard regions in the United Kingdom (West Midlands, Highlands & Islands, and especially Inner London) and Valle d'Aosta/Vallée d'Aoste in Italy regarding urbanization and the conservation of natural heritage. Again, these outcomes are due to the sensitivity calculation.

All three branches indicate high positive impacts on the number of people exposed to noise across Europe. Following branch a, these positive impacts are found to a lesser extent in Scandinavia, whereas Estonia, Latvia, Romania, Malta, Ciudad Autónoma de Ceuta and Ciudad Autónoma de Melilla, experience additional high positive impacts on health. The high positive impacts of branch b are more limited, occurring mostly capital regions, England and Wales, Belgium, Netherlands, north-western France, western regions of Germany, the Czech Republic, some Polish regions and coastal regions of the southern European countries

Of all branches, branch c shows the greatest beneficial impacts on the European regions. Besides the overall high positive Impact on the exposure to noise, regions in Estonia, Latvia, Romania, Bulgaria, Észak-Magyarország (HU) as well as Ciudad Autónoma de Ceuta and Ciudad Autónoma de Melilla experience high positive impact on two other indicators: entrepreneurship and health. Finally, regions showing very high (two indicators) positive impact are located in the Czech Republic, Denmark, Scotland and northern France.

#### **(d) Insights for policy options**

Overall, not many negative impacts are expected to be evoked by this directive. The positive impacts outweigh the negative ones by far. There is however a difference in the extent of this beneficial impact depending on the kind of measures introduced within national jurisdiction and depending on the region's sensitivity in various fields.

The result of the territorial impact assessment – as realised in this project – allows to compare the different strategies and measures chosen by the member states for transposing the Directive.

With regard to the Directive on environmental noise, implementing traffic planning measures and providing financial incentives (**branch a**) show the least amount of negative impacts on the regions. Solely the accessibility of regions might be adversely influenced. On the other hand, the extent of benefitting effects can be observed on 11 indicators. Most of these indicators can be summarized as environmental but the highest impacts and the highest number of regions hit occur in health related fields.

However, the most positive impacts follow if the national government decides on technical measures (**branch c**) in order to fulfil the requirements of the noise directive. The immanent boost of manufacturing and R&D are particularly conducive to the regional economy and employment while at the same time the Directive succeeds in reducing the exposure to noise, benefitting human health and the habitat. Negative impacts on energy consumption and related environmental fields suggest a trade-off with the benefits of increased production.

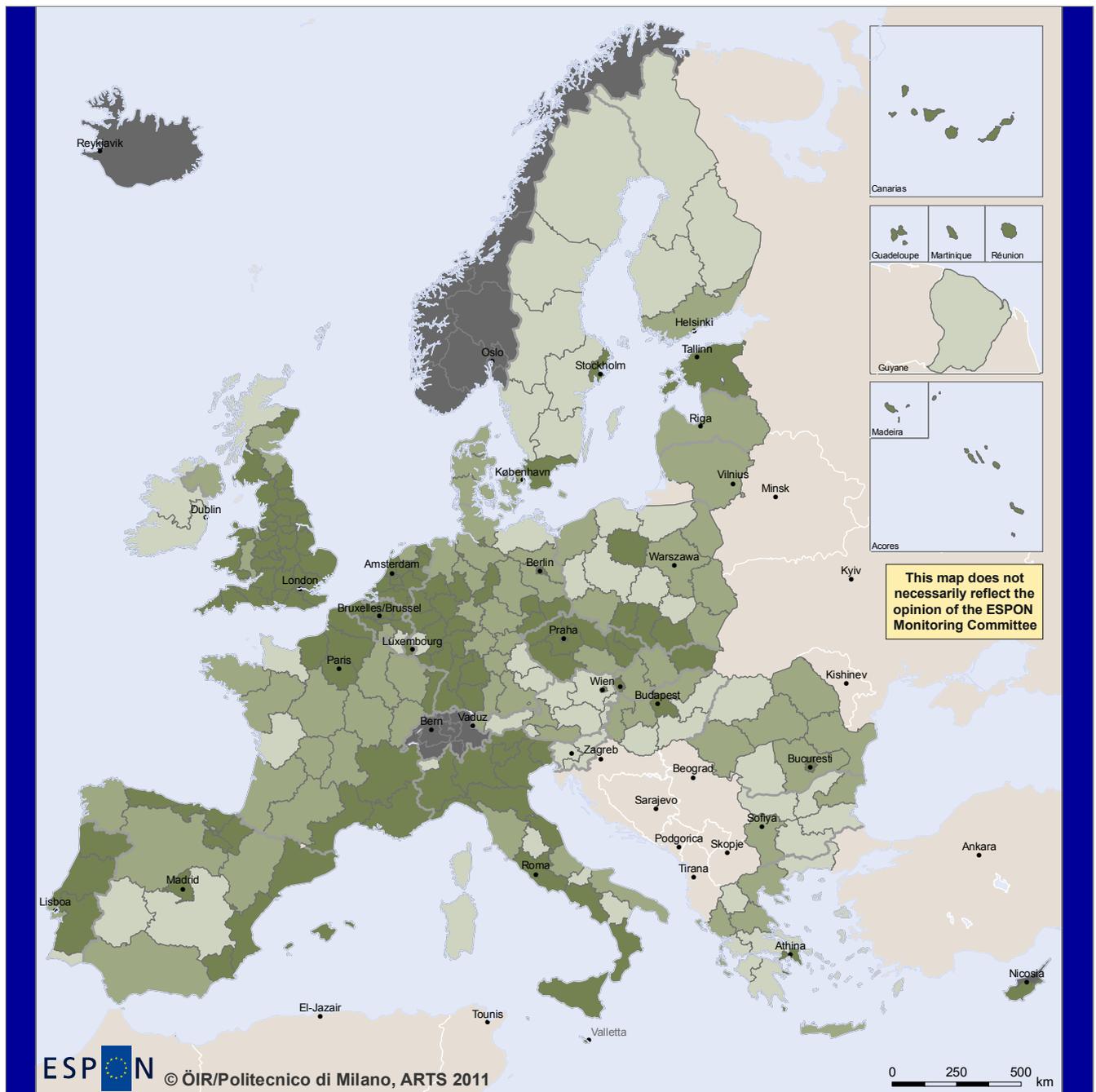
**Map B 3: Territorial Impact of Directive 4 (branch b) on number of people exposed to noise**

**Map B 4: Territorial Impact of Directive 4 (branch c) on fossil fuel consumption**

[following pages]

# Regions affected by Directive on managing environmental noise branch b

## Number of people exposed to noise (F25)



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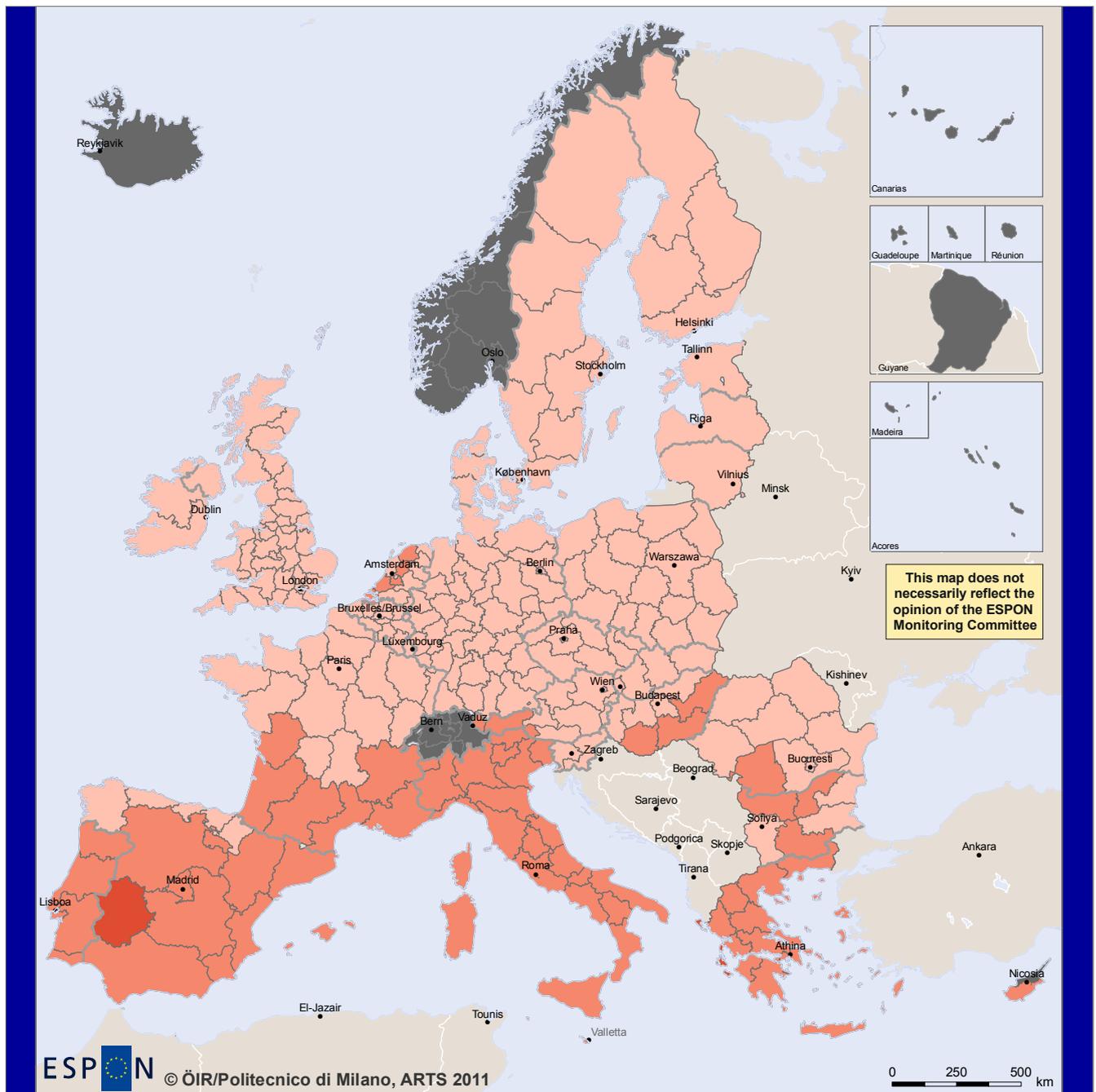
Regional level: NUTS 2  
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### Positive Impact



Types of regions affected: urban, agglomerated, densely populated, high density of road, high density of rail, major airport location

# Regions affected by Directive on managing environmental noise branch c Fossil fuel consumption (F34)



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## Negative Impact



Types of regions affected: urban, agglomerated, densely populated, high density of road, high density of rail, major airport location

The adoption of landscape planning measures (**branch b**) puts another complexion on things. In that case, the negative effects prevail the positive ones by far. The favourable effects on people's exposure to noise and transnational cooperation are thwarted by adverse impacts on accessibility, urban sprawl and subsequently on landscape diversity.

The analysis points to the implementation of policy measures, that integrate both technical and transport planning measures while at the same time providing financial incentives. Jointly pursued, regions can benefit not only in terms of improved conditions for human health, but also from growing economy with all its entailing socio-economic effects. Furthermore the disadvantageous impacts on the environment from installing technical measures can be countervailed by actions aiming at reducing the traffic volume.

### **Directives on the promotion of clean and energy-efficient road transport vehicles**

This directive aims at the introduction of specific measures in the transport sector to address energy use and greenhouse gas emission with the ultimate goal of better integration of transport and energy policies. Specifically, the directive aims at stimulating the market for clean and energy-efficient road transport vehicles, namely standardised vehicles produced in large quantities such as passenger cars, coaches and trucks. Special attention is devoted to the procurement of public transport services. To this end, the directive provides a list of criteria that must be met by vehicles purchased in accordance to public procurement rules. These criteria regard lifetime energy use, environmental impacts and pollutants.

#### **(a) Conceptual model, logical chain and exposure**

The impacts of the directive are expected to follow two distinct routes. On the one hand, impacts depend on the demand-side: the incentives for adopting cleaner and more efficient vehicles will lead to positive impacts on the natural environment in terms of lower emissions and pollutants in air as well as reduced fossil-fuel consumption (branch a).

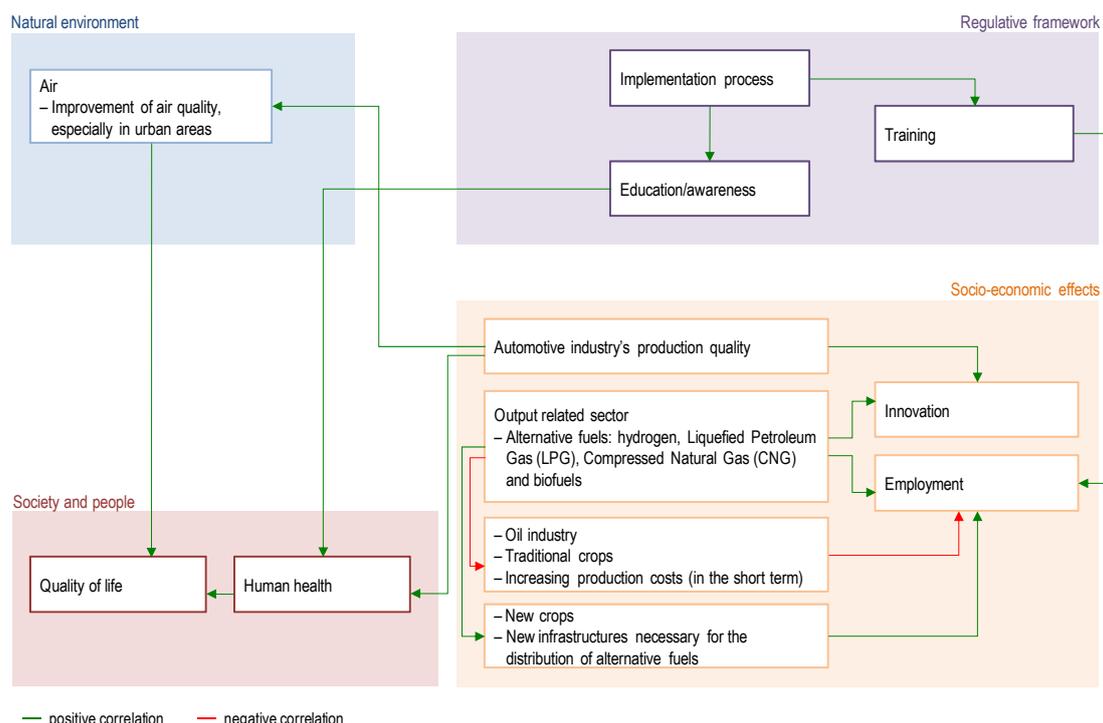
On the other hand, impacts also depend on the supply side: investments in and production of cleaner and more efficient vehicles are expected to influence employment and GDP and promote innovations in cleaner and greener technologies (branch b).

The exposure fields affected in branch a of this directive pertain to the natural environment, namely a moderate reduction of CO<sub>2</sub> emissions and the level of pollutants in air (PM<sub>10</sub>). This is linked to a moderate reduction of the dependence on fossil fuels. This impact is expected to be moderate since the directive does not aim at a full substitution of the vehicle fleet, but basically addresses fleet renewal. Also,

vehicles can be considered as a substantial although not exclusive component of CO<sub>2</sub> emissions.

The impact via the supply side (i.e. branch b) will bear moderately positive on GDP and employment (namely in manufacturing) since it has an effect on a limited part of the manufacturing sector. Some effects can be expected regarding the share of arable land, permanent grass area, permanent crops areas, since the extra production of biofuels may require an extension of cultivated areas. The impact on innovation is expected to be considerable since the directive can induce car producers to make extra investments in alternative and superior vehicle technologies.

**Figure B 5: Logical chain of the directive**



**(b) The regions affected by the directive**

We expect that the regions most affected by this directive are agglomerated regions in the first case and, in the second case, those with a considerable share of employment in vehicle production (i.e. here defined as those regions falling in the top 25 percentile of the distribution of employment in vehicles production over total employment in manufacturing).

The rationale behind this expectation is as follows. In the first case, benefits will be particularly high in regions that are more congested and polluted, typically agglomerated ones. These regions include capital cities and densely populated regions in Central Europe.

Conversely, benefits stemming from the implementation of this directive will mainly affect regions that are highly specialised in vehicle production; these may experience an increase in production and employment. These regions are concentrated in

Central Europe, with some hotspots in Italy (namely Piemonte, Abruzzo, Molise, and Basilicata), Spain (Galicia, Pais Vasco, Aragón, Castilla y León and Cataluña), France (Basse-Normandie, Nord-Pas-de-Calais, Franche-Comté) and British and Swedish regions in Northern Europe. Also several Eastern European regions look potentially affected by this directive in Slovakia, Poland, Czech Republic and Hungary. A map depicting regions affected in each branch can be found in A5.

### **(c) The territorial impact of the directive**

Looking at the impacts deriving from the demand side, this directive seems to produce minor positive impacts (i.e. a reduction of) pollutants in air (F6) with the exception of Bucuresti which has major positive impacts. Similarly, impacts on the emission of CO<sub>2</sub> (F7) will be positive albeit minor with the exception of Brussels Capital Region (BE) and Ciudad Autónoma de Melilla (moderate) and Inner London (high). Lastly, impact on fossil-fuel consumption (F34) is once again positive and minor but a larger number of regions seem moderately hit in Italy (Liguria; Lombardia, Veneto, Lazio, Campania), Spain (Aragón, Comunidad de Madrid, Cataluña, Comunidad Valenciana), and other Mediterranean regions (Provence-Alpes-Côte d'Azur, Attiki, Malta, Lisboa), as shown in Map B 5 and Map B 6 below.

Looking at impact derived from the supply side, this directive seems to produce minor positive impacts on economic growth (F12) in all regions with the exception of five in Eastern Europe (i.e. Észak-Magyarország, Podkarpackie, Centru, Sud, Vest in Romania) which show moderate impacts. This variation is due to the sensitivity calculation. Impacts on innovation (F13) are expected to be positive and high and (mostly) very high across all European regions touched by this directive. Furthermore, impacts on the share of arable area (F17) are generally seen as positive and minor, but moderate in some German and Czech regions as well as in some Polish, Romanian and Hungarian ones. High impacts are expected in a few regions such as Basse-Normandie, East Riding and North Lincolnshire, Herefordshire, Worcestershire and Warwickshire. Finally, impacts on employment in manufacturing (F18) will be largely minor and moderate, being high only in some eastern regions in Czech Republic, Hungary, Slovakia and Romania.

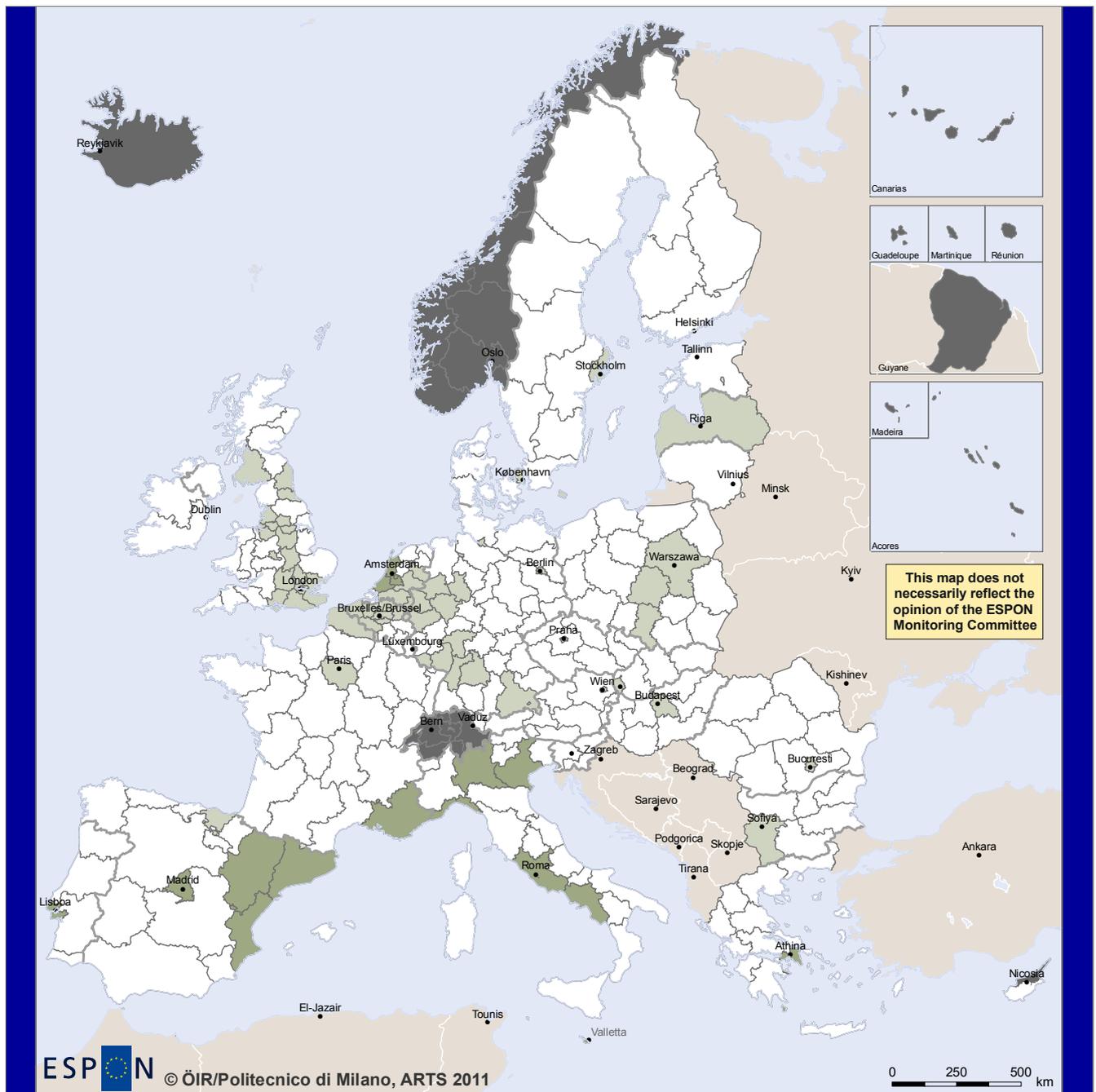
Regarding the cumulative impacts, branch a does not produce any high negative impacts, and high positive impacts are limited to two regions (and on just one impact field): Inner London and Bucuresti. In branch b, no high negative impacts were produced either. Contrary to branch a, most regions will experience high positive impacts on one indicator (53 out of 64 exposed regions) and some on two indicators as well (11 out of 64 exposed regions), namely in Czech Republic, Hungary, Slovakia and Romania.

**Map B 5: Territorial Impact of Directive 11 (branch a) on fossil fuel consumption**

**Map B 6: Territorial Impact of Directive 11 (branch b) on employment in secondary sector**

[following pages]

# Regions affected by Directive on clean and energy-efficient road transport vehicles branch a Fossil fuel consumption (F34)



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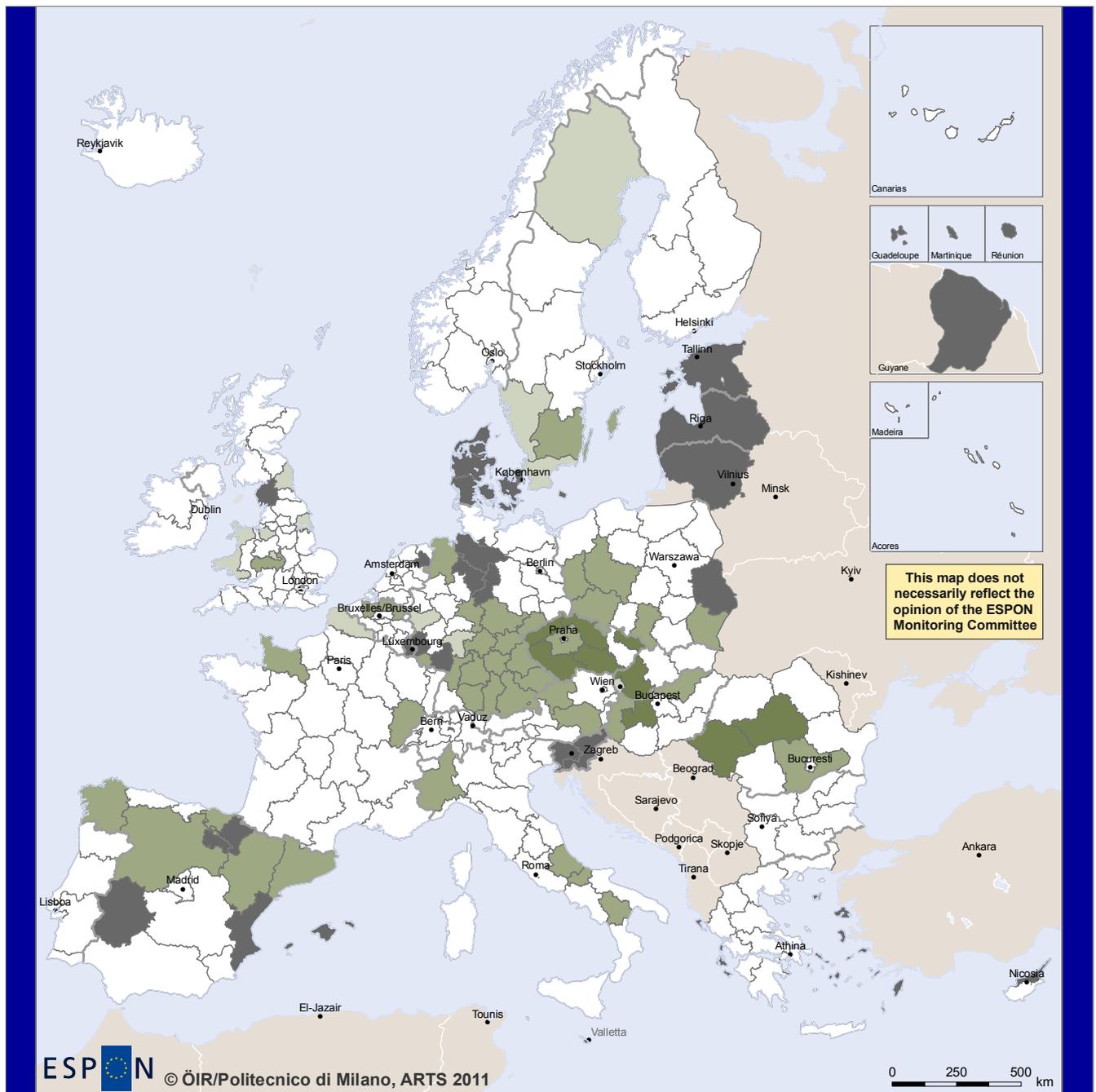
Regional level: NUTS 2  
Transformation and Compilation of Data based on:  
ESPON Projects, EUROSTAT, EEA Corine Land Cover,  
5th Cohesion Report, BOKU University, DG AGRI  
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## Positive Impact



Types of regions affected: agglomerated

# Regions affected by Directive on clean and energy-efficient road transport vehicles branch b Employment in the secondary sector (F18)



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Regional level: NUTS 2  
Transformation and Compilation of Data based on:  
ESPON Projects, EUROSTAT, EEA Corine Land Cover,  
5th Cohesion Report, BOKU University, DG AGRI  
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## Positive Impact



Types of regions affected: highest share of employment in automotive

#### **(d) Insights for policy options**

This directive deals with a very relevant aspect connected to the green economy (i.e. the shift towards clean and energy-efficient transport vehicles) and highlights two routes along which European directives may eventually show territorial impacts, the supply and production side on the one hand and the demand and adoption side on the other.

Interestingly, the impacts of the two branches always look positive and never offset each other (i.e. substitution effect), rather they seem to cumulate and reinforce each other (i.e. complementary effect). This suggests that policy measures undertaken in the framework of the two branches could be jointly promoted and pursued to better exploit the potential benefits accruing from this directive.

This also suggests that policy options in this specific field should be conceived and developed in accordance with both the supply-side as demand-side. In particular, policies may first aim at the production side by supporting research and innovation for developing and producing more advanced and efficient (i.e. greener) technologies in transport vehicles. Next, and perhaps once technologies become sufficiently stable and relatively cheaper, policies may be aimed at the adoption side, either through additional ad-hoc directives or by specifically envisaging policy instruments in the new Structural Funds allocation in the upcoming Financial Perspective which is currently under discussion. Especially in this regard, coordination among member states in support of the adoption of greener technologies in transports seems crucial in order to limit selective and uneven adoption patterns across the European territory.

Furthermore, our analysis points to the potential added value this directive could have when used in unison with other policy measures influencing the production and adoption of other green technologies, especially in the energy sector (e.g. biomass, biofuels). For example, the TIM approach highlights the link of this directive with agricultural and energy policies since it has direct effects on the share of agricultural land and may introduce a shift in crops towards biofuels.

#### **2.6.3 General analysis of selected case study directives**

##### **Case study: Directive establishing a framework for Community action in the field of water policy**

The Water Framework Directive (WFD) concerns a comprehensive package of regulations on water. It applies to all types of inland water, including ground, transitional (i.e. from sweet to salt) and coastal waters. It covers the entire European water system, from spring to sea and from sweet to salt and provides a uniform regulatory framework for the management and protection of water across the European Union.

### **(a) Conceptual model, logical chain and exposure**

Its main aim is to secure good water quality. The focus is on chemical, system, nutrients and ecological quality indicators. The background is that water is a vital resource for both humans and nature. The aims and objectives of the WFD overlap greatly with existing EU (and domestic) policies, such as Natura 2000, Swimming water Directive and the Nitrate Directive.

To achieve these goals member states are required to develop water management plans at a water (river) basin level by 2009. A good ecological and chemical water quality should be achieved by 2015 or at maximum by 2027 in case of technological constraints or excessive costs.

The WFD has significant territorial impact. It applies to the complete water system in Europe, no region excluded. In all areas where water quality does not meet the thresholds additional measures are to be taken. Measures range from filtering, end-of-pipe solutions, ecological improvement, restoring traditional morphology to, finally, change or restrictions on certain types of land-use, for example agriculture. The overall territorial impact should particularly benefit environmental aspects, such as a reduction of pollutants in ground and surface water, biodiversity, reduction of flood hazards and conservation of natural heritage. Whether the WFD will have consequences for shipping, hydro-energy production and inland fishing, is not clear.

Significant impacts are to be expected in the fields of efficient governance system, complexity of planning procedures and cross-border cooperation. This is due to the requirement to develop management plans at the level of water basins, which are expected to impact on planning procedures. Where regional jurisdictions do not always neatly overlap with functional water basin boundaries, regions may be forced to co-operate with each other. Where water basins cross national borders regions need to co-operate across borders.

### **(b) The regions affected by the directive**

Given the objectives relating to chemical and ecological water quality it is possible to be more specific about regions that will be affected relatively more than others due to specific territorial characteristics and land uses. This concerns regions where the water quality is relatively poor or under pressure due to intensive and/or polluting territorial functions. Regions that will be relatively highly affected concern:

- Regions with a high share of agriculture
- Urbanized regions
- Regions with a high share of inland water

A map depicting regions affected can be found in A5.

## **Case study: Directive on the control of major-accident hazards involving dangerous substances (so-called Seveso II Directive)**

This directive is aimed at the prevention of major accidents involving dangerous substances and the limitation of their consequences for man and the environment.

### **(a) Conceptual model, logical chain and exposure**

This Directive introduces a comprehensive regulative framework for the operation of plants dealing with dangerous substances. It extends from notifications about the installation of such plants to reports covering safety issues, accident prevention policies and emergency plans. The competent authority monitors and inspects the establishments and provides information to other member states and the public.

While these new administrative tasks should mitigate the risk of major accidents and foster transnational cooperation on the one hand, they also complicate matters for operators on the other hand. This can result in increased prices for consumers and consequently a decline in household disposable income. These measures can have a bearing on the regional economy and thus employment. The measures constitute market barriers and are seen as hampering production in industries addressed by the directive, but at the same time stimulate innovation in end-of-pipe technologies and environmentally friendly chemistry while mitigating negative externalities. The member states are free to involve land-use planning by, for example, imposing land-use restrictions following the establishment of a plant, preventing the building of plants altogether or by taking ecological measures prior to construction.

The directive's most direct effects will be on the environment and human health in the case of an accident. Better and more efficient repair measures will have positive effects on the quality of soil, water and air and improve health and safety at work.

### **(b) The regions affected by the directive**

This directive principally affects regions where establishments handling dangerous substances are located. The mere presence of these potentially harmful substances implies the risk of accidents. Natural hazards can also play a part in triggering industrial accidents, as illustrated by the Fukushima nuclear power plant disaster.

Hence, we expect regions with a high technological/environmental risk profile to be more likely to be affected by this directive. We identified these regions as those falling in the top-10 percentile of the technological/environmental risk distribution of the aggregated hazard typology (based on 15 hazard indicators) developed in ESPON project 1.3.1. The affected regions stretch from England to the north of Italy. In Romania, the Czech Republic and Poland, mainly the eastern regions are affected. Another area covers northern Spain and French regions bordering the Mediterranean Sea. A map of the affected regions can be found in A5.

## **Case study: Directive on the promotion of the use of biofuels or other renewable fuels for transport)**

This directive sets minimum percentages for renewables in transport fuels in order to promote the transition to renewable energy.

### **(a) Conceptual model, logical chain and exposure**

According to this directive, member states are free to determine for themselves how to meet the imposed targets. Because of this, the territorial impacts were branched according to the most likely measures to be taken. As this directive has not been selected for in-depth analysis, only one branch will be discussed here: the large-scale import of raw materials from overseas. For a full description of the branching of the directive and more results, please see the Scientific Report.

Given the low profitability of biofuel production, one of the most likely impacts of the biofuels directive is the large-scale import of raw materials from overseas, which are then industrially converted into fuels (Rienks et al. 2009).<sup>17</sup> This kind of bulk transport generally occurs over water, both over sea as well as over inland waterways. Raw materials have to be off-loaded, stored and processed, which means intensified use of industrial areas situated next to waterways. The conversion process requires industrial installations, which can be large-scale (in the case of second generation biodiesel) or more modest in size (in the case first generation biodiesel and gasoline).

These industrial and transport activities are bound to have effects on social, environmental and economic fields in their respective regions, as well as reducing activities in the traditional fossil-fuel supply chain. This is in addition to the direct impact of the directive on the use of renewables and net reduction of CO<sub>2</sub> emissions. Specifically, fields such as soil sealing and pollutants in ground, local CO<sub>2</sub> emissions and biodiversity will be negatively afflicted against gains in fields such as GDP and employment.

### **(b) Type of regions affected by the directive**

To illustrate the territorial impacts in this branch, regions with harbours (both sea and inland ports) were selected (ESPON indicator: accessibility of sea harbours within 30 min). A map depicting regions affected can be found in A5

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<sup>17</sup> The other branches concern domestic production. This involves switching from food crop production to biofuels in agricultural areas, and harvesting biomass in wetlands (reeds) and forests.

### **Case study: Directive on environmental liability with regard to the prevention and remedying of environmental damage**

This directive introduces a framework for environmental liability based on the polluter-pays principle in order to prevent and remedy environmental damage. This directive allows operators to be held responsible whose activity has caused environmental damage or if an imminent threat of this exists. This directive allows the public to express a request for action.

As regards impacts, remedial action (primary, complementary or compensatory) should decrease the pollution of water, soil and air while at the same improving natural habitats. In case of preventive action, whether this means providing information or implementing end-of-pipe measures, similar effects can be expected since the measures aim at reducing carelessness. In either case, positive effects for the environment correlate positively with human health.

Another expected effect of the directive is that additional expenses to industry are passed on to consumers through increased prices, with reductions in disposable income as a result. In order to find ways to decrease production costs, new processes or products are invented (innovation). Although one can deduce this logical chain from the directive, all regions are equally exposed to these effects. Even if not equally sensitive, no territorially differentiated impacts can be derived from this directive.

### **Case study: Directive on the interoperability of electronic road toll systems in the Community**

This directive lays down the conditions necessary to ensure interoperability of electronic toll system in the EC. This is of relevance to the removal of artificial barriers to the operation of the internal market. The directive is part of a larger body of policies that together aim at a more uniform road pricing system in Europe. The combined territorial impact of this policy package is expected to be rather high.

In contrast the territorial impact of this single directive is expected to be low. Interoperability of electronic road toll systems (namely for highways) is a means to improve road traffic and accessibility, mainly in cross-border regions, thus improving economic performance and reducing emissions and congestion time; it will also impact on competitiveness of road vs rail.

Effects will occur where road toll systems are in place, or will be, that are not interoperable. This has a potential effect on all regions with a high share of motorways. However, it is to be expected that electronic systems within member states already are interoperable, which means that in the case of this directive impact is to be expected mainly in cross border regions. Based on available data and indicators (high share of motorways) no regional differentiation was found.

## **Case study: Directive on the recognition of professional qualifications**

This directive establishes a framework for the recognition of professional qualifications within the EU. It aims to clarify and consolidate the current rules in place and facilitate the free movement of qualified professionals between member states.

### **(a) Conceptual model, logical chain and exposure**

The simplification and harmonisation of recognising professional qualifications should benefit governance in all regions. When considering the effects of this directive it becomes apparent that urban and wealthy regions (branch a) will be influenced differently than shrinking regions (branch b). Highly mobile professionals are inclined to abandon 'unattractive' regions and migrate to regions where working conditions (especially wage levels) are more promising. In addition, access to labour markets facilitates freedom of movement and service provision and also enables citizens to profit from cultural exchange.

In wealthy regions, the recognition of professional qualifications should trigger regional development in all sectors of the economy by creating a favourable environment for the movement of workers and thus additional labour supply, and in due course, lay the groundwork for the establishment of service enterprises. For shrinking regions, the effect can be the opposite: jobs are lost in the secondary and tertiary sector, impeding economic growth in the short run. In the long run, rebound effects are expected due to the relocation of production to regions with lower production costs. As it is tied to the land, the primary sector will face competitive disadvantages in relation to other sectors in both wealthy and shrinking regions. Generally, this will increase income inequalities in the short term due to labour surplus in the host countries, but in the long term, labour market equilibrium should produce a more equal income distribution.

The general increase of economic activities and transport should result in more CO<sub>2</sub> emissions. Population growth in the regions receiving workers will increase demand for housing, water and energy. The opposite can be expected for the regions of origin. This can exacerbate urban sprawl in growing regions and reduce landscape diversity.

### **(b) The regions affected by the directive**

The directive is expected to affect urban, agglomerated and wealthy regions (branch a) differently than shrinking regions (branch b). The rationale behind this is that agglomerations and wealthy regions are attractive to mobile professionals seeking better working conditions. As these regions attract workers, regions with less promising job prospects are left behind, particularly in rural and peripheral regions. In order to approximate regions affected by the directive, a typology indicating regions

with a shrinking population — regardless if caused by migration loss and/or death surplus — was selected. A map depicting these regions can be found in A5.

### **Case study: Directive on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection**

This directive establishes a procedure for the identification of European critical infrastructures (ECIs) and a common approach to assess the need to improve their protection. The specific focus of the directive is on the energy and transport sectors.

#### **(a) Conceptual model, logical chain and exposure**

The impact of the directive is most likely in two fields: the national environment and accessibility. Regarding the first, the directive should lead to a lower risk of environmental and technological disasters. Second, and probably more importantly, are the impacts on accessibility. Greater protection of critical infrastructure such as airports, rail and road networks should positively influence accessibility and, in turn, economic growth and, marginally, employment (e.g. security services and construction). GDP and employment may benefit from the extra investments undertaken to improve critical infrastructure safety conditions as well. Finally, the directive should have an effect on safety, both in terms of reduced accident rates and lower technological/environmental risks.

The directive is likely to hit several fields (overall 16 out of 41) at once, ranging from society and people and natural environment to economy and governance. The most influenced field should be accessibility by road, rail and air. Improvement in critical infrastructure protection and safety could generate a quantum leap in accessibility, with positive spin-offs for GDP and employment.

In addition, the directive could modestly touch the soil quality, as the overall level of pollution depends not just on improvements in safety conditions of critical infrastructure but on the behaviour of businesses and consumers as well. Similarly, the effect on the share of natural areas depends on new construction, and not necessarily the protection of critical infrastructure. Overall, this leads to a moderate reduction of accidents in transport as well as technological and environmental risks.

#### **(b) The regions affected by the directive**

We expect that regions showing either a relatively high technological/environmental risk or those with a relatively high density of rail and road networks are more likely to be affected by this directive. Consequently, we selected regions falling in the top-10 percentile of the distribution of an aggregated index of technological/environmental risk and/or in the top-10 percentile of the distribution of rail and road network density. A map depicting the affected regions can be found in A5.

## **Case study: Directive on the establishing a framework for Community action to achieve the sustainable use of pesticides**

This directive establishes a framework to achieve a sustainable use of pesticides by reducing risks and impacts of pesticide use on human health and the environment and promoting non-chemical alternatives to pesticides.

### **(a) Conceptual model, logical chain and exposure**

The directive requires member states to draw up action plans to reduce the potential damage to human health and environment caused by pesticides. The directive also calls for inspections of equipment as well as training and certification schemes for all those using pesticides professionally. Furthermore measures need to be adopted to inform the general public of health and environmental hazards relating to pesticide use and awareness-raising programmes on the involved dangers need to be implemented.

Regulations concerning the sustainable use of pesticides should limit their use in agriculture. This should reduce the need for pesticide production and reduce pollution levels in water, soil and air. Mandatory establishment of buffers and protection zones will entail changes in land use. The regulations concerning transport and storage of pesticides will lessen risks among users and chemical industries. This should have positive effects on the ecosystem and public health but negative effects on economic growth. Producers of pesticides and other input-related sectors suffer financial losses as do agricultural producers due to falling crop yields, at least in the short run. The promotion of alternatives should foster innovation, change the amount of arable land and increase labour-intensive agricultural production. Low regional labour costs lead to substitution gains from replacing pesticide costs with labour. In regions with high labour costs the reverse applies. High value-added farm products and environmentally friendly production, together with inelastic demand, should increase the disposable income of the rural population. The opposite is true for workers in the chemical industry. First-tier effect of losses and gains in different sectors leads to a short-term imbalance of regional income distribution which can, in turn, influence migration flows.

### **(b) The regions affected by the directive**

This directive has different effects on regions that are primarily rural (branch a) and those with many chemical industries (branch b). A characteristic of rural regions is their comparably high share of agricultural production, which makes them the primary recipient of pesticides. Regions with a high density of chemical plants (in relation to the EU-average) are more likely to be affected by reductions in demand for pesticides.

Rural regions are mainly situated at the European periphery, covering most of Scandinavia, Romania and Greece. In central Europe rural regions are found in Austria, southern Germany, Prov. Luxembourg in Belgium and Valle d'Aosta/Vallée d'Aoste in Italy. Regions with a comparably high density of chemical industries are mostly located in the core of Europe and the capital regions of the periphery. A map depicting affected regions can be found in A5.

### **Case study: Directive on the energy performance of buildings**

The directive promotes the improvement of the energy performance of buildings, taking into account outdoor climatic and local conditions, as well as indoor climate requirements and cost-effectiveness. Local planners are directly addressed by the directive, to properly consider the optimal combination of improvements in energy efficiency, use of energy from renewable sources and use of district heating and cooling when planning, designing, building and renovating industrial or residential areas.

#### **(a) Conceptual model, logical chain and exposure**

The four key points of the Directive are: 1) a common methodology for calculating the integrated energy performance of buildings; 2) minimum standards on the energy performance of new buildings and existing renovated buildings; 3) systems for the energy certification of new and existing buildings; 4) regular inspection of boilers and central air-conditioning systems and heating systems in buildings. All new buildings should comply with 'near zero-energy buildings' standards by 31-12-2020, and 31-12-2018 for public buildings.

All areas with buildings will be affected by this directive. Most effects will be on the level of individual new or renovated buildings that will be designed in different ways in order to make maximum use of natural climatologically conditions, to use different construction materials, to integrate renewable energy production and may come in adjusted shape: thicker walls.

Physical effects are mainly to be expected at the level of a building block or neighborhood. Urban design provisions can be expected to facilitate the penetration of water and cool air from outside the city. This includes measures such as lowering the amount of soil sealing, i.e. pavements, roads. The overall effect could be a lowering of the amount of buildings per hectare. Increasing attention is expected in urban design for the integration of heat and cold storage and exchange systems, which may influence decisions on land use.

In particular in urbanized regions the directive will lead to more innovation and new small middle sized consultant and advisory companies in the tertiary sector. Another social effect could be further segregation and uneven income distribution in terms of disposable income.

The directive foresees in establishing monitoring systems including energy performance certificates for several building categories, national plans to achieve targets, policies and incentives. This will mainly impact the efficiency of government in terms of additional tasks and lead to further complexity of the planning procedure. The certificate system that may play a role in issuing permits.

#### **(b) The regions affected by the directive**

The type of regions that will be affected mostly concern densely populated, urbanized and growth regions. Two more specific types of regions can be identified where effects may be relatively large: regions with a high share of cultural heritage in terms of historic buildings and regions where income distribution is unbalanced.

A map depicting regions affected can be found in A5.

#### **2.6.4 Lessons learned from the case studies**

The case studies of the twelve territorially relevant directives aimed at testing the TIA quick check concerning its usability and user-friendliness. Additionally to these case studies conducted by the experts of the TPG, a workshop was organised involving experts of DG Regio in the testing phase. The results of these test runs helped to improve the final version of the TIA quick check. The most interesting experiences were:

- The **conceptual model** allows a first overview over the possible cause-effect relations that derive from implementing a directive. Defining the model's components, subsuming them to model modules and establishing positive or negative feed-back loops between them, helps to identify, which exposure fields the directive will affect. It turned out that on average only 5 – 10 fields per directive are impacted strongly. Additionally, the conceptual model helps to identify, whether the directive is generating different cause-effect-chains and consequently different branches of the analysis of its impact need to be developed.
- The conceptual model with its causal chains as well as the completion of the **directive exposure matrix** (DEM) are based on expert knowledge, gathered in a meeting of experts in a workshop. In those workshops experts often like to discuss details and consequently tend to lose sight of the most important relation detail. Therefore, it is useful to do at least a second round of discussion in which the rating of DEM is reconsidered and revised, if necessary.
- The accuracy of the conclusion on impacted regions depends on the provided sensitivity indicators and **typologies of regions**. So the maps showing the impacted regions are strongly depending on how the typology allows to draw a picture of the effects of the directive analysed. Consequently the existing comprehensive ESPON typologies can serve as a quick and dirty analysis tool, providing a first glance of potentially impacted regions.

- The pre-defined set of indicators and typologies allows first rough pictures of potentially impacted regions. If a more accurate result of the impact of a special directive is desired, more adequate and specified indicators and typologies are required. Consequently the **advanced TIA quick check** was developed, offering the possibility to alter this data.
- When discussing the outcome of the TIA quick check it has to be kept in mind, that the results are based on the **average indicator values** for the region. As in the case of the set of indicators for the quick check, most of the data is available on NUTS 2 level. If small scale results are expected, the calculated impact and maps yield a distorted picture (e.g. urban/rural regions).

For the **policy makers** this ex-ante TIA quick check can fulfil two important tasks: First, the analysis shows that LPD have territorial impacts that are geographically differentiated in their polarisation and intensity. This must be tirelessly and continuously reiterated as the debate on new European policy is usually narrowly focussed on weighing sectoral objectives against possible costs and other side-effects. The fact that these exercises generate maps already contributes towards **territorial consciousness-raising**. Second, introducing the possibility of branching a directive reveals the causal relation between the decisions of member states and the expected impacts. Via branching we saw that different measures/strategies will have different territorial impacts in different places. Governance can greatly amplify or mitigate these impacts. Although governance could not be taken into consideration in this particular analysis (e.g. functioning of legal system and public administration would have been interesting variables), a branched territorial impact analysis can act as a powerful **decision-making support tool** if used prior to implementation, and as such can contribute to improving governance.

## 2.7 Governance

In this study the focus is on three governance aspects of TIA: 1) the use of a TIA instrument (section 2.7.1 and 2.7.2), 2) governance as an explaining factor of territorial impact (2.7.3) and, 3) the question whether a separate governance filter should be considered for ARTS (2.7.4) and finally how governance has been factored into the ARTS methodology (2.7.5).

### 2.7.1 TIA in European countries

At the 2001 ECTP/CSD conference several participants indicated that in their country bits and pieces of what could be called territorial impact assessment were carried out, although the regulatory base differs greatly and is not always there (ECTP/CSD 2001). Only in a few countries is some form of territorial impact assessment standard practice, i.e. Germany, Switzerland and Austria. In the latter two – where the partly obligation to carry out a TIA or a Raumverträglichkeitsprüfung is based on law – TIA is directed to the identification of possible territorial impacts in relation to concrete

projects. What is important is that among the Member States there is no common understanding of TIA.

### **2.7.2 Impact Assessment procedure in the Commission relevance for TIA**

It was found that for political as well as substantive reasons the Commission's Impact Assessment (IA) practice qualifies as one of the best opportunities to get TIA implemented at the EU level (Zonneveld & Waterhout 2009).

IA offers opportunities to introduce territorial thinking in the development process of EU directives. Currently this barely happens, even not in cases where it seems obvious that the directive will have territorial effects. There are two key challenges: 1) to get involved in the IA process, and 2) to prove with ready-to-use evidence that the directive under consideration has a likely effect on territorial development and/or policy making. The first challenge concerns an institutional/organisation issue which needs to be solved between key stakeholders. The second challenge concerns a research and design issue. Currently there is neither sufficient persuasive territorial data available, nor are there easy-to-use tools and instruments. The ESPON ARTS project should be understood in this context and aims to fill this gap.

### **2.7.3 Governance as an explaining factor for territorial impact**

One aim of the ESPON ARTS project is to develop a more thorough understanding of the role of governance as an explaining factor for the territorial impact of EU directives. The basic hypothesis underlying is that domestic governance structures can have either an amplifying or a mitigating effect on the potential territorial impact of EU directives.

The key issue is that directives (in contrast to, for example, regulations and decisions) need to be transposed in domestic policies and need to be up-held by domestic institutions in domestic administrative, cultural and territorial contexts. This means that several follow-up decisions have to be taken during the transposition process, decisions that each member state takes in its own right. This is called discretionary freedom or space.

For a better understanding one needs to look in a more detailed way at the process that directives go through before they are being implemented and applied. Based on a literature review addressing the impact of EU directives and on developing the logical chains and exposure matrices in this project, we discern between four policy stages that directives go through:

- (1) Development of the EU directive: the process whereby EU law is developed through negotiations among member states, the European Commission, the Council and the Parliament.

- (2) Transposition: the process whereby European directives are incorporated into national law in order to make their objectives, requirements and deadlines directly applicable in the EU member states.
- (3) Implementation: the process whereby EU law is applied at national and subnational levels by means of existing and/or new policies.
- (4) Enforcement: the process whereby full compliance with EU law is monitored and secured, and non-compliance is systematically sanctioned by national and supranational courts. (Based on: Allio & Fandel 2006, p. 10-11)

In each of these four policy stages specific government and governance decisions play a role and can lead to unexpected territorial impact (as will be further elaborated upon in chapter 6).

A number of conclusions can be drawn:

- Coordination mechanisms, horizontal and vertical, during development, transposing and implementation stages can be instrumental in avoiding negative impact of directives. In member states where mechanisms are in place to proactively organize inter-sectoral, multi-level and stakeholder consultation directives generally cause less unwanted and unexpected territorial impact.
- Roughly two models are applied when transposing directives into national legislation: 1) issuing new legislation in an isolated way or 2) integrating it into existing legislation. In particular the latter model contains risks in a sense that directive obligations and logic do not always match those of the domestic legislation. In case of the first approach the problem may be that the implementation and application (actual use) stages require additional effort.
- In decentralised member states, i.e. federalised or regionalised, such as Belgium, Germany, Austria, Spain and Italy, the involvement of sub-national authorities in the transposition of directive is significantly larger than in more centralised member states. This adds a further layer of complexity to the governance factor of directives and the outcomes of transposition processes may be even more diverse, both in terms of time keeping, quality and contents.
- Although records are being kept by the European Commission regarding the performance of member states in terms of the timely transposition of directives and of its quality, it is not possible to generalise for member states as the performance differs from policy sector to policy sector. Hence, the transposition records of the European Commission cannot be regarded a reliable, general, indicator for the governance performance of member states.
- A crucial decision in the context of explaining territorial impact is being taken during the implementation phase where it is decided which measures and instruments will be used in order to reach the directive's objectives. It is often in this stage that vast differences can be observed across member states, due to differences in interpretation and subsequently application in the domestic context.
- Some member states apply EU directive thresholds in a more strict way, whereas others provide for more flexibility and balance thresholds with various

interests and compensation measures. In the case of the first the impact is more directly felt and leads to risk avoiding behaviour by public stakeholders when developing new plans, projects and programmes. In case of the second model the planning and decision making processes are less influenced, but new plans and projects can be questioned during later stages.

- Legal systems do have strong influence on the use of a directive and its impact. Countries with an accessible system tend to experience higher territorial impact of EU directives than others.
- The role of NGO's in the implementation and enforcement (and sometimes transposition) adds to the further differentiation of impacts caused by EU directives.
- In terms of resources and capacity a wide variety can be observed between member states in terms of investing in the implementation and enforcement of transposed directives. As a consequence a wide variety can be observed as regards the impact of directives.

#### **2.7.4 Developing a separate governance filter?**

As has become clear from the limited list above, the governance aspect of EU directives cannot straightforwardly be translated into indicators or into a model, if at all (see below). Not only are there many governance indicators that need to be taken into account, also are individual governance indicators internally inconsistent. Whereas in one country the appearance of sub-national authorities lead to further complexity in terms of implementation and enforcement, this can be the opposite in other countries.

Nevertheless it has been considered to integrate the factor governance in an integral way in the ARTS methodology. In such a case there are two options: 1) integrate governance in the exposure and regional sensitivity matrices, or 2) developing a separate 'governance filter' as a final step of the model.

From the perspective of understanding governance as a mitigating or amplifying factor, the second option would be preferable as this would offer the highest level of transparency and allow for distinguishing between territorial impact proper and impact related to governance. Also from a perspective of durability this option would be preferable since governance aspects generally tend to change more often and quickly than territorial characteristics.

For reasons explained above and in chapter 6 a governance filter has not been developed. Nor would we advise to develop such a filter. Although a number of governance factors have been identified that could be translated into indicators, there seems to be scope for extending the current list of factors as research in this field is still relatively young and, moreover, the identified indicators so far are not straightforward themselves. An additional reason to refrain (at least for the moment) from constructing a governance filter would be the availability of data, or better, the lack thereof.

### 2.7.5 Governance as part of the ARTS methodology

At a more modest level the ARTS methodology does include a number of governance elements. It does so in two ways: firstly, by explicitly referring to a number of governance issues in the impact fields, secondly, by offering the possibility to distinguish for each directive in several branches.

As regards the impact fields governance refers to the following:

- (a) efficiency of government/governance mechanisms (efficiency/effectiveness of public administration)
- (b) duration or complexity of planning procedures (introduction of new administrative tasks/mechanisms/units/structure)
- (c) participation rate
- (d) Societal transfer (e.g. tax added)
- (e) transnational cooperation between member states

In contrast to the type of governance elements that amplify or mitigate the impact of a directive, i.e. that are related to domestic institutions, the governance elements that are listed above and are part of the methodology are directly related to the contents of directives themselves. This concerns for example the obligation in the Air Quality Directive and Directive on energy performance of buildings to develop national plans. Such measures have a direct impact in countries and regions by increasing administrative tasks and adding complexity to the domestic territorial governance system. A similar type of impact is for example caused by the Water Framework Directive which demands better ecological and chemical water quality across Europe and requires water management plans at the level of river catchment areas. The first translates into a number of measures and will require administrations to raise additional tax (societal transfer). The second requires cross border co-operation in the case that rivers cross national borders. These governance elements are unavoidable effects of the directive itself, regardless of the governance context within a region or country.

Although five governance factors have been factored into the model, the possibilities to confront them with the territorial sensitivity matrix and differentiate their impact to regional characteristics are rather limited. The impact field 'cross-border co-operation' can be operationalized in a meaningful way. Other impact fields such as complexity of planning process a societal transfer are relatively difficult to operationalize as they are not stable over time. In so doing the exposure fields relating to governance primarily have a signalling function. They indicate to policy makers that the implementation of the directive will impact upon the current domestic governance system. To what extent this will occur cannot be made clear. It nevertheless enables policy makers to take the effect into account in the wider process of assessing the desirability of the directive in it's, at that moment, unfinished form.

A more radical way in which the ARTS methodology enables policy makers to incorporate specific governance elements, concerns the possibility to distinguish between several branches for a directive. This directly refers to one of the most important governance factors as identified above and concerns the selected policy instruments and measures to implement the directive. By being able to process various instrumental alternatives the ARTS model is able to show in a very transparent way the extent to which the impact of a directive will vary depending on the chosen instruments. In so doing the ARTS is able to assist policy makers in selecting the most appropriate way of implementation, by showing directly the possible effects of their decisions.

### 3 Options for policy development

#### Implementation of the TIA procedure in the IA of the Commission

The impact assessment (IA) procedure on the Commission level was introduced in 2002 and further developed by means of a gradual process that allowed Commission officials and organization to grow with it. The basic idea of the IA procedure is that ex ante impact evaluation, parallel to the policy making process, will improve the original ideas and result in robust, effective, efficient and widely supported policies.

An IA usually takes about a year to one and a half year and is intended as a bottom-up process. In principle each and every stakeholder is invited to be part of the IA process.

IA procedures always make use of existing knowledge and never develop data themselves. In terms of addressing territorial impact this may have consequences as (apart from ESPON) there is little territorial data available.

Therefore, the Commission's Impact Assessment practice qualifies as one of the best opportunities to get TIA implemented at the EU level (Zonneveld & Waterhout 2009). The TIA as developed in ESPON ARTS could serve as a first pre-check on the expert level of the Commission and add the territorial dimension to the IA procedure combining a standardised indicator-based tool developed in Excel with a means to systematically collect expert knowledge in a workshop setting. It enables to identify those regions with would benefit intensely and those regions with likely high negative impacts. The result of TIA could feed in into the further stakeholder driven process of the Commission's Impact Assessment.

The TIA quick check within ESPON ARTS can be used for a first ex-ante analysis of policy proposals in two ways:

- Analysing the full range of potential impacts at a general level the **standard TIA quick check** helps to identify the relevant thematic that are effected by a policy

proposal. Based on common indicators for European NUTS 2 regions it allows to select the regions with a potentially high positive or negative impact. This information helps to set a focus and further and more detailed impact analysis.

- The **advanced TIA quick check** allows users to define special indicators describing the exposure to policy proposals and to combine these with indicators describing regional sensitivity. As the tool provides the technical framework, but the indicators are defined individually, the advanced TIA quick check can serve for a more detailed analysis of a specific potential impact of policy proposals.

The result of TIA quick check could feed in into the further stakeholder driven process of the Commission's Impact Assessment.

### **Taking the EU neighbourhood on board**

The analysis concentrates on the direct and indirect effects within in a region of the EU27 where the directive is directly implemented. However, each directive will also produce spill over effects towards the neighbouring countries. These effects are not covered by the TIA procedure up to now. Analysing the impacts of EU legislation on the EU neighbourhood could be a new part of the EU neighbourhood policy in order to support the neighbouring to be better prepared.

## **4 Issues for further analytical work and research**

The results reached in this project confirm that:

- a quali-quantitative methodology is absolutely necessary when dealing with all European regions, a wide array of impact dimensions and a widely diversified policy field;
- it is possible to devise and design a simple methodology even in a complex and wide field like the one at stake. The present methodology may fit any Directive or EU policy and provides a first but consistent and complete list of potential impact fields;
- the operational application to 12 different and diversified Directives confirms this flexibility of the tool;
- the methodology proposed builds on the previous experience of Tequila 1 and Tequila 2 TIA models provided to the ESPON Programme, simplifying their logics and operations where possible and enlarging the scope of the assessment well beyond the previous attempts.

Nevertheless, the results of the TIA on the selected Directives show clearly what kind of additional analytical work is still needed:

## **Additional indicators**

The analysis of the impact of the directives should cover all relevant fields of territorial development: covering natural environment, regional economy as well as society and people. 41 indicators were defined in order to cover that wide range. However, only 35 indicators values were found allowing to picture sensitivity of regions in a quantitative way. Missing information concerned mostly governance indicators (efficiency of government/governance mechanisms, duration or complexity of planning procedures, participation rate and societal transfers).

Additional indicators would be needed in order to provide the full range of possible impacts of directives.

## **Additional and more specified types of regions**

When setting up the conceptual model for the selected directives, it became clear that their territorial effects would be very different and particularly strong in very special types of regions (e.g. regions with chemical plants, intense agriculture, specific infrastructure etc.) The existing regional typologies, defined on existing statistical information, do not cover the types that would be necessary in some cases. So it would be very useful to extend the list of pre-selected types of regions of the regional exposure matrix. Only if it were possible to provide a suitable type of region for the analysis, the running of a TIA procedure in the format of an interactive workshop would be possible.

As it will be expensive and probably limitless to build a comprehensive data base on fine regional typologies, in the application of the present methodology to new Directives a direct attention should be paid to:

- availability of regionalised data on explicit target issues,
- openness to collect the new required data by statistical offices and Eurostat in particular,
- cooperation of the offices and officials of DG Regio in the supply of these punctual information (that, in most cases, do in fact exist for policy decisions and management);
- need for sufficient time in order to collect the required information.

Of course, these requirements should not be considered as limitations of the methodology: they refer to a necessary but feasible precondition for any assessment procedure (even more qualitative in nature than the one proposed here).

## **A better definition of regional exposure.**

In this project, regional exposure was treated in a Yes/No, dychotomic way. A relevant improvement could be achieved allowing the definition of different intensities of exposure, taking into consideration the size and relevance of the targeted fields,

the strength and the binding nature of the directive for specific regional typologies, the intensity of potential indirect counter-effects. This intensity would be revealed by a coefficient ranging from 0 to 1.

### **Indicators at NUTS 3 level**

Due to availability of necessary indicators, the TIA was carried out at NUTS2 level. NUTS 2 is quite a large scale for the distinction of effects of some directives e.g. when directives aim at urban areas etc. Therefore, a relevant priority in the research field would be to build statistical information on the list of indicators as well as on regional typologies at NUTS 3 level, in order to get more precise and meaningful results. It is worth recalling that the previous experiments with the Tequila models were run at NUTS 3 level.

### **A better solution for describing cumulative effects easy and reliable**

At the moment the TIA delivers usable results for each impact field. For policy makers it would be interesting to get also an overview about “cumulative” impacts of a directive on each region, considering together all impacts on the different fields. At the moment, in this project the simplest solution was chosen: counting all fields in which the impact on the region was considered “high”. This led to very simple, credible but first approximation results.

Additional research would be interesting on how to picture this “cumulative” effects better. One approach would be computing a weighted multi-criteria impact index, in the same way as it was done in the ESPON Tequila Models. This solution implies the definition of a shared system of weights for the single impacts (through experts judgement, policy maker’s priorities, etc.) and of some thresholds beyond which compensation among impacts is excluded (the FLAG methodology in the Tequila 2 model). Another option would be a cluster analysis. Then a system of weights would not be needed, but a cluster analysis cannot be standardised for applying it directly during an interactive workshop.

### **Depicting spillover effects**

The analysis focuses and depicts the impact of the EU legislation within single region. Additionally also spillover effects and cross border effects could be analysed.

### **Alternative approach for the TIA analysis on governance issues**

Instead of trying to model governance in order to predict where problems might occur, a different approach is to help stakeholders identifying potential issues in the process of developing, transposing, implementing and using the directive. This could be done by developing a guidance and check-list which provides general and stage

specific guidance. Such a check-list should inform policy makers about how to act in specific situations and what the possible options and their likely effects are. A general guidance, applying to all possible directives, could act as a framework and tool for policy makers.

Going one step further the challenge becomes to adapt the general guidance in such a way that it becomes attuned to a specific directive. Here the ARTS model comes back in. With the outcomes of the ARTS model and the elaborations by means of the logical chains and reports the guidance could become further specified in a qualitative way by taking account of specific territorial characteristics of the directive under consideration.



# C Scientific report

## 1 Introduction

The necessity of an in-depth assessment of the territorial and regional effects of EU sectoral policies and directives had already entered the European policy debate during the preparation of the European Spatial Development Perspective (1995-1999). Given the inherently multi-dimensional nature of the possible, intentional and unintentional effects of the Union's policies, often going well beyond the single goals for which policies were built, the need for an integrated assessment came into full view. Furthermore, it was realized in that time that any integrated assessment should address multiple dimensions – the economic, the social, the environmental, the cultural – all of which represent distinct but interconnected aspects of what was increasingly considered as the 'territorial realm'.

Following up on this discussion, the Tampere Action Plan (1999), in which the construction of a Territorial Impact Assessment (TIA) methodology was taken on as a main task for the subsequent action of the Committee for Spatial Development, the mission of this methodological and operational work was assigned to the newly born ESPON 2006 programme.

In time, this mission became even more central in the EU policy debate. *The Third Report on Economic and Social Cohesion “A New Partnership for Cohesion”* (February 2004) introduced the general goal of “territorial cohesion”, afterwards confirmed and institutionally strengthened through its inclusion among the main new goals of the Union in the Draft Constitution and the New Treaty. More recently, the *Territorial Agenda* of the Union (May 2007) and the First Action Programme (November 2007), as well as the *Green Paper on Territorial Cohesion* (October 2008), focussed explicitly on the issue of regional diversity, and emphasized the relevance of territorial and regional “uniqueness” for devising appropriate and diversified development strategies. These must be based on local specificities, knowledge and identity.

This last point is particularly relevant for the impact assessment debate: regional diversities imply in fact a different sensitivity to EU LPDs, justifying the increasing attention paid to this precise issue.

Very recently, the Commission itself produced a thorough and consistent document, taking a further step in the development and refinement of a growing tradition of impact studies of EU policies and directives (since 2002): the *Impact Assessment Guidelines* (January 2009) (SEC(2009)92). The general objectives of these guidelines are similar to the ones indicated by ESPON, namely:

- “to ensure that Commission initiatives and EU legislation are prepared on the basis of transparent, comprehensive and balanced evidence”,
- to prepare “evidence for political decision makers on the advantages and disadvantages of possible policy options by assessing their potential impacts” through ..... “the likely economic, social and environmental impacts of those options” (p. 4), both “intentional”, i.e. referring to the very objectives of the policies, and “unintended” (p. 31);
- to improve “the quality of policy proposals by providing transparency on the benefits and costs of different policy alternatives” (p. 6).

The impact assessment in this case refers to the Union in aggregate terms, but a reference is explicitly made to the case in which impacts would “*have a specific impact on certain regions*” or “*on single Member States*” (p. 33). The IA procedure is applied to all policy proposals of the Commission, which means that each year some 100+ Impact Assessments are completed.

In line with the goals of the EU *Impact Assessment Guidelines* ESPON ARTS aims to develop a tool allowing for analysis of the impact of EU legislation against the background of the different sensitivity of regions.

It is important to distinguish the EU legislation: First of all there is a difference between *legislation* and *policies*: in the latter case, support and spending are the key elements, while in the former case decisions take the form of legislative prescriptions. Within legislation, one can further distinguish between *regulations* and *directives*:

- The legislation refers to precise obligations that have to be implemented immediately and in the same way throughout Europe, generally bearing a limited differential territorial impact,
- The directives – represent a form of binding EU legislation aimed at Member States who are called upon to adopt consequent national legislation <sup>18</sup>.

The analysis of regional sensitivity to EU directives and policies is to be intended as a simplified, evidence-based procedure of Territorial Impact Assessment (TIA). TIA is defined as “a tool for assessing the impact of spatial development against spatial policy objectives or prospects for an area”, working at “any spatial scale” and therefore applicable to large projects, plans and programmes (Williams et al., 2000, ECTP/CSD 2001, Böhme & Eser, 2008).

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<sup>18</sup> Because directives have to be transposed into national legislation they receive an additional dimension, which may result in different impacts across Member States. This means that their final impacts are both predictable and unpredictable. Predictable in the sense that specified results, processes and products have to be delivered following directly from the directive. Unpredictable in the sense that several impacts relate to the transposition of a directive into national legislation and depend on national institutional contexts (see: Zonneveld, Waterhout, 2009).

As far as the impact assessment of EC policies is concerned, since many years the Commission has requested impact studies (CEC, 2002, 2004) on multiple directives, regulations and policy decisions. Generally these studies refer to an aggregate impact on the EU and no regional differentiation of effects is pursued; the different impacts are defined on the basis of accurate logical chains (from policy to impacts).

The ESPON methodology, as developed mainly in the TIPTAP project, was the first approach to implement a methodology for TIA allowing the description of regional differences. The TIPTAP project, is based on a well-established methodology, namely Multi Criteria Decision Analysis <sup>19</sup>.

ESPON ARTS took this experiences on board and developed a methodological approach in line with the vulnerability concept according to the ICCP definition. A quantitative tool was developed to quickly gauge the potential impact of EU legislation, policies and directives on regions (hereafter referred to as simply “policy proposals”). The main goal was to elaborate a general common framework and a methodology in which assessments concerning particular policy proposals could fit.

## 2 Territorial Impact Assessment: the general approach

### 2.1 Main objectives of the research project

The main objectives of the ESPON ARTS project are the following:

- (a) presenting a **new and fresh reflection on methodologies** for assessing territorial and regional sensitivity of EU legislation, policies and directives (LPD), on the basis of an accurate and critical evaluation of recent most advanced practices in Member Countries and present achievements inside the ESPON Program;
- (b) building a **general common framework** in which assessments concerning single different LPDs could fit;
- (c) applying the proposed framework to around **12 EU directives**, chosen in a wider array of recent ones and approved by the ESPON MC and CU;
- (d) building a more **in depth assessment of 3 directives**, those in which a more thorough specification of specific territorial impacts will be apparent, specifying the results through tables and maps for European NUTS-2 and possibly NUTS-3 regions;

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<sup>19</sup> A review of various types of multicriteria evaluation methods can be found among others in Rietveld, 1980; Nijkamp P., Rietveld P., Voogd H., 1990; Munda, 1995; Janssen and Munda, 1999.

- (e) supplying policy makers with an **operational procedure** that could work as a “**evidence based policy support**” in the preparation of new legislation and directives;

The operational procedure should be as easy and simple as possible, indicating cases of excessive regional impact of LPD on some typology of regions or even cases of “outlier”, disproportionate impact.

The EU stakeholders (the Commission, national, regional and local authorities) and the ESPON MC will be involved in a dialogue concerning both the methodology and the main results, in order to reach a wider consensus and to strengthen the validity of results.

## 2.2 Concept and definitions

In the Terms of Reference (ToR) for this project call, territorial and regional **sensitivity** to EU legislation is defined as “*the degree to which a territory (region) is directly and indirectly affected, either adversely or beneficially, by change in European legislation or policy*”. It refers therefore to the probability (or risk) of being affected by EU directives, “*an important variable in Territorial Impact Analysis*” (p. 172); to the “*possible*” or “*potential*” impact of these directives.

This definition seems appropriate, and comes close to the “Potential Impact” (PIM) defined in the ESPON 2013/1/6 project. The PIM is directly and objectively linked to the main logical chain between cause (policy measure) and effect (territorial impact), without (or before) the inclusion of the Desirability and Vulnerability elements that appear more linked to subjective judgements (see the Final Report, October 2009).

### The vulnerability concept

The terminology in the ToR in ESPON ARTS is rooted to the vulnerability concept developed by the IPCC<sup>20</sup> and broadly discussed in the impact assessments in natural sciences, especially concerning climate change. This approach allows to assess the impact of a policy by combining the exposure deriving from the effect of a policy measure and the territorial sensitivity (of regions).

However, the definitions between the ToR and the IPCC approach differ. In ESPON ARTS we will stick to the IPCC definitions in order to be able to communicate the TIA concept with this scientific community.

The concept of vulnerability consists of four core elements: exposure, sensitivity, territorial impact and adaptive capacity:

- “**exposure**” describes the intensity by which EU directives and policies potentially affect European territory through a double logical chain. On the one

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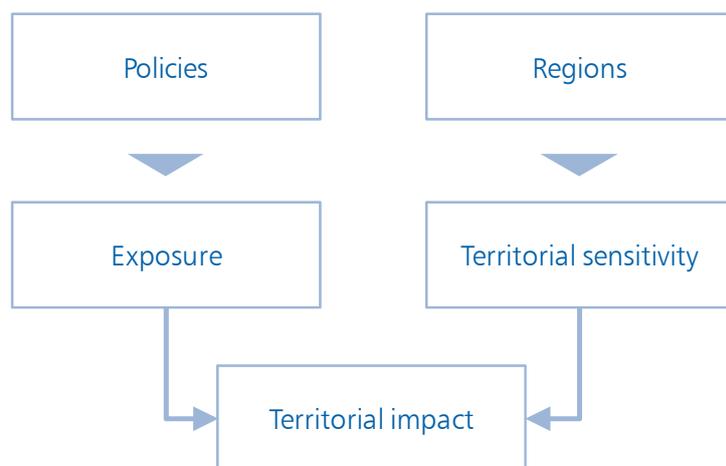
<sup>20</sup> Intergovernmental Panel on Climate Change

hand single directives and policies may affect specific *classes of regions* (“**regional exposure**”), without reference to the specificity of *each* region; on the other hand they may affect particular “fields” of the territorial realm, e.g. surface water quality, emissions, sectoral production (“**field exposure**”);

- (territorial) “**sensitivity**” describes how *single* territories/regions are subject and evaluate impacts in specific exposure fields, due to their socio-economic and geographical characteristics and to the social values and priorities they are likely to show;
- “**territorial impact**” is the final, likely effect of a given EU policy or directive as a product of exposure and regional sensitivity. The impact can be direct or indirect along specific cause-and-effect logical chains.
- The “**adaptive capacity**” is the ability of a system to adjust to the likely territorial impact, to moderate potential damages, to take advantage of opportunities, or to cope with the consequences (IPCC, 2007). Thus, adaptive capacity is closely linked with governance aspects. It can also be negative, such as rigid systems.

ESPON ARTS focuses on analysing the impact. In contrast to the IPCC-vulnerability concept it does not consider the (possible) adaptive capacity of a territory. However, as we also discuss governance issues in the projects, aspects of the adaptive capacity of territories are taken into account in a qualitative way.

**Figure C 1: The territorial impact combining exposure with sensitivity**



Looking at the effects to be analysed on the exposure-side in ESPON ARTS three distinct elements/processes are taken into account:

- a direct and intentional impact of EU directives**, which is proportional to the presence of the territorial assets involved in sectoral EU LPDs.
- an indirect and mainly unintentional or unexpected impact of the directives**, concerning positive or negative side effects.
- the **response and adaptation capability** of the regional context: the “filtered” impact. This element would in fact: reduce the effect of potentially negative impacts; emphasize/multiply the effect of potentially positive impacts.

The relevance of the last process is linked to main characteristics of the regional context:

- (I) the *complexity and differentiation* of the socio-economic context,
- (II) the *redundancy* of potential internal and external linkages,
- (III) the local *governance structure*. In fact, “*domestic territorial characteristics and governance systems act as a filter and interface*” between EU directives and territorial actual impacts (Zonneveld, Waterhout, 2009). General results of the same EU intervention are likely to be highly differentiated among regions and territories according to territorial specificities and, particularly, of national/regional/local governance systems. Therefore we speak here about “filtered” impacts. In this case, both a theoretical and an empirical analysis will be carried out through case studies.

All the preceding tasks were carried out on a sample of 12 directives. From these, 3 cases were selected in a second time for more in-depth analysis.

## 3 The analytical approach

### 3.1 The selection process of the directives to be analysed

The relevance filter was developed as a tool to screen policies in order to attain a selection of 12 territorial relevant directives. This filter contains 3 steps:

#### (a) Eur-Lex Filter

The website of Eur-Lex ([http://eur-lex.europa.eu/RECH\\_menu.do](http://eur-lex.europa.eu/RECH_menu.do)) contains all legal documents of the EU. A refinement of the search enquiry is the first filtering step towards the relevant directives:

- Excluding the words ‘amending’, ‘adapting’, ‘correcting’ from the **search terms**. Once the relevant directives are identified, it has to be checked, if there are any important amendments to these specific documents. (Search for: ‘directive’; exclude: ‘amending’, ‘adapting’, ‘correcting’)
- Reducing the **time frame**: the coming into effect of the Treaty of Maastricht ’93 is the starting point of the time frame (1993.01 – 2010.12)
- Singling out directives as the relevant **document type**, also found under the headline **legislation** (directives). At this step one should **restrict the search to acts in force**
- Using **classification headings** to search within topics (i.e. agriculture, environment...) that were assigned to specific partners. All together there are 20 categories.

## (b) Title check

After the Eur-Lex filter, the number of directives decreases significantly. The next steps comprise reading through the titles of the directives and sort out those which

- do not cover the entire EU (directives targeting single states)
- have self evidently no territorial impact (i.e. statistics, marketing measures,...)
- Filter out substantively overlapping directives (e.g. choose only one on water, air, noise, safety, etc) best done by choosing the most recent one.

## (c) Text check

This last step involves reading through the directives and assess if it has a potential effect on the territorial based economy of a region, the society and population as well as on the built and natural environment. It also includes rating these potential impacts into no-, low-, high- or unknown relevance. This rating of hypothetical intensity or importance of impact is based on expert judgment.

This quick scan is documented in an excel-sheet, which is decisive for the selection of 5 – 8 directives per partner.

**Table C 1: Relevance filter process**

Number of directives	Result of Eur-Lex filter	Result of title check	Result of text check – selection for potential analysis
4396 directives	1393 directives	149 directives	28 directives

The implementation of the relevance filter led to 28 directives to be considered for further analysis. Following a discussion with the CU an ensemble of 12 directives were chosen<sup>21</sup> and analysed in terms of their effect on regional exposure:

- (1) Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances
- (2) Council Directive 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air
- (3) Council Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy
- (4) Council Directive 2002/49/EC of the European Parliament and of the Council relating to the assessment and management of environmental noise

<sup>21</sup> After consultation with the ESPON MC the Directive on the control of major-accident hazards was included due to its highly differentiated territorial impact. It was exchanged with the Directive on the promotion of electricity produced from renewable energy sources in the internal electricity market. Since this directive focuses on the promotion of renewable energy, it is assumed to be similar in their regional territorial impact to the directives on the promotion of clean and energy-efficient road transport vehicles and on the promotion of the use of biofuels or other renewable fuels for transport.

- (5) Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport
- (6) Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage
- (7) Council Directive 2004/52 on the interoperability of electronic road toll systems in the Community
- (8) Council Directive 2005/36/EC on the recognition of professional qualifications
- (9) Council Directive 2008/114 on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection
- (10) Council Directive 2009/128/EC on the establishing a framework for Community action to achieve the sustainable use of pesticides
- (11) Council Directives on the promotion of clean and energy-efficient road transport vehicles
- (12) Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings

The examination of two directives (no 6: directive on the on environmental liability and no 7: directive on the interoperability of electronic road toll systems) showed that no regional differentiation was possible. For these two directive the conceptual model about their intervention logics was set up and the directive exposure matrix was completed, but no further regional differentiated analysis was conducted.

### **3.2 The conceptual model of a directive**

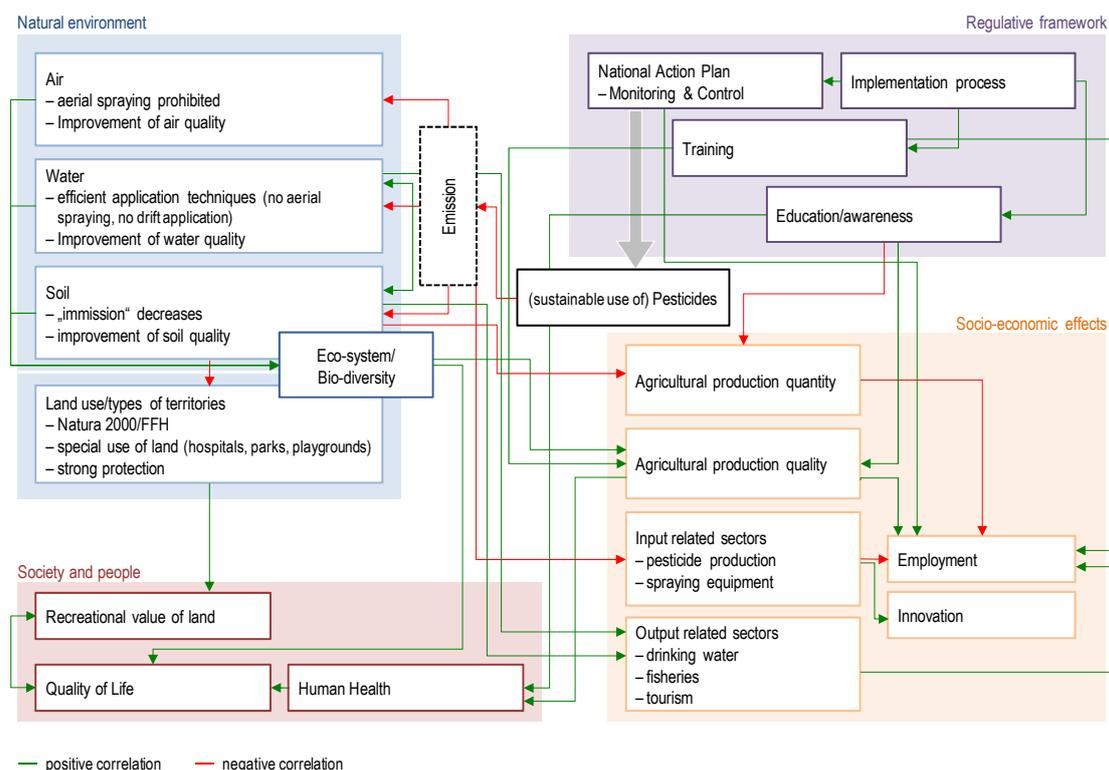
As a first step it is necessary to translate the text of a directive into cause/effect relations describing the “intervention logic” of a directive. These relationships are depicted as flowcharts showing the links between the regulation laid down in the directive, its specific targets and the different fields in which it will potentially show direct or indirect effects (“field exposure” in this project’s definition).

This conceptual model comprises the establishment of relations between all relevant model components and the drawing of systemic borders. The elements of the model are to be selected carefully so that they show a direct relation to the system reality (in our case the causes and effects of EU directives on territorial impacts) and therefore allow for traceability for the user of the model, taking also into account the data availability. It enables to picture cause/effect relations as well as positive and negative feed-back loops of a directive on the development of regions. In the case of EU Directives, model modules were identified as ‘Natural environment’, ‘Regional economy’, ‘Society and people’ and ‘Regulative framework’. Each contains several components that were identified as part of the system; these components later

become the impact dimensions of TIA (“impact fields”). Links between the components were drawn, indicating indirect or direct negative and positive relations.

The following figure shows an example of such a conceptual model for the Directive establishing a framework for Community action to achieve the sustainable use of pesticides.

**Figure C 2: Conceptual model of the directive 2009/128/EC Directive on the sustainable use of pesticides**



### 3.3 The statistical and assessment tools

One of the goals of the project is to build a “KIS” operational methodology (as simple, comprehensible and user-friendly as possible) in order to define in quali/quantitative and comparative terms the sensitivity of European regions to EU directives. As all European regions have to be inspected and many directives considered, it is necessary to use a statistical and quantitative methodology, as it was done in previous ESPON exercises on Territorial Impact Assessment, namely in the Tequila Models.

Three definitions represent the conceptual pillars on which the quantitative methodology is built: exposure, sensitivity and territorial impact.

The starting point is given by three sets of elements.

- (a) a common set of  $n$  exposure fields  $f$ , the same for all directives, where  $f = 1 \dots f \dots n$

- (b) a common set of m regions r (at NUTS 2 level in this project)  
where  $r = 1 \dots r \dots m$
- (c) a common set of 12 EU Directives d,  
where  $d = 1-12$  (as agreed with the ESPON CU).

Given the fact that three dimensions are involved – exposure fields, regions and directives – the problem at hand looks statistically complex and has to be simplified without missing relevant information or trivializing the entire procedure <sup>22</sup>.

The methodology resides in the construction and combination (multiplication) of **three indicators, organised respectively in three matrices**, which represent the three logical steps of the methodology itself (Figure C3):

- A – the Directive/Exposure Matrix**, indicating the intensity of exposure of each field to each single directive,
- B – the Regional Exposure Matrix**, indicating the intensity of exposure of each region to each single directive,
- C – the Regional Sensitivity Matrix**, indicating the intensity by which each region is sensitive to impacts in each specific exposure field.

### 3.3.1 The Directive/Exposure Matrix

**The Directive/Exposure Matrix** – with two dimensions: n fields on rows and 12 directives on columns – presents the evaluation of the intensity by which each Directive acts on the different Exposure Fields. As said before, exposure fields relate to different dimensions of environment, economy, society and territory.

The list of exposure fields as seen below is the result of comprehensive literature research covering impact assessment methodologies and the expert knowledge in the TPG. The selection and attribution to the three dimensions was finalized after a feedback loop to ESPON CU.

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<sup>22</sup> For each directive, n Territorial Impacts on m regions have to be indicated and computed, namely  $41 \times 287 = 11,767$ . Multiplied by 12 directives this gives 141,204 potential territorial impacts. Of course, many impacts are nil, as some fields might not be touched by some directives or some regions might not be exposed to some directives. The TIMs may be organized logically into the Directives/Impact Cube (see Fig. C4).

**Table C 2: List of exposure fields**

Natural environment				
Soil	Water	Air	Climatic factors	Fauna/Flora/Habitat
erosion	water consumption	pollutants in air	emissions of CO <sub>2</sub>	biodiversity
pollutants in soil	pollutants in ground/surface water		heavy rain/flood hazard/occurrence of landslides	conservation of natural heritage (landscape diversity)
share of artificial areas/soil sealing				conservation of cultural heritage
Regional economy				
Economic development	Agriculture	Industry	Services	Tourism
economic growth	employment in primary sector	employment in secondary sector	employment in tertiary sector	overnight stays
innovation	% of arable area, permanent grass/-crop area			
entrepreneurship				
market barriers				
Society and people				
Social disparities	Demography	Accessibility	Built environment	Governance
disposable income in PPS per capita	out-migration/brain drain/"shrinking" regions	daily accessibility by air	increase of urbanization relative to population growth	efficiency of government/governance mechanisms
equal income distribution	number of people exposed to noise	daily accessibility by waterways	mixed land use	duration or complexity of planning procedures
employment rate	accident rate in transport	daily accessibility by road		participation rate
	accident risk: industry/energy supply	daily accessibility by rail		societal transfers (e.g. tax added)
	healthy life expectancy at birth	renewable energy		transnational cooperation between member states
		fossil fuel consumption		

Intensity of exposure of these fields to directives is assessed by experts judgement, thorough the careful identification of the logical chains from EU decisions to territorial impact. The regional dimension is absent here.

The generic value of the indicator of intensity of exposure in each cell of the matrix is:

$$dEXP_f \text{ (intensity of exposure of field } f \text{ to directive } d)$$

The experts choose between strong or weak advantageous resp. disadvantageous effect on territorial welfare, no effect as well as unknown effect. These classes are then converted into numerical terms. In this project, the Exposure values are indicated by positive and negative scores, as follows:

1.5 = high positive exposure intensity

1 = low positive exposure intensity

- 0 = no exposure
- 1 = low negative exposure intensity
- 1.5 = high negative exposure intensity
- ? = unknown exposure

The sign of impact scores is assigned looking at the likely direction of field indicators when exposed to a directive. In the Directive/Exposure Matrix, on each row indicating the different exposure fields, it is clearly indicated whether an increase in the indicator has to be considered a benefit or a cost<sup>23</sup>.

A case that often presents itself – given the complexity of the single directives, the multiplicity of policy indications eventually encompassed, the multiplicity of the logical chains that each directive generates, from decision to impact – is the impossibility of treating in a single vector of the Directive/Exposure Matrix the potential effects of a Directive on the different exposure fields. In this case is necessary to devise a “*branching*” of the effects of the directive into two or more logical chains, and consequently impacts. In Fact, the effects of the directive on a single exposure field (e.g. air quality) could be different in the different branches of the logical chain, and impact differently on different classes of regions: for example, a directive supporting the production of electric engines for cars will improve the air quality in regions where the new cars will be adopted, but worsen air quality in regions where the new cars will be produced, due to increases in emissions from plants and transport involved.

In this case, the directive splitting in two branches is treated as two separate directives (Directive Xa and Xb) in both the Directive/Exposure Matrix and the following one, the Regional Exposure Matrix. Of course, at the end of the elaboration process, the results of the two branches are summed up term by term in a single Territorial Impact Matrix.

### 3.3.2 The Regional Exposure Matrix

**The Regional Exposure Matrix** – with two dimensions: m regions on rows and 12 directives on column – encompasses the exposure of single regions to each directive, i.e. the fact that EU directives may or not affect the single regions. In fact, a directive could touch only particular regions – e.g. coastal regions, peripheral regions, regions with presence of particular productions or facilities like nuclear power plants or else – and not being relevant for other regions. As a consequence, only regions directly hit by the directives are considered; indirect and side effects, both expected and generally unexpected, are supposed to take place only inside the regions directly affected and not to spill-over the regional borders. ESPON typologies can be used as a basis for the possible types of regions affected by the directive. However in some cases it might be useful to add more specific types like regions with a high share of employment in a particular sector.

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<sup>23</sup> This is particularly relevant as far as a “cumulative” territorial impact should be calculated, comparing the impacts on different fields.

In this project, this matrix is a dichotomic, NO/YES matrix (0/1). Two possible complexifications of the method could be envisaged, though:

- considering also interregional *spillover effects* (very difficult to model for the entire European territory), and
- considering the *intensity of exposure* in the single regions. This second refinement is more easy to handle, and could be introduced in future projects in case a single Directive is in depth explored in its territorial impacts<sup>24</sup>.

The generic value of the regional exposure matrix in each cell is:

**dREXP<sub>r</sub>** (intensity of regional exposure of region r to directive d).

In this case, the exposure field dimension is absent. The matrix is filled (with 0/1 scores) according to the results of the logical chain inspection on the single directives: regions are classified in different categories, relevant for the single exposure potentials indicated in the logical chain description, according to the ESPON definitions: rural/urban, central/peripheral, coastal/mainland, advanced/lagging, high/low presence of sectors or specific productions considered by some directive, presence of protected natural areas, ....- The indicators and thresholds for considering a region exposed/non-exposed is given in the following section 3.4.

### 3.3.3 The Regional Sensitivity Matrix

**The Regional Sensitivity Matrix** – with two dimensions: m regions on rows and n exposure fields on columns – encompasses the general sensitivity of each region to single exposure fields (an element which was directly taken into consideration in the previous Tequila models), with no reference to any specific directive. This sensitivity depends on socio-economic and geographical characteristics of the single regions, their social values and the political priorities attached to the different policy fields. A region might be particularly sensitive to economic impacts (on GDP or employment levels), given its relative backwardness; another could be particularly sensitive to environmental impacts given the presence of very sensitive natural or mountain areas; a further region could be very sensitive to impacts on congestion given its present high level of traffic density and traffic jams. In this case, the directive dimension is not present.

The Regional Sensitivity matrix is built, for each exposure field, using relevant statistical indicators from a regional data base. In general, on the basis of experts judgement and data availability, a region is hypothesized to be more sensitive to “pressure” indicators in direct proportionality to the present pressure condition (e.g., in the field of emissions, air or water quality), and more sensitive to status conditions in inverse proportionality (e.g. in the field of GDP and employment). Details are given in the relative table in the following section 3.4.

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<sup>24</sup> This refinement could be relevant in the case of directives hitting single sectors, where the intensity of regional exposure could be assumed proportional to the importance of the sector or sectoral *filière*.

The generic value of the regional sensitivity in each cell of the matrix is:

**S<sub>r,f</sub>** (intensity of sensitivity of region r concerning exposure field f).

Each term of the S matrix has the form of a correction coefficient, amplifying or reducing the potential impact of directives on each exposure field in each region (given by the multiplication of the previous two matrices, as it will be explained below). It was decided to allow a correction of  $\pm 25\%$  to potential impact: therefore the coefficients range from 0.75 to 1.25 in the entire array of regions and are proportional to the specific sensitivity indicators chosen for each exposure field.

In further research works, the sensitivity matrix could encompass the effect of the analysis on regional reaction or adjustment capability with respect to the potential effects of EU directives, taking into consideration the internal governance structure and performance in each region. In the present research project this last issue is only tackled in theoretical terms.

### 3.4 The Territorial Impact Matrices

The **Territorial Impact Matrices** are built through empirical investigation and statistical elaborations on:

- the 12 chosen Directives,
- all European regions of EU 27 countries. The other countries of the ESPON space are not considered, due to data availability problems but mostly because their sensitivity to EU Directives that do not engage them directly bears a completely different meaning than for present Member Countries;
- the checklist of 41 Exposure Fields, defined for any directive on the basis of the Commission's suggestions in its *Impact Assessment Guidelines* (January 2009: SEC(2009)92) and other considerations concerning data availability and possibility of impacts definition.

The three matrices previously mentioned and duly elaborated, bring to the definition of the Territorial Impact of the Directives, represented in a series of Impact Matrices, one for each Directive, as shown in Figure C3. The impact of directives is indicated as TIM (Territorial Impact).

The elements of the three matrices presented in the previous section are multiplied by each other, term by term (not in the linear algebra way), and the general term obtained will be:

$$dTIM_{r,f} = dEXP_f \cdot dREXP_r \cdot S_{r,f} \quad (1)$$

indicating the likely impact of directive d on the exposure field f in region r. Given the three dimensions encompassed (d,f,r: directives, impact fields and regions), the results are organised in a series of 12 matrices (one for each directive), each of them indicating likely impact on exposure fields (on columns) in all regions (on rows) for each directive. In a more compact geometrical presentation, the results are

encompassed in a cube with regions, fields and directives on the three axes: the **Directives/Impact Cube** (Figure C4).

The logics of the general model may be split in two parts, concerning the first multiplication and then the second one. The first multiplication refers to the application of the Directives/Exposure matrix to the case of each region, according to the fact that the region is exposed or not to the single directives. The result that could be considered as a sort of “potential impact” (POTIM), is presented in a series of matrices, one for each directive:

$$dPOTIM_{r,f} = dEXP_f \cdot dREXP_r \quad (1a)$$

For each single directive, the POTIM matrix has a dimension  $m \times n$ , with the  $m$  regions on rows and the  $n$  exposure fields on columns. There are 12 matrices of this kind.<sup>25</sup>

In a second step, the potential impact matrices POTIM (one for each directive) are multiplied by the same regional Sensitivity matrix, adding the further information concerning the relevance for the single regions of the single potential impact forecasted. The result is given by:

$$dTIM_{r,f} = dPOTIM_{r,f} \cdot S_{r,f} \quad (1b)$$

The final territorial impact TIM is encompassed in a matrix  $m \times n$  (with regions on rows and impact fields on columns) indicating likely impact of one single directive on the different exposure fields in each region. There are 12 such matrices, one per Directive (see also the previous compound formula under 1).

As a consequence of the scores attributed in the first matrix (-1.5, -1, 0, 1, 1.5) and in the third one (0.75 to 1.25), the final scores emerging in the TIM matrices are continuous scores ranging from -1.875 to +1.875. In maps, impacts are aggregated in three classes (plus the 0 class, indicating no exposure): “high, moderate and minor impact”, the medium class merging cases with a high and low initial Directive/Exposure impact (1 and 1.5).

It is clear from what precedes that the three matrices presented above are simple two-dimensional matrices (with two subscripts of their terms each), while the final result is represented by a series of matrices, one per directive (three subscripts); the mapping of results (TIM of directive X on exposure field Y) implies a map for each column Y of the matrix referring to directive X.

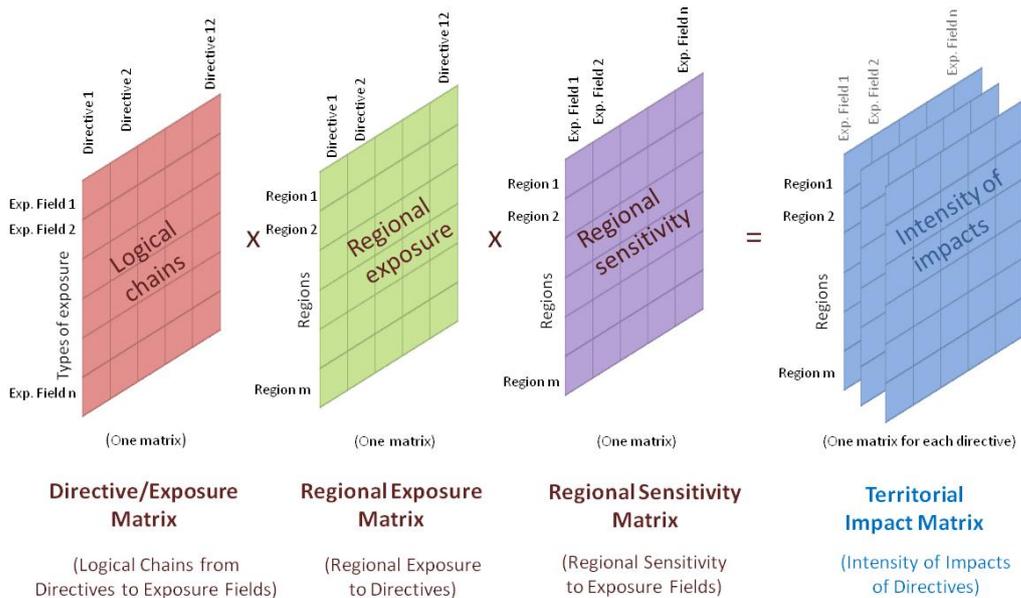
A further elaboration (a further column in a TIM matrix of a directive) concerns the possibility of calculating a “cumulative” impact of a directive on each region, considering together all impacts on the different fields. Two solutions exist in this case:

- the simplest solution: counting all fields in which the impact on the region was considered “high”: is the solution utilised in the present project;

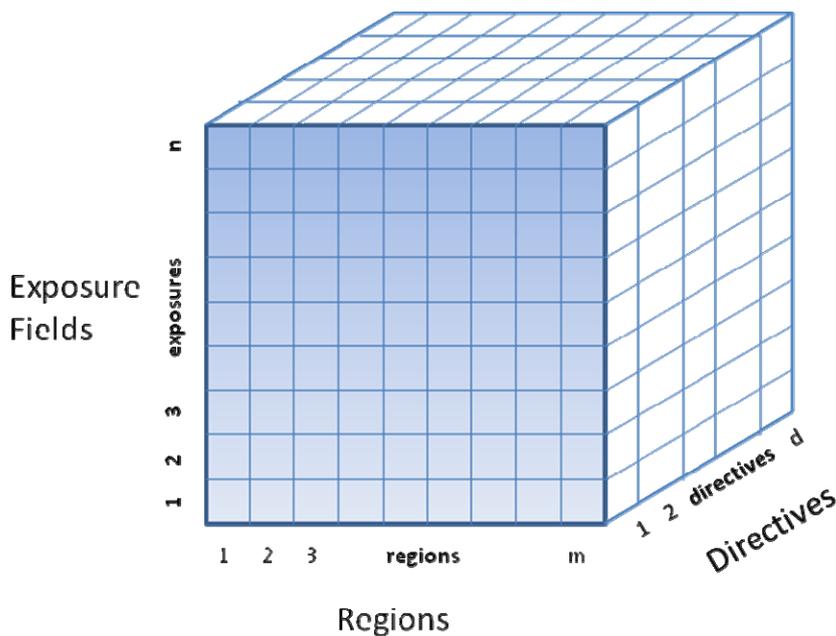
<sup>25</sup> Algebraically, for each single directive, the POTIMP matrix ( $m \times n$ , with regions on rows and exposure fields on columns) is given by the linear multiplication of the column vector ( $m \times 1$ ) of the Regional Exposure Matrix by the row vector ( $1 \times n$ ) of the Directive Exposure Matrix.

- the complex solution: computing a weighted multi-criteria impact index, in the same way as it was done in the ESPON Tequila Models. This solution implies the definition of a shared system of weights for the single impacts (through experts judgement, policy maker's priorities, etc.) and of some thresholds beyond which compensation among impacts is excluded (the FLAG methodology in the Tequila 2 model). This is something left to possible future extensions of the project.

**Figure C 3: Assessment process of territorial impact of a EU Directive**



**Figure C 4: The Directives/Impact Cube**



### 3.5 Aggregation of Impacts

#### Excursus on the aggregation of impacts

When talking about the aggregation of the single impacts per exposure fields up to one value per region – thus arriving at the overall impact of a directive (EU policy) per region, we have to consider the following aspects:

In principle we produce an overall denominator from an analysis with numerous denominators. Still, when talking about aggregation of facts and measures, four major philosophical concepts have to be taken into account (see e.g. Martinez-Alier et al., 1997):

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

It should be noted in this context that incommensurability (i.e. to take into account all the different dimensions of a decision problem without any monetary reductionism) does not imply incomparability. It could be assumed that although there is no common measure based on an ordinal scale of measurement, there could be acceptance of the existence of conflicts between all different consequences of an action.

In principle the problem to be faced when trying to aggregate this heterogeneous information on the regional scale is in brief the problem of oversimplified assumptions in this context. In order to deal with real-world complexity, aggregation – i.e. the simplification of real-world observations – is necessary. Traditional approaches follow the epistemological tradition of the classic economic maximisation premise of individual behaviour, stating that rational decisions coincide with utility maximisation. Consistency is considered an important characteristic of rationality; as a consequence, the preference structure is reduced to preference and the indifference relations, and both relations are considered to be of a complete transitive type. No incomparability relation is allowed (Munda, 1997).

If individual impacts are added up, an optimising approach is adopted which is based upon the assumption that different objectives can be expressed in a common denominator by means of trade-offs (as described above as complete commensurability), so that the loss in one objective can be evaluated against the gain in another. From a theoretical point of view, the optimising principle is elegant

since it provides an unambiguous tool to assess alternative strategies/policies on the basis of their contributions to community welfare. From an operational point of view, the value of the optimising approach is rather limited, because the specification of a community welfare function requires complete information about all possible combinations of actions, about the relative trade-offs between all actions and about all constraints prevailing in the decision-making process. Such information is generally not available in the context of political decision-making, and in any case the validity of the proposed trade-offs is likely to be contested by the stakeholders.

During the last two decades, more support has emerged for the view that welfare is a multidimensional concept; thus the conventional complete commensurability principle can be questioned. The inclusion of complexity and the systemic approach in respect of picturing real-world phenomena in general has already been mentioned. In an operational framework, this means that an exhaustive analysis has to take into consideration efficiency criteria, ethical criteria and ecological criteria; thus a multidimensional approach is needed.

Traditional aggregation approaches assume that aggregation (i.e. the summing up of impacts expressed in the form of criteria) always arrive at a best possible solution, which is described in decision theory as an optimisation problem (see Simon, 1982). The reason why such a clear judgement is possible is to be found in an implicit reduction of complexity of the problem. In a complex and strongly interrelated world such a reduction seems to be rather dangerous – especially if all the effects of a given public action: direct and indirect, positive and negative, have to be included in the evaluation. This implies that aggregating impacts of such multi-related policy interventions will always be characterised by the search for acceptable compromise solutions.

Aggregation problems of the above-mentioned type are characterised by the following properties:

- A high degree of incomparability of the parameters (a mix of quantitative and qualitative indicators, different time scales)
- Certain parameters could only be included in the evaluation by using rather vague replacement indicators or proxies (e.g. in the context of measuring social qualities)

Thus for the tool suggested in this report we have decided to rely on cumulative aggregations and leave the exposure fields separated.

The cumulative impact as realised in this project focuses on the need communicate the result of the TIM in an easily comprehensible way. It allows merging branched directives to show the directive's combined impacts, although the positive and negative cumulative impacts are kept apart.

The impact fields on which the directive has a high impact ( $\pm 1.2$  and higher) are marked. The more impact fields per region are hit (meaning marked), the higher the cumulative positive respectively negative impact on the region. A map of a directive's

cumulative impact (either positive or negative) depicts the intensity of impacts that can be deduced from the directive.

More detailed knowledge about which impact field led to what kind of impact in which region cannot be illustrated in these maps. To gather this kind of information it is necessary to consult the comprehensive Territorial Impact Matrix.

### **3.6 Empirical definition of exposed regions and regional sensitivities**

The methodology of bringing together the exposed regions (for each directive) and their sensitivity to each exposure field was accomplished via a simple calculation. First, all regions were divided into classes and given a value of 0 or 1 according to whether they belonged to a particular class explicitly indicated in the analysis of the logical chain. Second, regional sensitivities to field exposure were computed using continuous regional datasets containing relevant indicators for each field.

The TPG undertook a rather extensive data collection exercise to build up the Regional Exposure Matrix (REM) and the Regional Sensitivity Matrix (RSM). The tables below summarize the main data collected, their source and the indicators computed to fill in these matrices.

Table C 3 below refers to the REM and shows that for each (sub)directive (column 1) the types of regions considered as exposed (column 2), the operationalization of these definitions in specific indicators and their measurement (column 3) and the sources of the data used to implement such definitions (column 4). All indicators are coded as dummy variables, taking the value of 1 if a region meets the relevant definition and 0 otherwise.

In section 4, the rationale behind this classification of exposed regions will be clarified in relation to each specific (sub)directive.

**Table C 3: Regional Exposure: Definition of exposed regions, measurement and related data sources**

Directive (keyword)	Exposed regions	Indicator and measurement	Source
Air quality (branch a)	High particulate air pollution	Regions falling in the TOP 20 percentile of PM10 distribution	5 <sup>th</sup> Cohesion report
Air quality (branch b)	Industrial regions	Regions with GVA in manufacturing above EU average	EUROSTAT
Water-framework	All regions	n/a	n/a
Seveso	Areas at highest technological/ environmental risk	Regions falling in the top P10 of technological and/or environmental risk distribution	ESPON DB
Environmental noise (branch a,b,c)	Urban	Regions classified as URBAN according to ESPON typology	ESPON DB
Environmental noise (branch a,b,c)	Agglomerated	Regions classified as AGGLOMERATED according to ESPON typology	ESPON DB
Environmental noise (branch a,b,c)	Densely populated	Regions falling in the top P10 of population density distribution	ESPON DB
Environmental noise (branch a,b,c)	High density of road	Regions falling in the top P25 of density distribution of km of road on usable land	ESPON DB
Environmental noise (branch a,b,c)	High density of rail	Regions falling in the top P25 of density distribution of km of rail on usable land	ESPON DB
Environmental noise (branch a,b,c)	Major airport location	Regions endowed with airport with more than 500000 passengers per year	ESPON DB
Promotion of use of biofuels (branch a)	Rural	Regions classified as RURAL according to ESPON typology	ESPON DB
Promotion of use of biofuels (branch a)	Unprofitable farming	Regions falling in the bottom P10 of the average farm size distribution	DG Agriculture – Rural Development Report
Promotion of use of biofuels (branch a)	Natural areas	Regions with a share of natural areas above EU average	DG Agriculture – Rural Development Report
Promotion of use of biofuels (branch a)	Forest	Regions with a share of forest areas above EU average	DG Agriculture – Rural Development Report
Promotion of use of biofuels (branch b)	Harbour regions	Regions with port areas	ESPON DB
Environmental liability	Industrial regions	Regions with GVA in manufacturing above EU average	EUROSTAT
Electronic road toll systems	Highest density of high speed/ highways	Regions falling in the top P10 of density distribution of km of road and rail on usable land	ESPON DB
Recognition of qualifications (branch a)	Wealthy regions	Regions with GDP per capita in PPS 50% above EU average	ESPON DB
Recognition of qualifications (branch a)	Urban	Regions classified as URBAN according to ESPON typology	ESPON DB

Directive (keyword)	Exposed regions	Indicator and measurement	Source
Recognition of qualifications (branch a)	Agglomerated	Regions classified as AGGLOMERATED according to ESPON typology	ESPON DB
Recognition of qualifications (branch b)	Shrinking regions	Regions with population loss due to migration and/or death	German Federal Institute for Research on Building, Urban Affairs and Spatial Development
Critical Infrastructure	Highest density of rail and road network	Regions falling in the top P10 of density distribution of km of road and rail on usable land	ESPON DB
Critical Infrastructure	Areas at highest technological/ environmental risk	Regions falling in the top P10 of technological and environmental risk distribution	ESPON DB
Pesticides (branch a)	Rural	Regions classified as RURAL according to ESPON typology	ESPON DB
Pesticides (branch b)	industries	Regions with a high density of chemical plants above EU average	ESPON DB
Road transport vehicles (branch a)	Agglomerated	Regions classified as AGGLOMERATED according to ESPON typology	ESPON DB
Road transport vehicles (branch b)	Highest share of employment in automotive	Regions falling in the top P25 of density distribution of the share of employment in automotive	EUROSTAT
Energy performance of buildings	Urban	Regions classified as URBAN according to ESPON typology	ESPON DB
Energy performance of buildings	Agglomerated	Regions classified as AGGLOMERATED according to ESPON typology	ESPON DB

Similarly, Table C 4 below on Regional Sensitivity shows for each of the 41 Exposure fields (columns 1 to 3), the indicator used and a definition (column 4) and the sources of the data used (column 5). All indicators have been normalized according to a linear transformation, so that the minimum observed value of the indicator was set at 0.75 and the maximum observed value at 1.25.

Before doing this, we will turn to the rationale behind the way in which the sensitivities were established. We do this by briefly describing how the magnitude and direction of impact would change under certain conditions for each exposure field. It should be stressed that the choices made in the framework of this project are intended as a first step towards a general methodology. It is also feasible, and in many cases desirable, to modify these definitions of sensitivity in the context of the application to a particular directive in practice, for example in a workshop setting with policymakers since these definitions are to a certain extent arbitrary and because the sensitivities are so important for explaining variation in impact between regions.

## Natural environment

F1 – erosion: regions showing a greater share of areas at risk of soil erosion are expected to be more sensitive to directives whose implementation has some impact on this phenomenon. Sensitivity is thus directly proportional to the share of areas at risk of soil erosion.

F2 and F5- pollutants in soil: regions showing a higher density of land-use are expected to be more sensitive to directives aimed at a reduction of soil and water pollution on the one hand, and those which benefit dirty industry on the other. High density land use is used as a proxy of the ratio between population plus employment divided by usable land; sensitivity is thus directly proportional to the density of land use.

F3 – share of artificial areas/soil sealing: regions displaying a greater share of artificial areas are expected to be more sensitive to directives aimed at a reduction of soil sealing or those causing more urbanization. Sensitivity is thus directly proportional to the share of artificial areas.

F4 – water consumption: regions having a greater share of inland water may experience lower constraints of water consumption. Sensitivity is thus inversely proportional to the share of inland water areas.

F6 – pollutants in air: regions showing greater concentration of air pollution are expected to benefit more from directives aimed at its reduction. For this, particular matter (PM<sub>10</sub>) was used as an indicator of pollution in general; sensitivity is thus directly proportional to PM<sub>10</sub> concentration.

F7 – emissions of CO<sub>2</sub>: this is largely dependent on vehicle emissions (which in turn increases with population density). Regions showing greater density of vehicle fleet per capita are expected to be more sensitive to directives aimed at reducing CO<sub>2</sub> emissions. Here, we proxy vehicles emissions as by the average of the number of vehicles per 1,000 inhabitants and population density. Sensitivity is thus directly proportional to this indicator.

F8 – heavy rain/flood hazard/occurrence of landslides: regions showing a greater risk of flood hazard are expected to be more sensitive and benefit more from directives aimed at a reduction of this risk. Due to data availability, we focused on flood hazards only. Sensitivity is thus directly proportional to the risk of flood hazard.

F9 – biodiversity: as no sufficient indicator is available for biodiversity, a proxy was used. Regions showing greater area of protected nature areas (such as in the Natura2000 network) are expected to be more sensitive to directives directed at biodiversity or directives which may endanger habitats. Sensitivity is thus proportional to the share of areas protected under the Natura 2000 programme.

F10 – conservation of natural heritage (landscape diversity): regions with a higher proportion of natural areas are expected to be more sensitive to directives having an effect on this. Sensitivity is thus proportional to the share of natural areas.

F11 – conservation of cultural heritage: regions possessing a large number of artistically and historically valuable monuments (as documented by 3 stars in the Italian Touring Club (TCI) guidebooks) are expected to be more sensitive to directives aimed at cultural heritage conservation, or which may have an indirect bearing on it. Sensitivity is thus proportional to the number of sites with 3 TCI stars.

### **Regional economy**

F12 – economic growth: regions with lower GDP per capita are expected to benefit more from directives aimed at GDP growth increase and which inadvertently harm economic growth. Sensitivity is thus inversely proportional to the level of GDP per capita.

F13 –innovation: regions with greater share of enterprises engaged in product and/or process innovation activities are considered to be more sensitive to directives influencing innovation.

F14 – entrepreneurship (share of private enterprises): entrepreneurship is here captured as the share of self-employed in total employment. Regions showing lower levels of self-employment are expected to benefit more from actions aiming at its promotion, or which inhibit it unintentionally. Sensitivity is thus inversely proportional to the share of self employment.

F15 – market barriers: all regions are assumed to benefit equally from greater competition in terms of lower prices and better quality products and services on the market. Sensitivity is thus set at 1.

F16 – employment in primary sector: regions with higher GDP per capita are assumed to be more sensitive to an increase of the level of employment in the primary sector because of likely saturation of job opportunities in the other sectors and an increasing demand of agriculturally related product (better quality agri-food, agri-tourism etc.). Sensitivity is thus expected to be directly proportional to GDP per capita.

F17 – share of arable area, permanent grass area, permanent crops area: regions with a large share of agricultural areas are likely to be more sensitive to directives touching these areas. Sensitivity is thus directly proportional to the share of agricultural areas.

F18 – regions with a greater share of employment in the secondary sector are assumed to benefit more an increase in the level of employment in this sector, or respectively harmed more from a decrease. Sensitivity is thus proportional to the share of employment in the secondary sector.

F19 – regions with a greater share of employment in the tertiary sector are likely to be more affected from changes in the level of employment in this sector of employment resulting from a directive. Sensitivity is thus proportional to the share of employment in the tertiary sector.

F20 – overnight stays: regions with low levels of tourism (here proxied as the total number of nights spent in accommodations on total population) may benefit more from an increase in tourism as compared to regions already congested by tourism. Sensitivity is thus inversely proportional to the total number of nights on population.

### **Society and people**

F21 – disposable income in PPS/capita: regions with lower disposable income per capita (in PPS) are expected to benefit more from directives raising disposable income and more harmed by potential decreases. Sensitivity is thus inversely proportional to the level of disposable income per capita in PPS.

F22 – (equal) income distribution: regions which have greater income distribution disparities are likely to experience more acute poverty. Sensitivity is thus set as directly proportional to the poverty index developed in the 5<sup>th</sup> Cohesion Report.

F23 – employment rate: regions experiencing lower employment levels (i.e. higher unemployment rates) are likely to benefit more from a reduction of unemployment and be harmed more by increases thereof. Sensitivity is thus directly proportional to the unemployment rate.

F24 – out-migration/brain drain/"shrinking" of regions: regions experiencing these development will benefit more from actions aimed at their reduction or suffer most from their exacerbation. Sensitivity was thus set as being inversely proportional to the net migration balance (i.e. immigration minus outmigration on total population).

F25 – number of people exposed to noise: exposure to noise is largely an urban phenomenon. Regions with a higher share of population living in urban areas are likely to be more hit by impacts changing the levels of noise. Sensitivity is thus proportional to the share of population living in urban areas.

F26 – accident rate in transport: regions already experiencing high rates of accidents in transport (here proxied as road fatalities per million inhabitants) are expected to benefit more from directives increasing safety and be most disadvantaged by those that inadvertently decrease it. Sensitivity is thus directly proportional to road fatalities.

F27 – accident risk (industry/energy supply): regions experiencing greater technological and/or environmental risk are expected to benefit more from measures aimed at its reduction or measures which increase risk. Sensitivity is thus proportional to this indicator.

F28 – healthy life expectancy at birth: regions in which life expectancy is lower are assumed to benefit more from policy measures aimed at its increase and more negatively influenced by those which decrease it. Sensitivity is thus inversely proportional to life expectancy at birth.

F29 – daily accessibility by air: this is proxied by potential accessibility by air. Regions with lower potential accessibility will benefit more from its increase and be most disadvantaged by measures that lower it. Sensitivity is thus inversely proportional to accessibility by air.

F30 – accessibility by waterways: accessibility over water is considered more a matter of regional exposure (e.g. being a region coastal or endowed with a large share of inland water) than regional sensitivity. Sensitivity is thus set at 1.

F31 – daily accessibility by road: this is proxied by potential accessibility by road. Regions with lower potential accessibility will benefit more from its increase and suffer more from its decrease. Sensitivity is thus inversely proportional to accessibility by road.

F32 – daily accessibility by rail: this is proxied by potential accessibility by rail. Regions with lower potential accessibility will benefit more from its increase and suffer more from its decrease. Sensitivity is thus inversely proportional to accessibility by rail.

F33 – renewable energy: regions with limited access to renewable energies are more dependent on fossil-fuel consumption and will benefit more from measures aimed at reducing this dependency, which we proxy as by the indicator of vulnerability to climate change developed in the 5<sup>th</sup> Cohesion Report, and be most negatively influenced by measures which further increase this dependency. Sensitivity is thus proportional to this indicator.

F34 – fossil fuel consumption: regions highly dependent on fossil fuel consumption will benefit more from measures aimed at reducing this dependency, which we proxy as by the indicator of vulnerability to climate change developed in the 5<sup>th</sup> Cohesion Report and be most negatively influenced by measures which further increase this dependency. Sensitivity is thus proportional to this indicator.

F35 – increase of urbanization relative to population growth: regions showing greater shares of discontinuous urban area are expected to benefit more from policy measures aimed at its reduction, and be most harmed by measures which increase it. Sensitivity is thus proportional to share of discontinuous urban fabric areas.

F36 – mixed land use: all regions are expected to be equally sensitive to this field. Sensitivity is thus set at 1.

F37 – efficiency of government/governance mechanisms (efficiency/effectiveness of public administration): all regions are expected to be equally sensitive to this field. Sensitivity is thus set at 1.

F38 – duration or complexity of planning procedures (introduction of new administrative tasks/mechanisms/units/structure): all regions are expected to be equally sensitive to this field. Sensitivity is thus set at 1.

F39 – participation rate: all regions are expected to be equally sensitive to this field. Sensitivity is thus set at 1.

F40 – societal transfers (e.g. tax added): all regions are expected to be equally sensitive to this field. Sensitivity is thus set at 1.

F41 – transnational cooperation between member states: whereas all regions may equally benefit by increases in transnational cooperation, cross-border regions are more likely to be actually involved and interested in such agreements. Sensitivity is

thus considered as proportional to the per-capita funding in cross-border INTERREG programme.

Data availability in general was good especially for the EU 27 with the exception of the outermost regions. The tables in the Annex A3 show the missing data for the different indicators. It becomes obvious that data was missing on all regions for the following indicators: market barriers, accessibility by water, mixed land use and almost all governance indicators (efficiency of government/governance mechanisms, duration or complexity of planning procedures, participation rate and societal transfers). In many cases the indicator measuring transnational cooperation between members states 'funding pc in INTERREG' was missing too. Data on the "density distribution of the share of employment in automotive" which was used to define regions with the highest share of employment in automotive industry, is also quite incomplete.

Big gaps can be found in the data for NO, CH, IS and LI which are not in the EU but are included in the ESPON space. These partner countries were treated as if they also implemented the EU regulation and hence were included into the analysis.

Data coverage on the neighbouring countries TR, MK, HR is also highly incomplete as is the database for the Western Balkans. Being neither ESPON partner country nor EU member state it was decided not to include them into our assessment analysis.

As regards the computation, the geographical level of analysis is NUTS2 and accordingly all data and indicators have been computed at this scale.

Lastly, it is worth mentioning that some data were available at NUTS3 level only (namely, the indicator on technological/environmental risk, the indicator on road and rail network, the indicator on airport traffic, the indicator of concentration of PM<sub>10</sub>, and the indicator on the migratory balance). These were aggregated to the NUTS2 level.

**Table C 4: Regional Sensitivity: Definition of indicators, measurement and related data sources**

Thematic fields	Exposure Field	Indicator	Source
<b>Natural environment</b>			
Soil	erosion	% areas at risk of soil erosion	CLC
	pollutants in soil	(population+employment)/usable land	ESPON
	share of artificial areas/soil sealing	% artificial area	CLC
Water	water consumption	% inland water	ESPON on CLC
	pollutants in ground/surface water	(population+employment)/usable land	ESPON
Air	pollutants in air	concentration of PM10	5 <sup>th</sup> Cohesion Report
Climatic factors	emissions of CO <sub>2</sub>	((vehicles per 1000 inhab)+(density of population))/2	EUROSTAT+ESPON
	heavy rain/flood hazard/occurrence of landslides	risk of flood hazard	ESPON
Fauna/Flora/Habitat	biodiversity	% areas in Natura2000	University of Natural Resources and Life Sciences, Vienna
Landscape and cultural heritage	conservation of natural heritage (landscape diversity)	% natural areas	DG Agriculture – Rural Development Report
	conservation of cultural heritage	number of TCI 3-stars	ESPON ATTREG Project
<b>Regional economy</b>			
Economic development	economic growth (GDP/capita)	GDP per capita	ESPON
	innovation	share of product &/or process innovation	ESPON
	entrepreneurship	% self-employment	EUROSTAT
	market barriers	1	
Agriculture	employment in primary sector	GDP per capita	ESPON
	% of arable area, permanent grass area, permanent crops area	% agricultural areas	ESPON on CLC
Industry	employment in secondary sector	share of employment in secondary sector on total employment	EUROSTAT
Services	employment in tertiary sector	share of employment in tertiary sector on total employment	EUROSTAT
Tourism	overnight stays	nights per capita	EUROSTAT+ESPON
<b>Society and people</b>			
Social disparities	disposable income in PPS per capita	disposable income per capita	ESPON
	equal income distribution	poverty index	5 <sup>th</sup> Cohesion Report
	employment rate	unemployment rate	5 <sup>th</sup> Cohesion Report
Demography	out-migration/brain drain/"shrinking regions"	net migration balance	5 <sup>th</sup> Cohesion Report

Thematic fields	Exposure Field	Indicator	Source
<b>Society and people</b>			
Health	number of people exposed to noise	% population in urban areas	CLC
	accident rate in transport	road fatalities	5 <sup>th</sup> Cohesion Report
	accident risk: industry/energy supply	technological &/or environmental risk	ESPON
	healthy life expectancy at birth	life expectancy at birth	EUROSTAT
Accessibility	daily accessibility by air	potential accessibility by air	ESPON Data Base
	daily accessibility by waterways	1	
	daily accessibility by road	potential accessibility by road	ESPON Data Base
	daily accessibility by rail	potential accessibility by rail	ESPON Data Base
	renewable energy	vulnerability to climate change	5 <sup>th</sup> Cohesion Report
	fossil fuel consumption	vulnerability to climate change	5 <sup>th</sup> Cohesion Report
Built environment	increase of urbanization relative to population growth	% discontinuous urban fabric	ESPON on CLC
	mixed land use	1	
Governance	efficiency of government/governance mechanisms	1	
	duration or complexity of planning procedures	1	
	participation rate	1	
	societal transfers (e.g. tax added)	1	
	transnational cooperation between member states	INTERREG IIIa expenditures/capita	EUROSTAT

## **4 Detailed results of three Case Study Directives including their in-depth analysis**

### **4.1 Directive relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air**

This directive is one of the daughters of the 1996 Air Quality Framework directive. It mandates the measurement of air quality and designates minimum air quality standards that apply universally. These minimum standards are usually in urban areas, which is exactly where most people live.

#### **4.1.1 Logical chain and exposure**

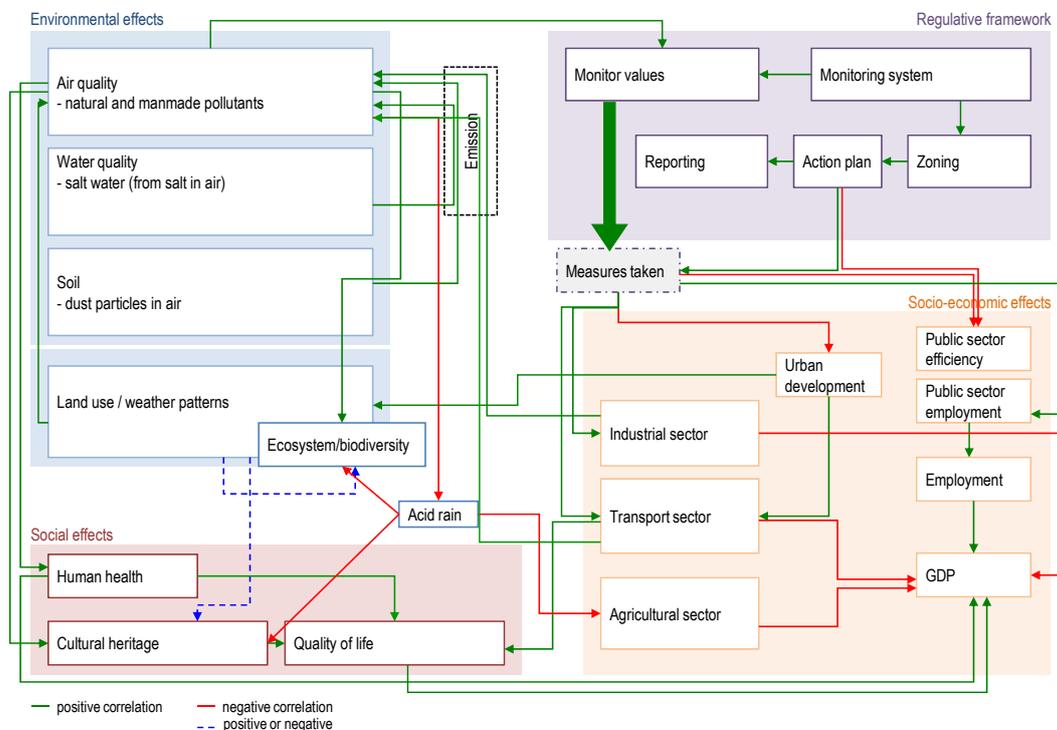
When considering this directive, it should be reiterated that the objective of ARTS is to work towards developing a TIA methodology, rather than carrying out a TIA per se. As such, the focus has been on walking through the various steps in the methodology while looking for and finding points for improvement. The analysis of the twelve directives, including this one, should therefore be read as examples in methodology development, rather than TIAs in their own right.

The first step of the method is to read the directive and identify potential impacts it could have. Like many others, this directive does not specify policy options. Instead, it states in articles 3-6 (one for each substance) that: "Member States shall take the measures necessary to ensure that concentrations of [...] in ambient air, as assessed in accordance with Article 7, do not exceed the limit values laid down in Section I of Annex II as from the dates specified therein". We can infer from this that member states are free to decide for themselves about which measures to take to improve air quality in those areas not meeting the minimum standards. In practice, a wide range of measures can be taken, each of which will form its own 'branch' of effects and knock-on effects. These measures include redirecting traffic to less polluted areas, traffic reduction, modal shift to public transport and cycling/walking, urban design (planting trees, building walls, tunnels, etc.). It can also include measures like prohibiting spatial developments in areas that exceed cut-off values to prevent the generation of extra traffic in these areas and to prevent the exposure of more people (Tennekes and Hornis 2008; VROM-Council, 2008). Other measures can be targeted at reducing emissions by industry or agricultural facilities. All these different measures have theoretically different kinds of territorial impacts on different kinds of regions.

The branching of the directive was performed by examining the scientific literature and drawing up a logical chain schematic on the basis of identified cause/effect relationships. The logical chain was then discussed with experts and modified

according to their suggestions. From the various measures sketched out above, two were finally selected for branching and further analysis: (a) traffic measures in areas exceeding limits and (b) at-source emissions measures for industry.

**Figure C 5: Logical chain of the directive**



With regard to branch a, the assumption is that measures are successful in reducing traffic in non-compliance areas, and hence in reducing emissions of sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air. Indirect effects are perceptible in the environment due to less contamination of soil and water and reduction of acid rain (which also harms historic buildings – and hence cultural heritage – and natural habitats of species and agricultural crops). Traffic reduction measures are also seen as potentially improving urban quality of life, human health, and hence, indirectly, promote economic growth. On the other hand, reducing traffic could either reduce economic activity in urban areas and hence growth, or just shift it towards more sustainable modes, which may actually have a positive effect on the economy. This example should serve to underline the ambivalence of some cause-effect relationships, even — and especially — when being discussed with experts. More certain is that the measures imposed as a result of the directive will involve more planning efforts and provide additional complexity and challenges when carrying out projects in urban areas; this can potentially negatively impact economic growth and government efficiency. It should be stressed that these assumptions are largely the result of expert consultation – and to a certain degree speculative – and not quantitative empirical research.

Branch b, the imposition of extra industrial emissions controls and/or toughening existing ones, is also expected to improve air quality. As with branch a, this will have

positive effects on environmental indicators and natural/cultural heritage (due to the reduction of acid rain). The directive may additionally produce innovation towards cleaner production methods. On the other hand, these measures are expected to drive up costs for concerned industries, which can negatively impact economic growth.

#### **4.1.2 The regions affected by the directive**

All regions in Europe will be affected by the directive insofar that all are obliged to measure air quality. However, only areas where thresholds have been exceeded will experience impacts caused by nationally or locally implemented measures stemming from this directive. The regions selected in the exposure matrix for branch a were those with high levels of PM<sub>10</sub>. Generally, this concerns the Benelux, north Italy and some regions in eastern Europe (see exposure map for branch a). Most major cities are exposed, although there are some notable exceptions, like Madrid, Berlin and Rome. Probably many regions on the map would have to deal with the directive because of high local values, on a busy street for example, but are not exposed due to the size of the NUTS2 region. So in retrospect, it might have been more interesting to lower the threshold to allow more regions to become affected by the directive, even if this would produce more false positives. Another thing to bear in mind is that PM<sub>10</sub> is just one of the air pollutants regulated by the directive. Although suitable for our purposes of illustrating the methodology, an actual assessment should ideally use all of the substances (i.e. also sulphur dioxide, nitrogen dioxide and oxides of nitrogen, and lead) for determining exposure.

In contrast, branch b affects regions which have a relatively large share of industry, regardless of whether the air quality meets the standards or not (see exposure map for branch b using manufacturing as an indicator). These could be areas outside of urban regions, for example, where a plant is located. The exposure map in this case reflects a poor choice of indicator: there are areas being exposed far in the north of Scandinavia which obviously will not have much polluting industry, whereas Zuid-Holland in the Netherlands which contains Rotterdam harbour and its accompanying refineries and other industry, is not exposed. Although this most certainly can be explained by examining the indicator itself and drawing the necessary conclusions (relative to EU-average, size of nuts area) the example underlines the importance finding indicators that accurately reflect the storylines of the logical chains. It is conceivable that in an actual TIA exercise, this step of linking indicators to logical chains would have to be repeated several times (this was also the case when evaluating this directive). If done in an interactive setting, for example in a workshop with policymakers, one could display potential exposure indicators using the ESPON hyperatlas — once this becomes available online with all indicators from the database.

Finally, as stated above, these are just two of the ways in which this particular directive can be branched, as the directive does not specify which measures should

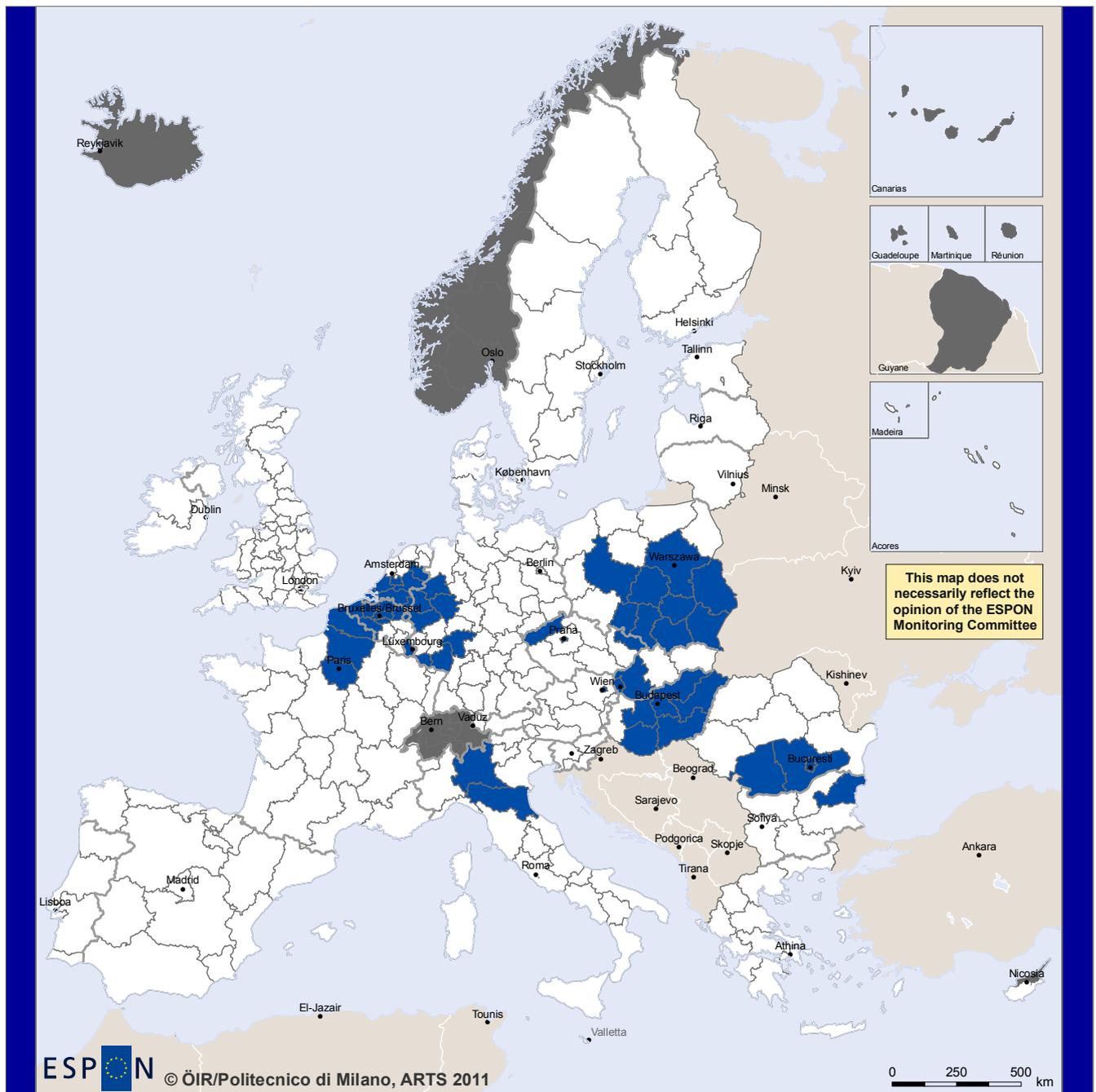
be taken to reduce the regulated substances in the air. The Dutch approach of linking air quality to urban development is a rather notorious example of the unforeseen consequences of implementation (VROM-Council, 2008).

**Map C 1: Regions affected by directive on air quality branch b**

**Map C 2: Regions affected by directive on air quality branch b, E6 pollutants in the air**

[following pages]

# Regions affected by Directive on air quality branch a



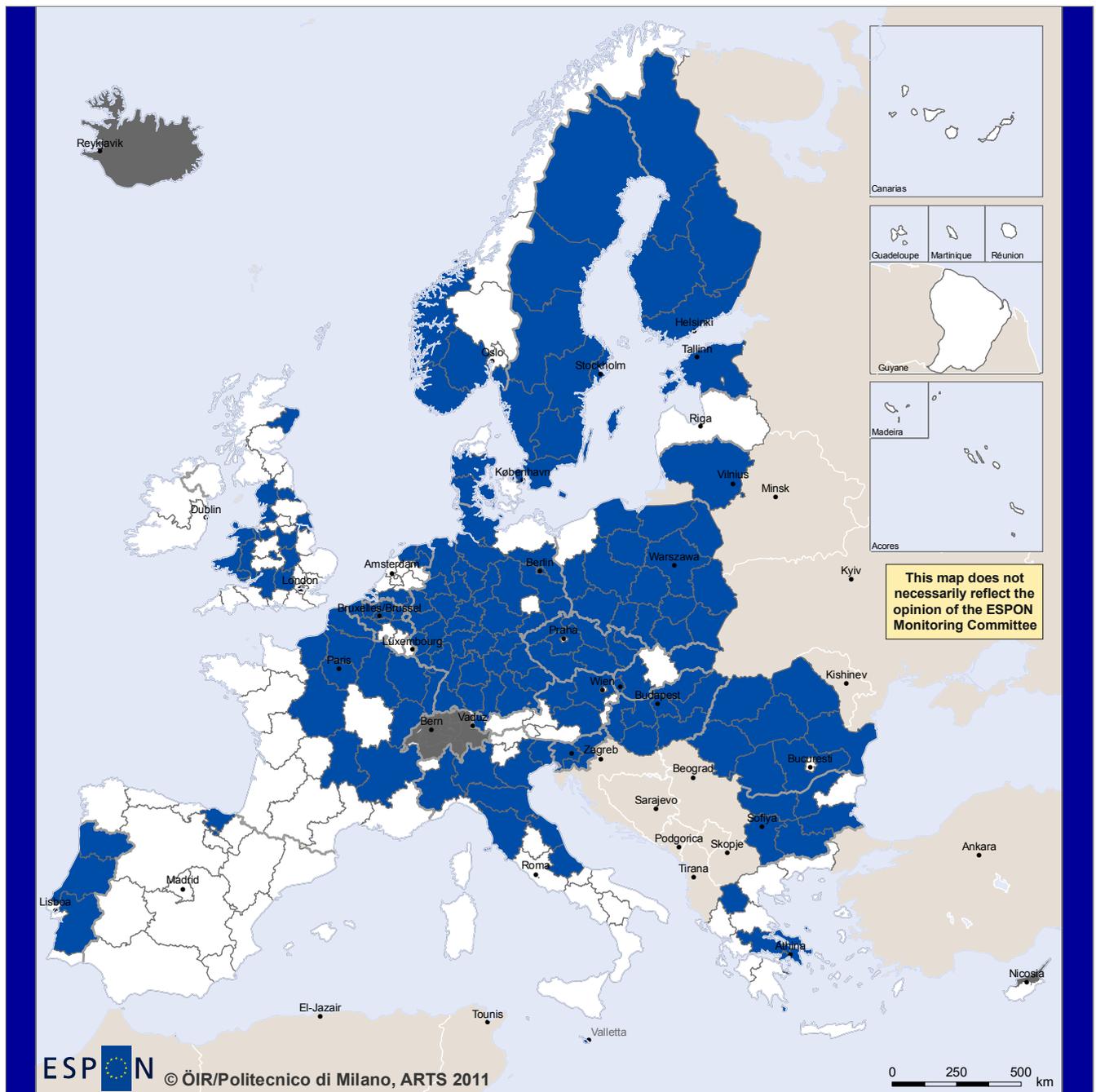

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-  Affected
-  Not Affected
-  Neighbourhood Countries
-  No Data

Types of regions affected: high particulate air pollution

# Regions affected by Directive on air quality branch b



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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: industrial regions

### 4.1.3 The territorial impact of the directive

The cause/effect relationships in the logical chain were subsequently translated into changes on specific indicators for each branch. These then comprised the input for the model calculating territorial impact.

For branch a, the model results show that the main impact of the directive is on the natural environment, specifically air quality (F6)<sup>26</sup>, the objective of the directive. This variable contained the highest values for both branches. The model predicted especially high impacts in cities such as Bucharest (RO), Slaskie (PL), Brussels and Közép-Magyarország (HU) as a result of the regional sensitivity adjustment. More indirect effects on the environment were pollutants in ground and water (F2 and F5). Since measures to reduce air pollution by vehicles generally result in less emissions in general, we also assumed that CO<sub>2</sub> would be reduced (F7) as well. Due to the reduction of acid rain caused by pollutants, this directive is also seen as positively impacting the protection of historical buildings and hence cultural heritage (F11) — particularly in Tuscany. Branch b has very similar results regarding the regions impacted by improved air quality, which is not surprising because the regional sensitivity is the same for both branches; the most concerned regions are therefore the same in both branches.

For both branches, impacts on the regional economy generally return negative results, due to perceived efforts and investments required to implement the directive. The model shows that the impact on economic growth (F12) is most significant in areas where the regional sensitivity is highest, namely the poorer regions. The top five most hit regions are all in Romania and Bulgaria for both branches (although not the same ones). For branch a there is some slight positive impact on services (F20) due to the need for setting-up measurement systems drafting air quality plans in non-compliance zones and for consultants.

The impact on society and people mainly regards the health benefits generated by breathing cleaner air in both branches. This is expected to contribute positively to healthy life expectancy (F28). Undoubtedly due to the regional sensitivity adjustment, the regions that show the highest impact according to the model are Latvia, Estonia, Észak-Magyarország (HU), Sud-Est (RO) and both Ciudad Autónoma de Ceuta and Ciudad Autónoma de Melilla (ES). For branch b, the life expectancy field is most hit in Romanian regions, again being influenced by the regional sensitivity aspect of the model.

Finally, the air quality directive is not expected to have a major impact on accessibility in general. For branch a, an indirect negative effect on road accessibility (F31) is expected from measures to reroute traffic or attempt to reduce it in polluted areas. According to the model run, the regions where this factor has the greatest

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<sup>26</sup> These abbreviations are related to the corresponding exposure fields and indicators in the TIM. (For a detailed description see scientific report, chapter 3.5.)

impact includes Canarias (ES) (not known for its traffic), Ciudad Autónoma de Melilla (ES), Malta, Cyprus and Iceland. For branch b the effects are non-existent.

Upon reflection, the territorial variation of the impacts of the directive is a direct reflection of the regional sensitivity. In one sense, this is understandable because it emphasizes the sensitivity aspect, being the central focus of the ARTS project. However it can also be misleading as virtually no distinction is made between the sensitivity and the level of exposure regions have to the directive. It stands to reason that areas with very high pollution will have to work much harder to meet air-quality standards, and implement more severe measures, than those who are just over the threshold level. For measures negatively impacting GDP, this then would be more significant in these polluted areas. According to the current method, GDP sensitivity has been linked to existing GDP levels, making poor regions more sensitive regardless of their levels of pollution. This explains why regions in Bulgaria and Romania are much more negatively impacted on GDP by the directive in the analysis than more polluted regions, which have struggled with the directive in practice.

Finally, a few words can be said as regards the cumulative impacts of the model. As regards branch a, the highest positive impacts were reported in Romania and Hungary, due to the sensitivity correction. The negative impacts of this branch were negligible. As regards branch b, the main positive effects were found in Estonia and Romania, again mainly due to the sensitivity correction. Only one region in Romania was marked as having a high negative impact, due to its sensitivity.

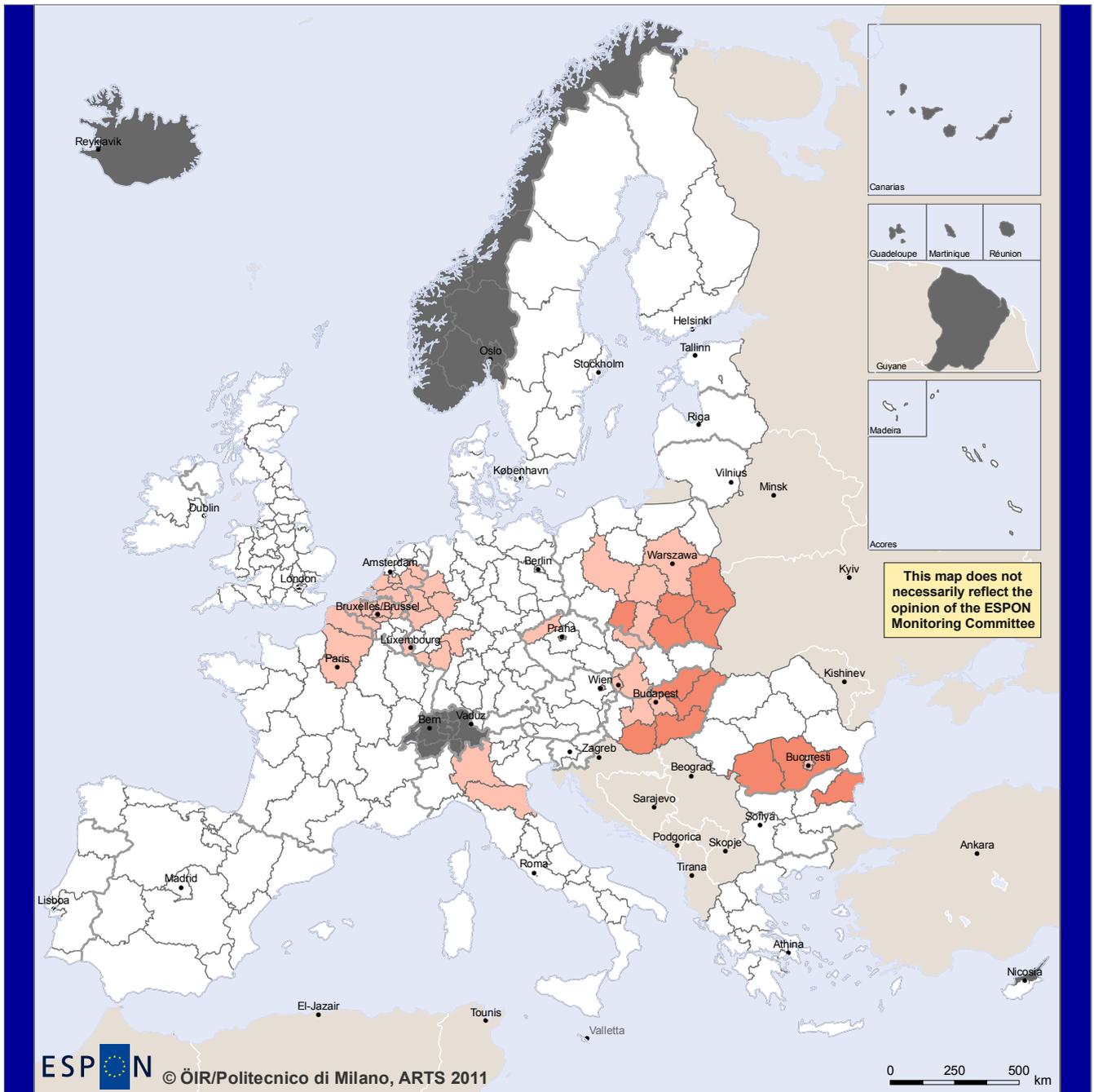
**Map C 3: Territorial Impact of Directive 1a on economic growth (GDP/capita)**

**Map C 4: Territorial Impact of Directive 1b on economic growth (GDP/capita)**

**Map C 5: Territorial Impact of Directive 1b pollutants in air**

[following pages]

# Regions affected by Directive on air quality branch a Economic growth (GDP/capita) (F12)



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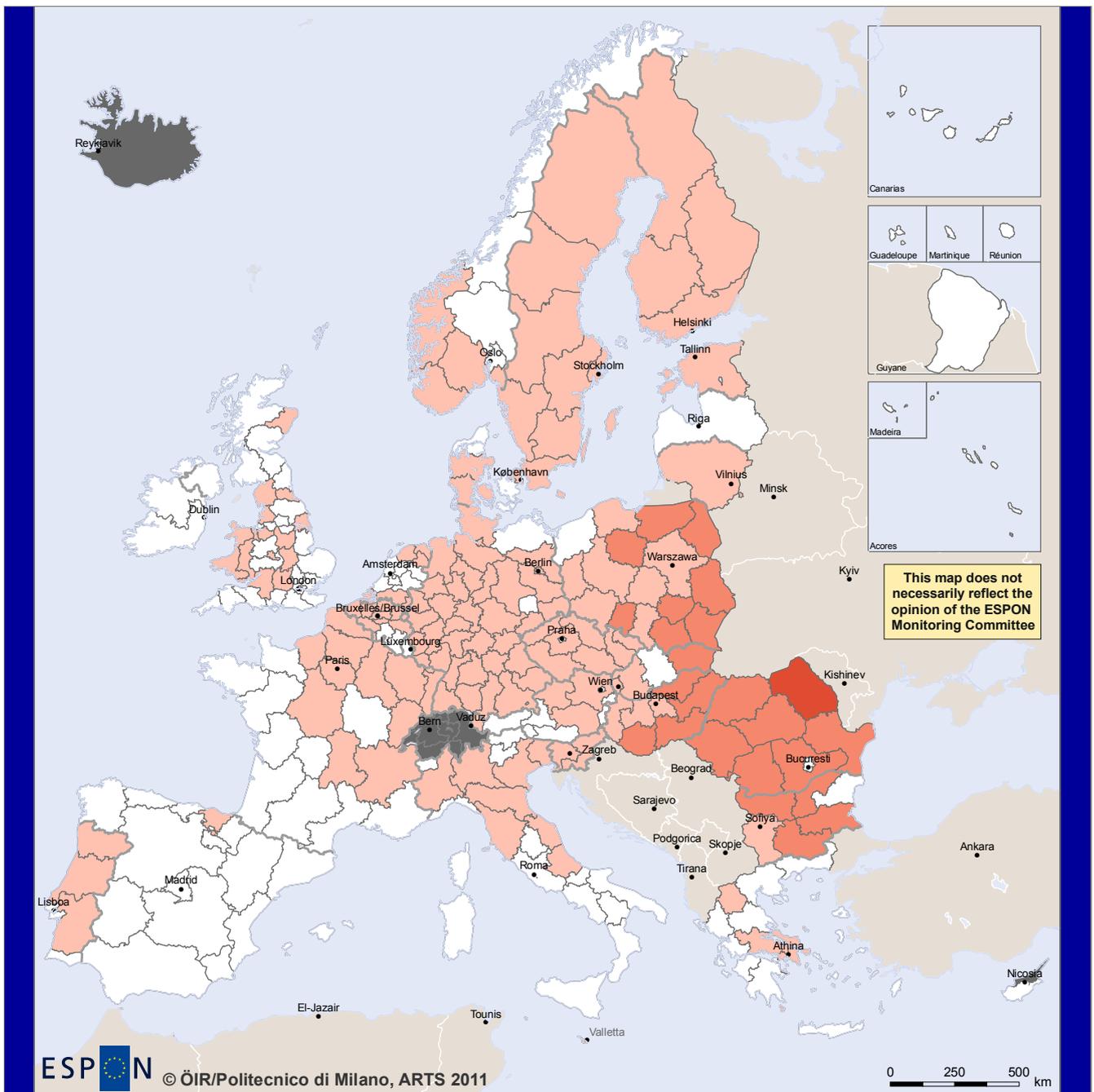
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## Negative Impact



Types of regions affected: high particulate air pollution

# Regions affected by Directive on air quality branch b Economic growth (GDP/capita) (F12)



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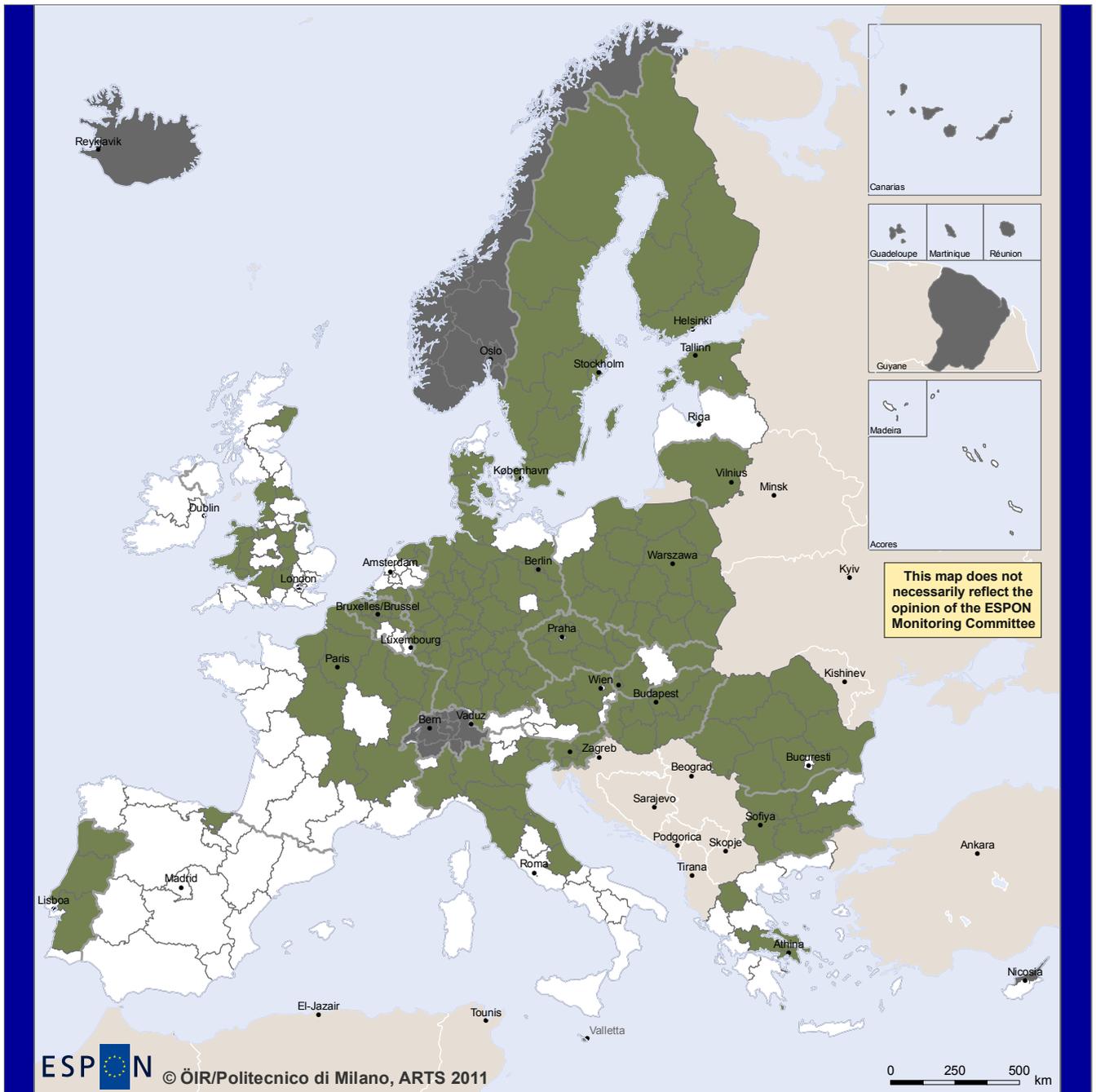
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## Negative Impact



Types of regions affected: industrial regions

# Regions affected by Directive on air quality branch b Pollutants in air (F6)



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## Positive Impact



Types of regions affected: industrial regions

#### 4.1.4 Insights for policy options

When examining the cumulative impacts, it seems *prima facie* as if the positive impacts are more widespread than the negative, both geographically as well as in magnitude, and for both branches. Policymakers should be restrained from drawing hasty conclusions from these results for a number of reasons. First, the air quality directive was only worked out for two branches (based on possible measures by member states), and as a pilot run. Inclusion of more or different branches would undoubtedly have changed the discussion on policy implications. Second, no policy-relevant weighing was carried out (e.g. a negative score on mixed land-use counted the same as life-expectancy). Third, some variables are strongly correlated (e.g. economic growth, employment, innovation, etc.) and therefore can amplify one another in the cumulative effects. Finally, it should be stressed that these cumulative impacts were not specified according to whether it concerns the environment, society or economy, and is therefore of only limited value for policymakers concerned with trade-offs between these broad categories. It is largely for these reasons that the cumulative maps were omitted from the report.

On the other hand, this analysis brings some issues to the fore that otherwise may have been neglected in the policy debate.

First, territory matters. The analysis shows that directives have more impact in some regions than others and that positive and negative impacts are geographically differentiated. Second, decisions of member states and regions matter. Via branching we saw that different measures/strategies will have different territorial impacts in different places. Governance can greatly amplify or mitigate these impacts. Third, regions differ according to their sensitivity. For instance, a region in a precarious economic situation was assumed to be more sensitive to regulations that harm economic growth and regions with fragile ecosystems more sensitive to pollution or nature fragmentation. The analysis of the air quality directive mainly highlighted areas in new member states as being sensitive, both positively and negatively. One could also posit an alternative definition of sensitivity, namely, that areas that are most sensitive are those closest to the threshold values of the directive — regions with worse air quality will conceivably have to implement more far-reaching measures and hence be more impacted.

According to the assessment we can consider the differences in territorial impact between the two strategies inherent in branches a and b. The nature of both branches is roughly similar: positive environmental impacts and modest negative economic impacts, implying a trade-off. More interesting is the kinds of regions being exposed due to governance implications. In branch a, it is those regions exceeding the standards that are exposed and must therefore implement traffic measures. These are generally urban areas governed by municipalities authorized to implement such measures. Branch b is potentially less straightforward because even regions that have relatively clean air are impacted due to the presence of polluting industry.

This branch would probably require national coercive policy, and may create tensions between business interests and the regions which depend on them, and national policy.

## **4.2 Directive relating to the assessment and management of environmental noise**

This directive mandates that member states make noise maps and action plans for agglomerations, major roads, major railways and major airports. Exceeding limit values shall cause competent authorities to consider or enforce mitigation measures<sup>27</sup> such as land-use planning, systems engineering for traffic, traffic planning, abatement by sound insulation measures and noise control of sources.

### **4.2.1 Logical chain and exposure**

This directive requires environmental noise be made visible through noise mapping and subsequently dealt with by developing action plans. The public is involved in this process (F39), not only by having access to information but also by being given the opportunity to participate in the preparation of the action plans. These provisions aim at increasing the efficiency of governance (F37) by providing information and empowering the people. At the same time, these additional procedures increase the complexity of administrative tasks (F38).

Generally the directive leaves the member states a great amount of leeway – the specifications in the action plan determine the directive's potential territorial effects.

Different logical chains were created depending on different kind of measures that can be chosen in a particular action plan. Although usually a package of measures is introduced, in order to allow for a comparison of policy alternatives, logical chains for each type of measure were examined.

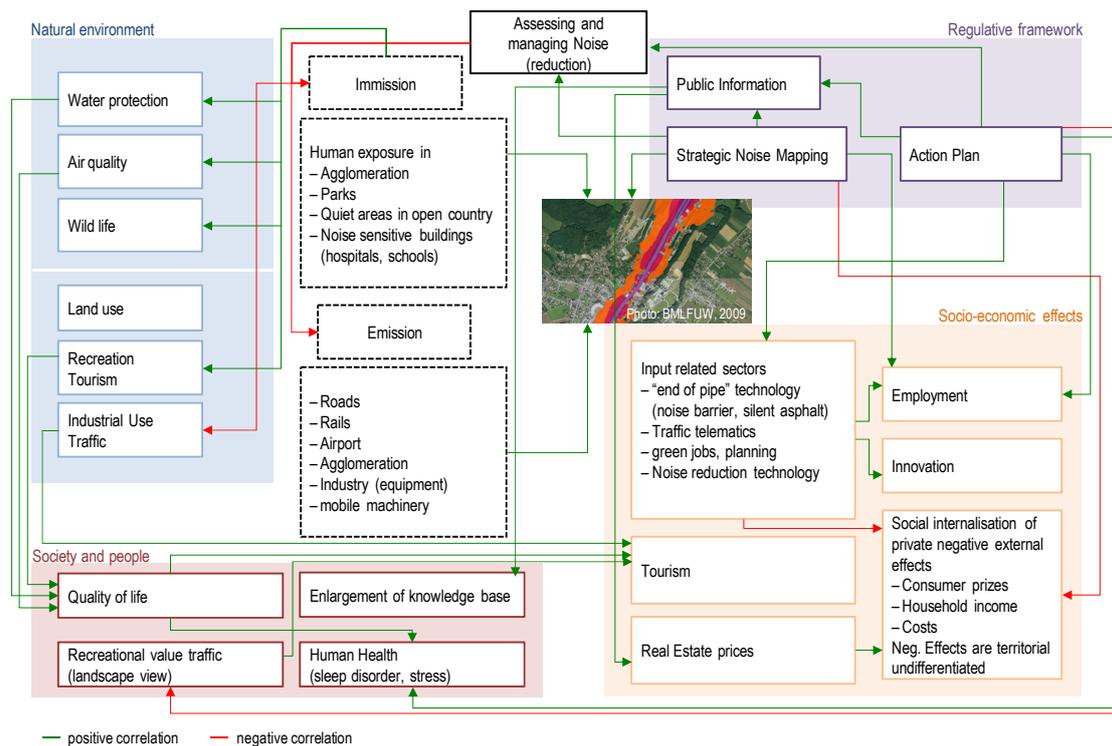
Branch a follows the cause/effect chain of implementing traffic planning measures or providing incentives to reduce noise exposure. In this case, traffic planning aims mainly at reducing traffic volumes to alleviate noise. Traffic planning includes traffic management systems (telematics), speed limits but also driving bans (at definite times, on specific days or roads or related to certain types of vehicles) and noise limits for industrial sites. Other measures in this branch regard incentives for low noise vehicles, rail access track charge or toll roads.<sup>28</sup>

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<sup>27</sup> Limit values may be different for different types of noise (road, rail, air-traffic noise, industrial noise, etc.), different surroundings and different noise sensitiveness of the populations; they may also be different for existing situations and for new situations (where there is a change in the situation regarding the noise source or the use of the surrounding).

<sup>28</sup> These measures can lead to a shift of traffic to other routes or other modes of transport. The territorial impact of these indirect effects was not included in this examination

**Figure C 6: Logical chain of the directive**



Other mitigation measures can be undertaken by land-use planning, which is considered branch b. This includes noise zoning around industrial sites, routing of rail tracks, roads or aerodrome siting, the orientation of buildings as well as restrictions on land use in sensitive areas or next to sensitive buildings.

Branch c follows the logical chain of introducing technical measures of sound insulation or noise reduction at the source. These can include motorway noise barriers, silent asphalt, broadband rail and wheel dampers, active noise filters, etc.

Each branch and its inherent specifications in the action plan determine the directive's potential territorial effects. Branch a impacts accessibility by road, rail and air (F29, F31, F32) negatively if traffic is restricted as in the case of night traffic bans (branch a). Measures like speed limits or traffic telematics lead to reduced fossil fuel consumption (F34) and road accident rate (F26).

The decline of fossil fuel consumption (F34) reduces CO<sub>2</sub> emissions (F7) and other pollutants, which induce positive effects on the quality of water, soil and air (F2, F5; F6) whilst mitigating damage on masonry and thus helps to conserve cultural heritage (F11). Measures specified in the action plans aim at reducing the number of people exposed to noise (F25). Less noise also provides better habitat conditions and helps to sustain biodiversity (F9). These effects will produce strong positive direct effects on health (F28). Noise reduction is expected to lead to increased recreational value of land, thus attracting more visitors (F20).

Effects on economic growth (F12) and subsequently employment in the secondary sector (F18) and disposable household income (F21) are contradicting. They can be either positive or negative; their net effects are incalculable within the scope of this project. On the one hand, just-in-time logistics will be compromised, leading to storage costs for transport industries. The burden of expenditure will be passed on to consumers who experience a decline in disposable household income. While this development could lead to a decrease in GDP/capita, on the other hand, economic incentives for the use of low-noise vehicles may stimulate research and development in low-noise technology. This can have a positive impact on innovation (F13) and subsequently the economy. Together with the construction and management of storage facilities, this path may provide jobs in the secondary sector.

Following the reasoning of branch c, the production of sound insulation or other technical means of noise reduction means higher energy consumption (F34) by industry which in turn causes higher CO<sub>2</sub> emissions (F7). Also the installation of noise barriers disturbs natural scenery and impairs landscape diversity (F10).

Positive effects can be expected on the regional economy. Innovations (F13) in input-related sectors (e.g. noise barriers, silent asphalt, active noise filters, green jobs) boost economic growth (F12) and employment in the industrial and service sector (F18, F19, F23). In the latter additional workplaces are established for research and development, mapping and tourism (F20). Similar to branch a, the technical measures applied mitigate noise emission (F25) strongly which benefits human health (F28) and, by means of better habitat condition, supports biodiversity (F9).

The positive economic developments, together with declining health expenditures, have positive effects on the disposable household income (F21). This positive development mainly concerns workers in the secondary and tertiary sector; this is expected to contribute to an unequal income distribution (F22).

In comparison to branch a and c, branch b has few territorial effects. Measures in land-use planning also fulfil the implicit aim of the directive to reduce the number of people exposed to noise. A consequence of reducing exposure to noise (F25) by separating land-use types (F36) means that industries and other noisy land uses are located far from sensitive buildings or fragile areas, and that the routing of major roads or rail tracks may have a negative effect on accessibility (F31, F32). Sites in quiet areas are developed for sensitive buildings (F35). The spread of the built-up area increases the share of artificial surfaces (F3) and fragments the landscape, impacting natural heritage negatively (F10).

#### **4.2.2 The regions affected by the directive**

Regardless of which cause/effect chain is examined, measures are implemented in areas where there is a high exposure to noise, caused especially by high traffic volumes. These regions were identified by aggregating those that fall either in an urban or agglomerated area, in the top 10 percentile of population density

distribution, in the top 25 percentile of density distribution of road and rail kilometres or regions with an airport of over 500,000 passengers per year.

When applying these regional filters on NUTS2 regions, almost all (276 out of 287) European regions are indicated. Only very remote regions are not affected by this directive, namely Burgenland (AT), Niederbayern and Oberpfalz (DE), Castilla-La Mancha (ES), Guyane (FR), Dél-Dunántúl (HU), Basilicata and Molise (IT), Swietokrzyskie (PL), Sud (RO), Slovenia (SL). The following map depicts the affected regions.

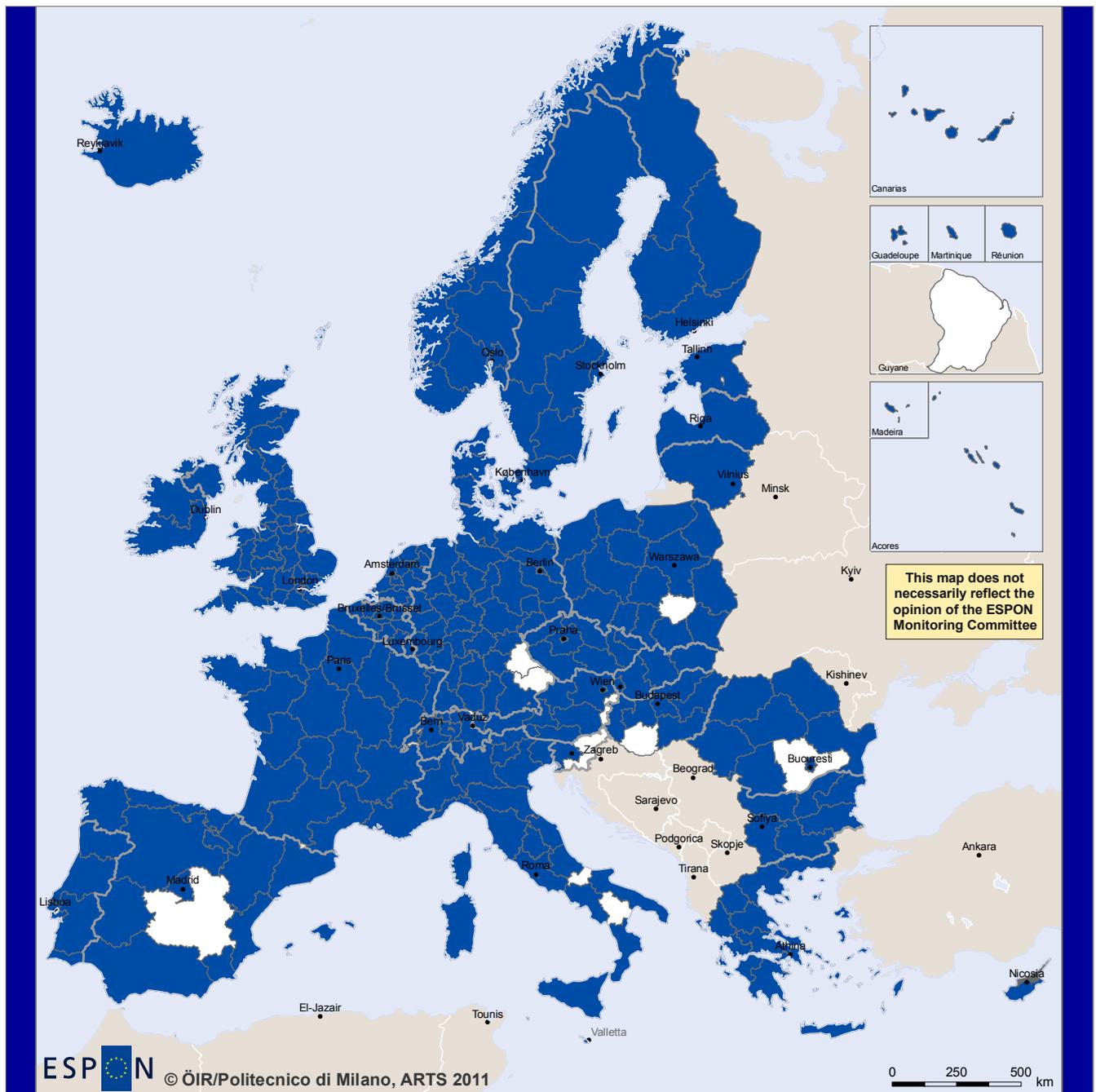
**Map C 6: Regions affected by directive on managing environmental noise branch a**

**Map C 7: Regions affected by directive on managing environmental noise branch b**

**Map C 8: Regions affected by directive on managing environmental noise branch c**

[following pages]

# Regions affected by Directive on managing environmental noise branch a



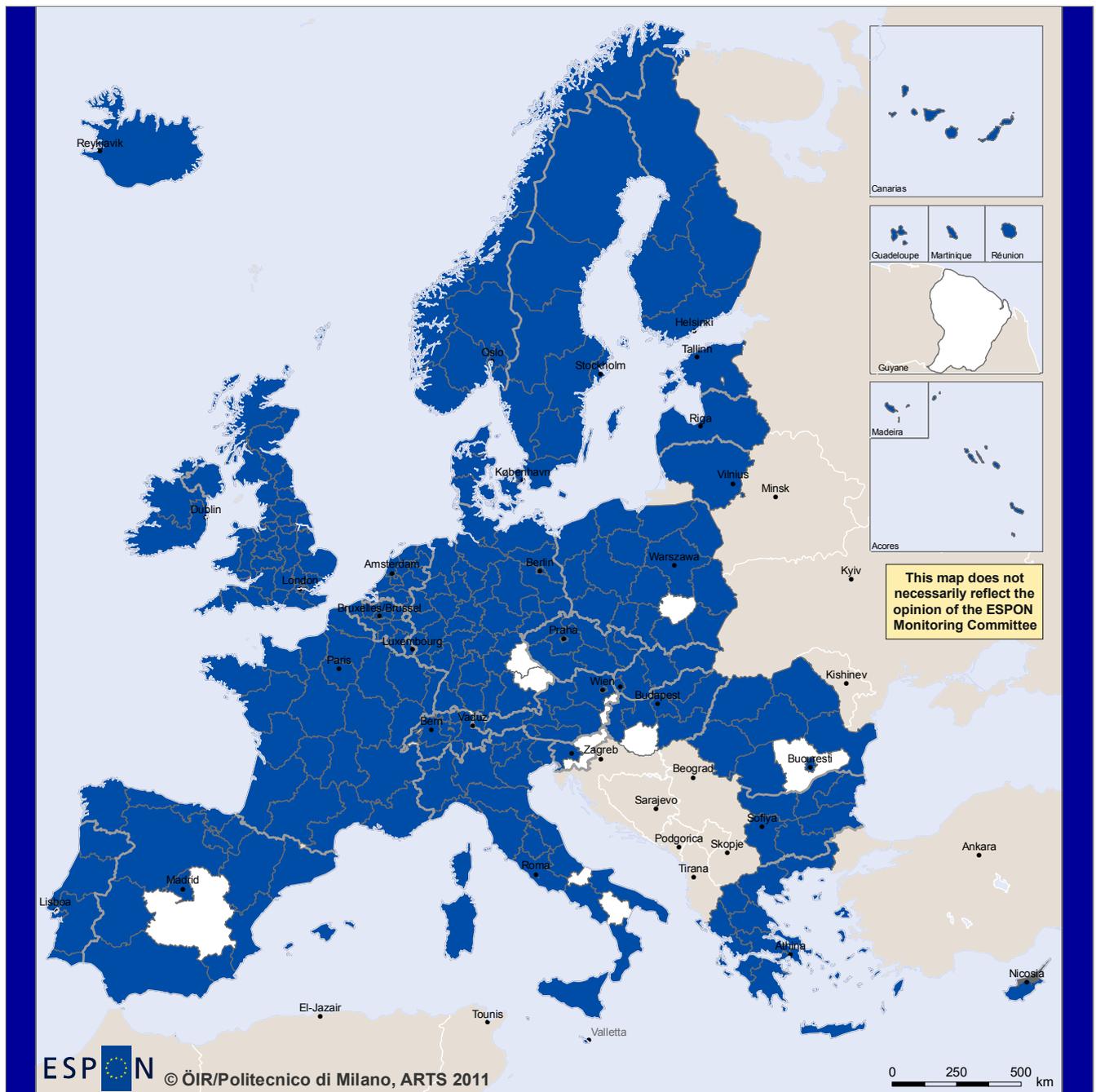

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-  Affected
-  Not Affected
-  Neighbourhood Countries
-  No Data

Types of regions affected: urban, agglomerated, densely populated, high density of roads, high density of rail, major airport location

# Regions affected by Directive on managing environmental noise branch b



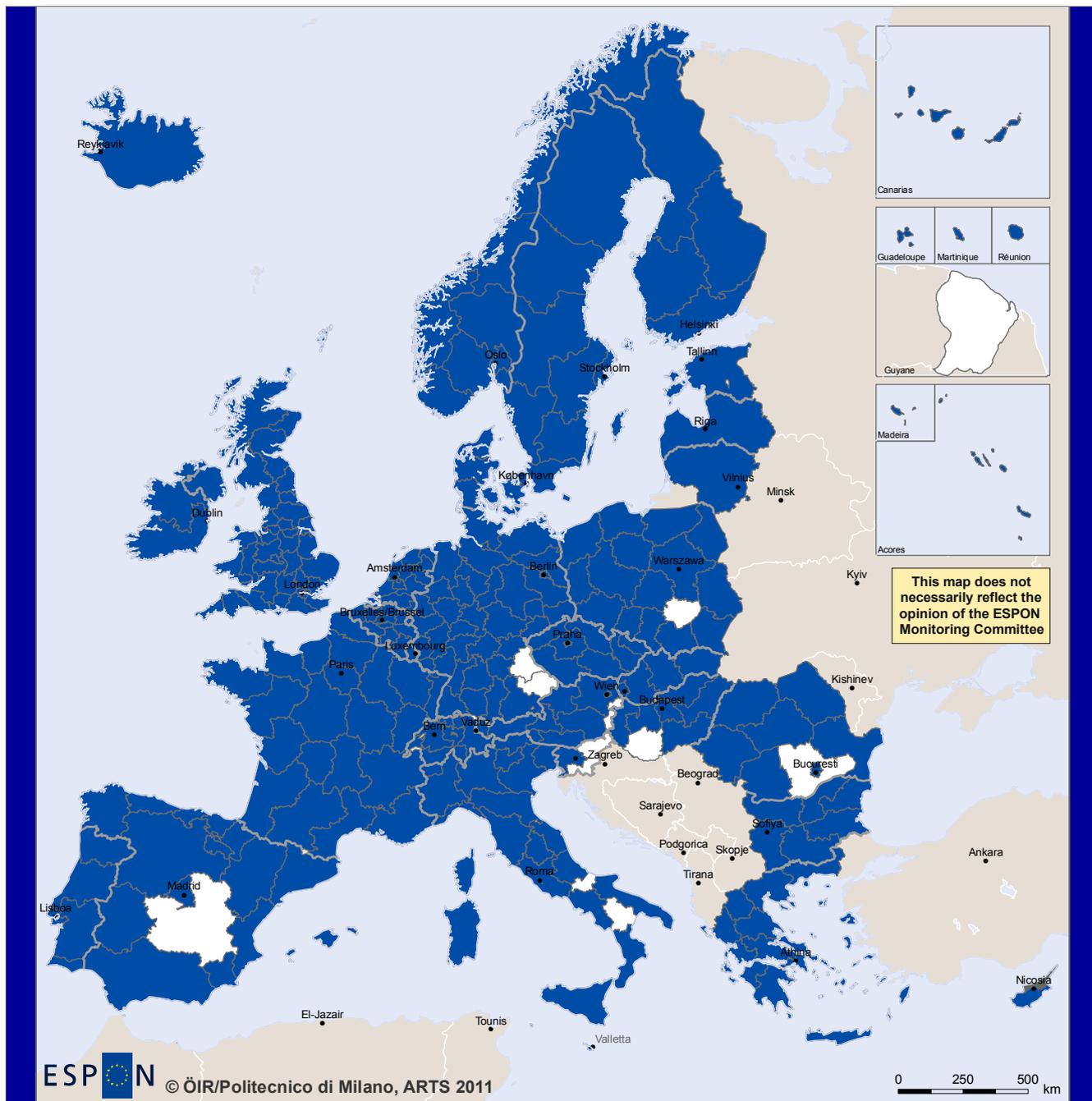

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-  Affected
-  Not Affected
-  Neighbourhood Countries
-  No Data

Types of regions affected: urban, agglomerated, densely populated, high density of roads, high density of rail, major airport location

# Regions affected by Directive on managing environmental noise branch c




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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: urban, agglomerated, densely populated, high density of roads, high density of rail, major airport location

### 4.2.3 The Territorial impact of the directive

The directive's primary objective is to reduce the number of people exposed to noise (F25). Strong positive impacts on this field in all branches mirror this effort, especially in densely populated areas. A reduction of exposure to noise is beneficial for human health. Consequently a high positive effect on the healthy life expectancy (F28) is shown for all influenced regions. Although the impact intensity ranges from moderate to very high, in the case of healthy life expectancy a high intensity dominates, and in the case of noise a very high intensity prevails. The effects are stronger when following branch a and c due to their stronger impact on these fields.

Following the implementation of transport-planning measures and provision of incentives (branch a) the effects on road fatalities (F26) are generally positive but limited, although Sterea Ellada in Greece sticks out as being impacted highly due its present sensitivity to road accidents.

Branch a's impact on the environment is consistently positive and generally minor. In a very few cases it is moderate and high. The latter is the case in Ciudad Autónoma de Ceuta (ES) on soil and water quality (F2, F5), in Bucharest (RO) on air quality (F6), Inner London on CO<sub>2</sub> emissions (F7), highly sensitive Tuscany on cultural heritage (F11) and the Canarias on biodiversity (F9). The positive effect on the latter can also be noticed when following branch c, and is a reflection of the sensitivity adjustment.

Landscape-planning measures (branch b) influence the environment slightly negatively. Urban regions – being already quite sensitive to soil sealing (F3) and urban sprawl (F35) are more concerned than others. Also measures like the construction of transport routes (branch b) and the implementation of technical measures (branch c) like noise barriers interfere with landscape diversity (F10) which primarily impacts Greece. The higher CO<sub>2</sub> emissions (F7) in branch c generally have only minor effects on regions with the exception of Inner London and Brussels which have a very high concentration of vehicles.

For measures relating to traffic bans (spatial and/or temporal) or landscape planning, negative impacts on the accessibility by road, rail (F31, F32) are expected. Although mainly minor, peripheral regions like Malta and the Canarias are more impacted.<sup>29</sup> The negative impacts on accessibility by air (F29) are generally stronger – the regions mostly hit are found in Greece, Romania and Bulgaria. A consequence of branch a is a decrease in fuel consumption (F34), leading to positive but limited impacts on the regions. More pronounced is the positive effect in Greece, Spain, Portugal and Italy, where the sensitivity is very high. The opposite is true when considering branch c, where the increase in industrial productivity increases demand for fuel.

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<sup>29</sup> This only concerns accessibility by road, since neither Malta nor the Canarias have a railway system.

in contrast to the other branches, the positive effects of the implementation of technical measures (branch c) on the regional economy can be noticed across all influenced regions. Most pronounced are the effects on entrepreneurship (F14) and employment in the secondary (F18) and tertiary sector (F19). Whereas in the case of entrepreneurship only Greece profits significantly less than other regions, the territorial impact on employment is more differentiated. The positive effects on employment in industry benefit eastern regions the most (with Czech regions leading the way). For metropolitan areas in western Europe the opposite is true regarding impacts on employment in services. The positive impact on the economy also shows up on tourism (F20) although on a smaller scale, with moderate impacts on regions in Poland, Romania and Bulgaria. Generally the employment rate (F23) in all regions is positive but limited, with the exception of Frenchs Guyane, Guadeloupe and Reunion, where the impact is higher, due to the sensitivity adjustment. The positive effect on innovation (F13) is most evident in southern Germany and Vienna (Austria), where it can be considered as moderate to high.

As regards the impact on economic growth (F12), it appears as if poorer regions profit more than wealthier ones: most of Romania and Bulgaria, many regions of Poland, Hungary's East and Východné Slovensko in Slovakia show a moderate to high positive impact. A similar positive impact on disposable household income (F21) can be noted in Bulgaria and Romania, while other regions are impacted only minor. This is also a product of the sensitivity adjustment in which impact is inversely proportional to employment. The imbalance in employment shows up as a negative impact on income distribution (F22) in southern European regions in Greece, Malta, Corse, Italy, Spain but mostly in Portugal.

In general, there are not many high negative impacts to be expected from any of the three branches of the directive on environmental noise. Branch a evokes high negative impacts on accessibility by air in some regions of Greece and one in Bulgaria, while for branch c they are most concentrated in Portuguese regions on income distribution. The highest negative impacts in branch b regard regions in the UK (West Midlands, Highlands & Islands, and especially Inner London) and Valle d'Aosta/Vallée d'Aoste in Italy on urbanization and the conservation of natural heritage.

All three branches indicate high positive impacts on the number of people exposed to noise across Europe. Following branch a, these positive impacts are to a lesser extent visible in Scandinavia, whereas Estonia, Latvia, Romania, Malta, Ciudad Autónoma de Ceuta and Ciudad Autónoma de Melilla, experience additional high positive impacts on health. The high positive impacts of branch b are more limited, concerning mostly capital regions, England and Wales, Belgium, the Netherlands, north-western France, western regions of Germany, the Czech Republic, some Polish regions and coastal regions of the southern European countries.

Of all three branches, branch c shows the greatest benefits for European regions. Besides the overall high positive impact on the exposure to noise, regions in Estonia,

Latvia, Romania, Bulgaria, Észak-Magyarország (HU) as well as Ciudad Autónoma de Ceuta and Ciudad Autónoma de Melilla experience high positive impact on two other indicators: entrepreneurship and health. Also very high (two indicators) is the positive impact in the Czech Republic, Denmark, Scotland and northern France.

**Map C 9: Territorial Impact of Directive 4 (branch a) on fossil fuel consumption**

**Map C 10: Territorial Impact of Directive 4 (branch b) on landscape diversity**

**Map C 11: Territorial Impact of Directive 4 (branch b) on number of people exposed to noise**

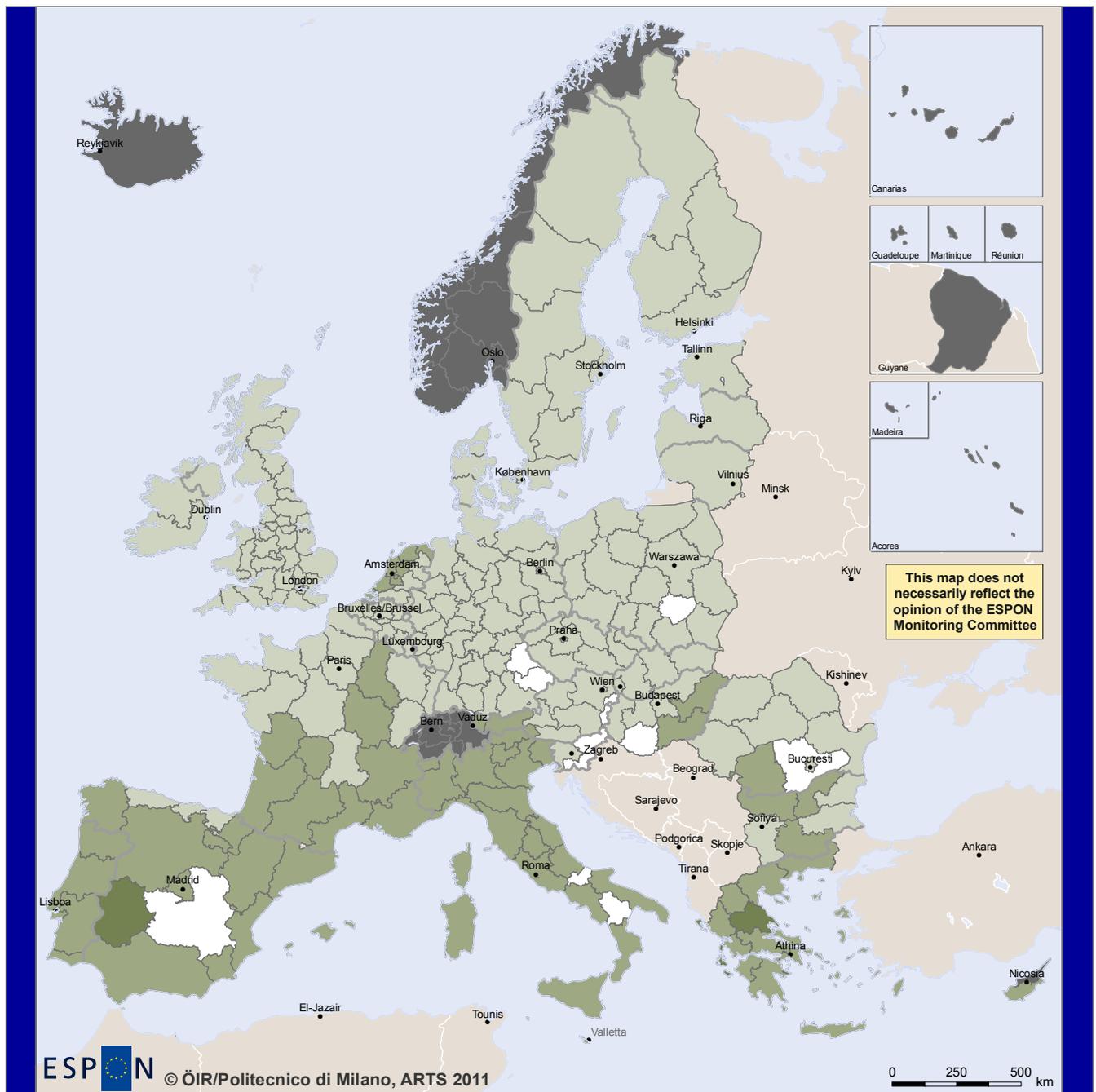
**Map C 12: Territorial Impact of Directive 4 (branch c) on employment in secondary sector**

**Map C 13: Territorial Impact of Directive 4 (branch c) on healthy life expectancy at birth**

**Map C 14: Territorial Impact of Directive 4 (branch c) on fossil fuel consumption**

[following pages]

# Regions affected by Directive on managing environmental noise branch a Fossil fuel consumption (F34)




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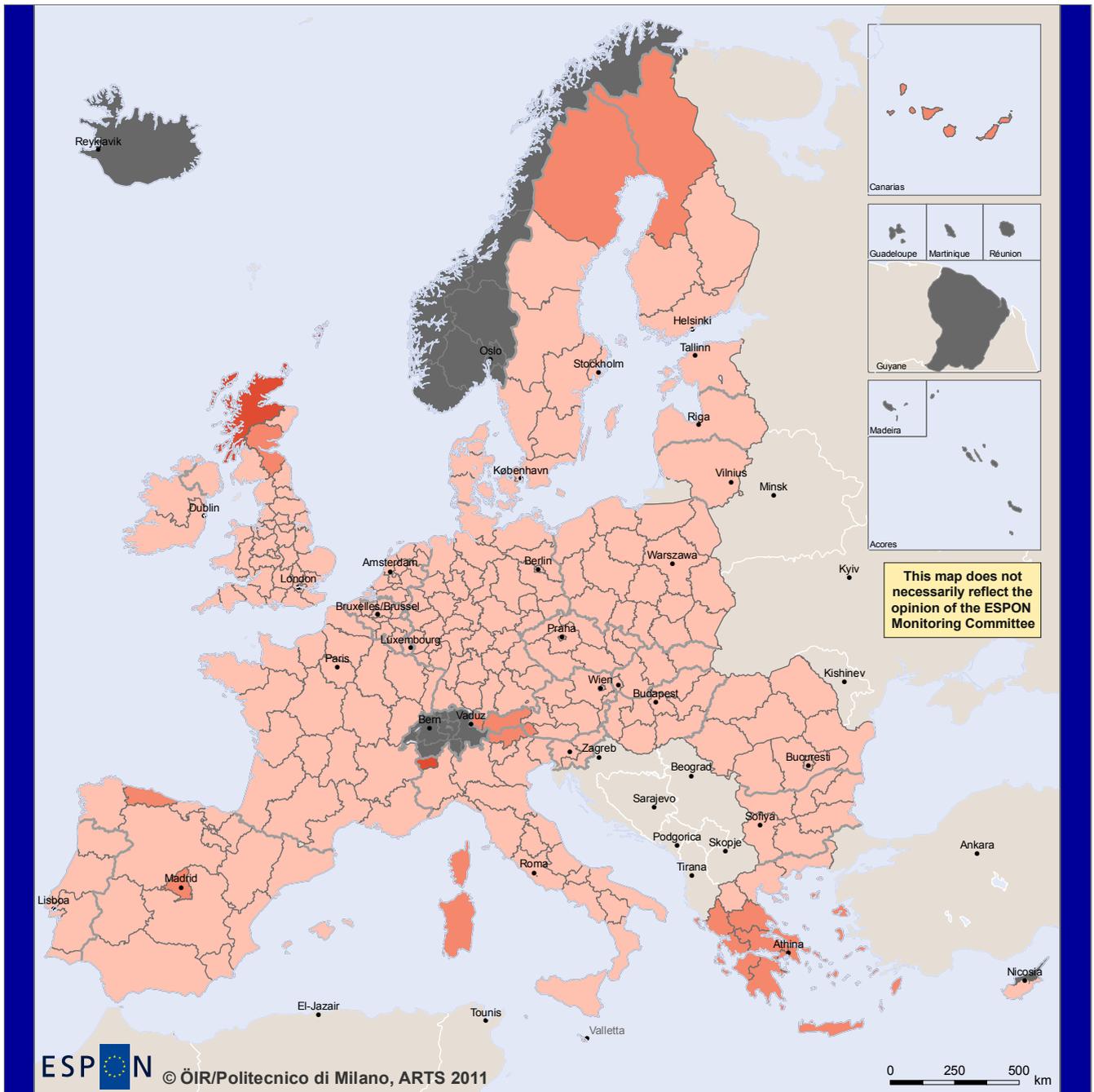
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## Positive Impact



Types of regions affected: urban, agglomerated, densely populated, high density of road, high density of rail, major airport location

# Regions affected by Directive on managing environmental noise branch b Conservation of natural heritage (F10)



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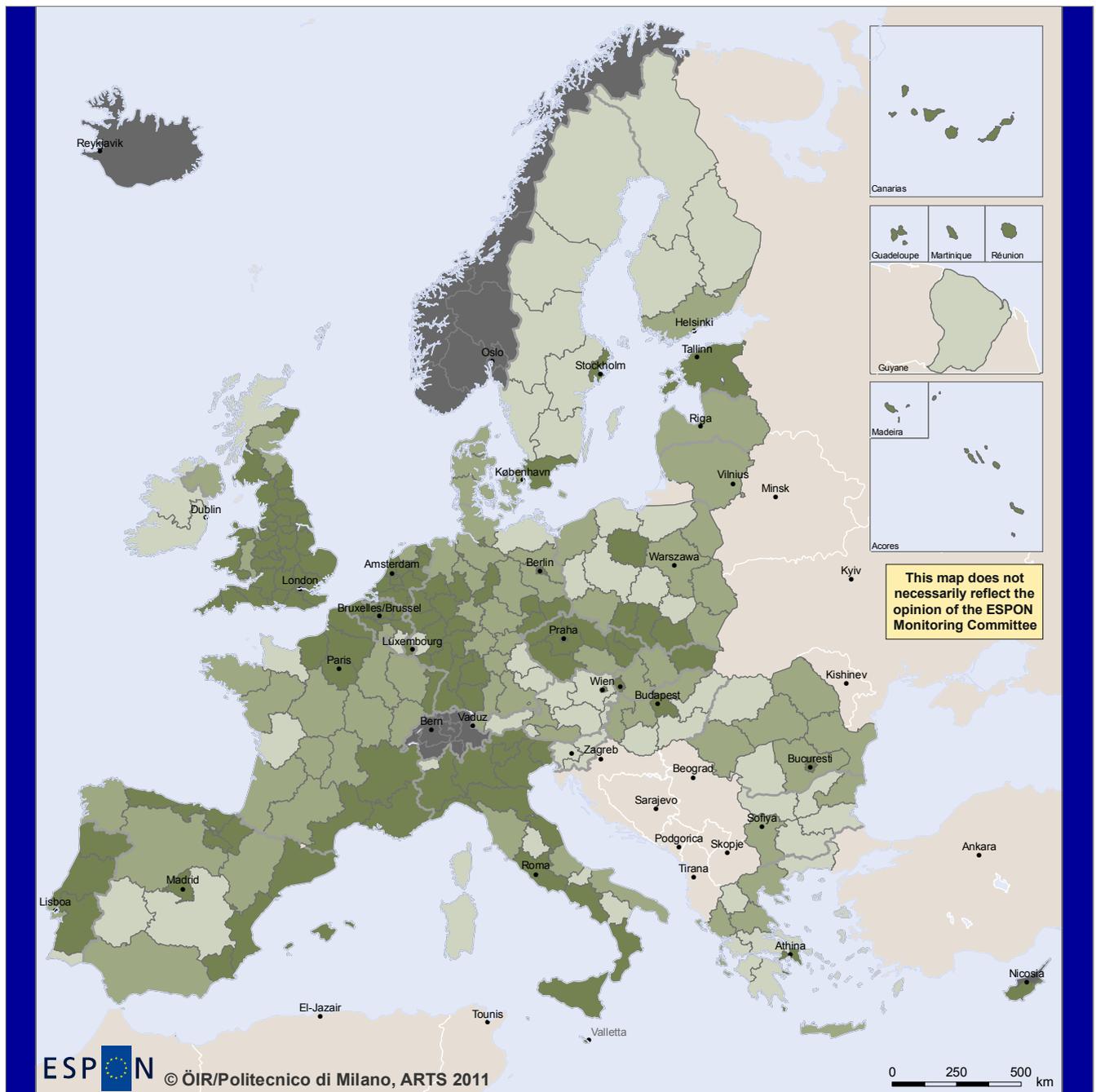
## Negative Impact



Types of regions affected: urban, agglomerated, densely populated, high density of road, high density of rail, major airport location

# Regions affected by Directive on managing environmental noise branch b

## Number of people exposed to noise (F25)




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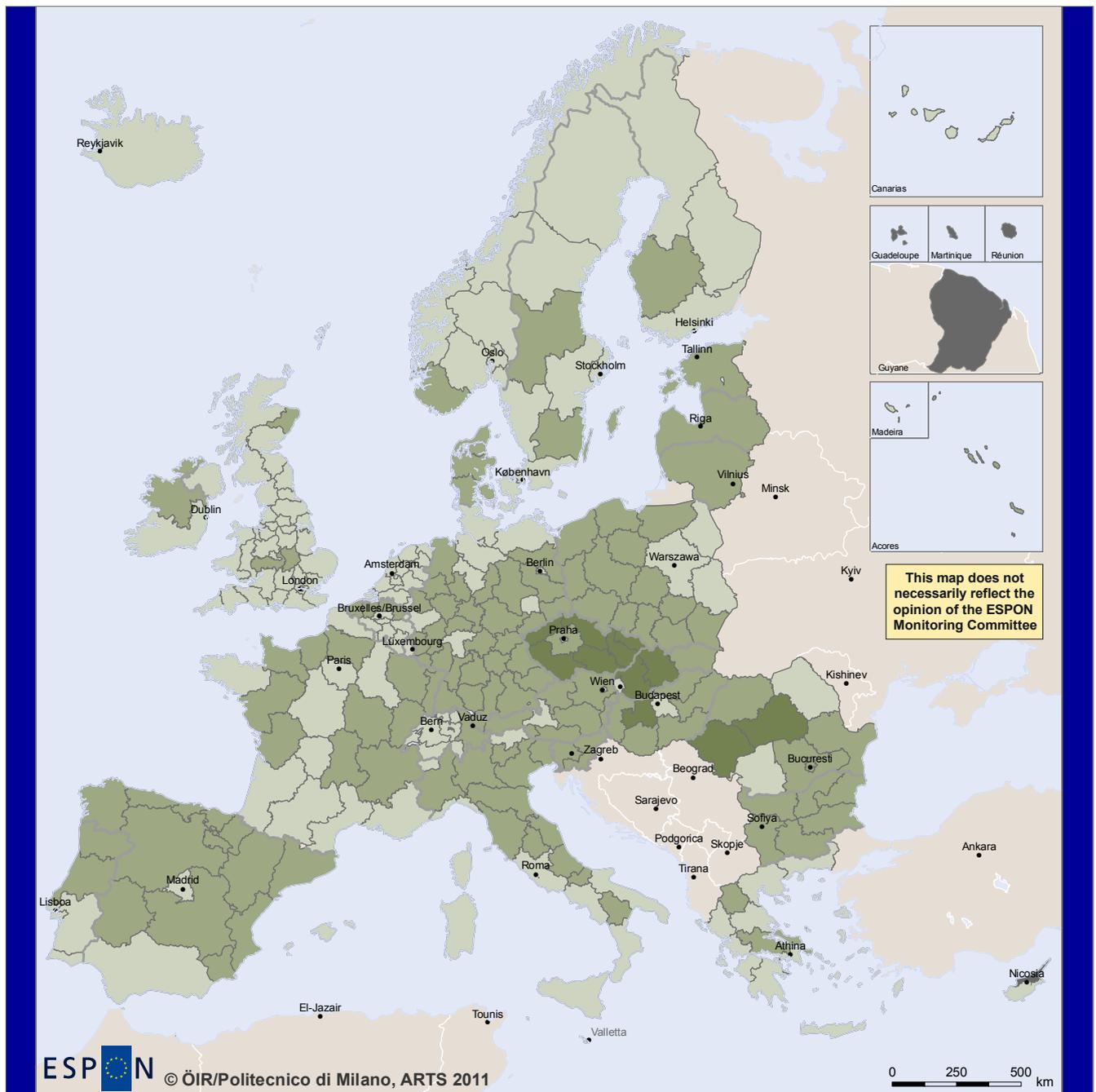
### Positive Impact



Types of regions affected: urban, agglomerated, densely populated, high density of road, high density of rail, major airport location

# Regions affected by Directive on managing environmental noise branch c

## Employment in secondary sector (F18)



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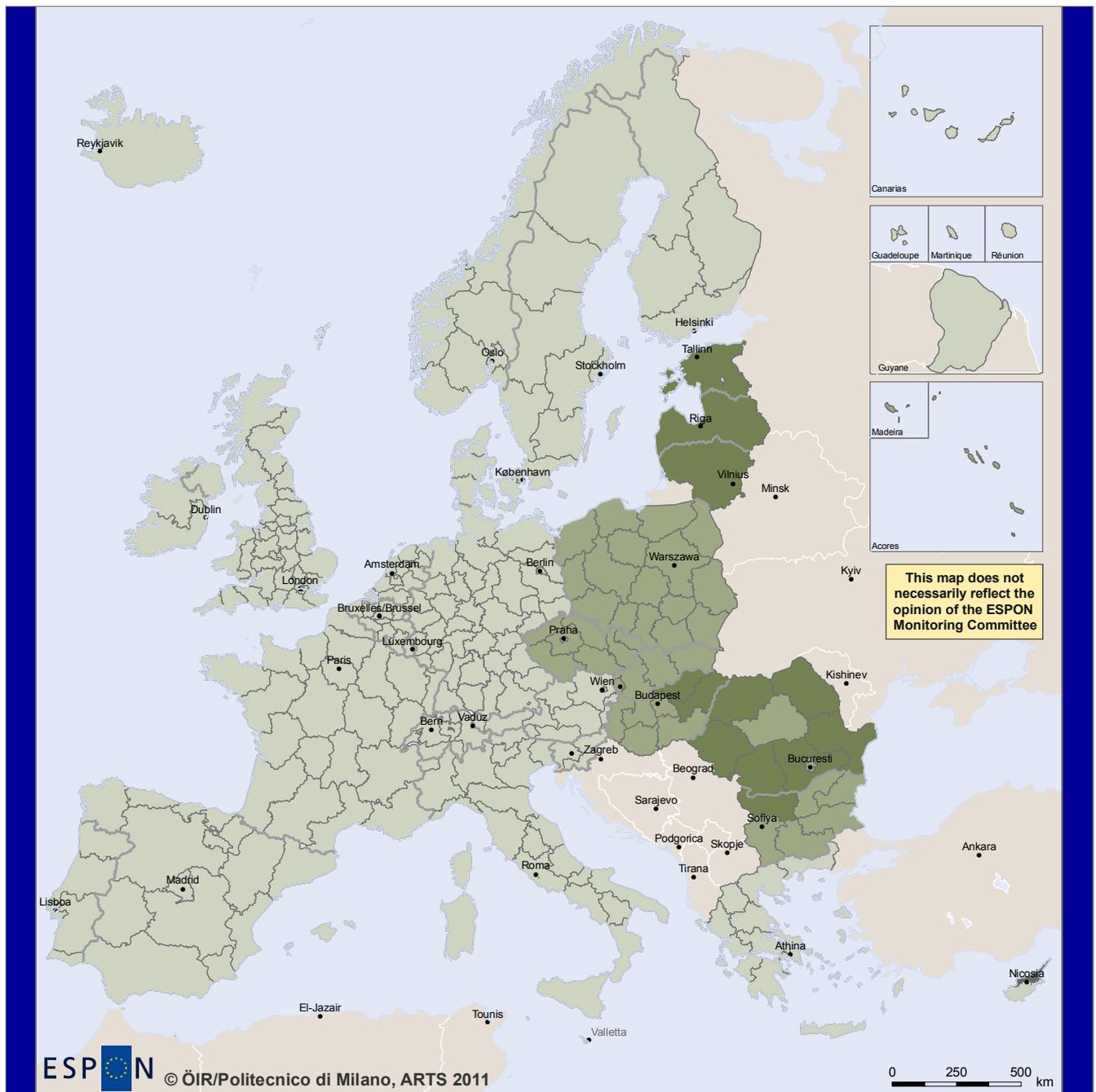
### Positive Impact



Types of regions affected: urban, agglomerated, densely populated, high density of road, high density of rail, major airport location

# Regions affected by Directive on managing environmental noise branch c

## Healthy life expectancy at birth (F28)



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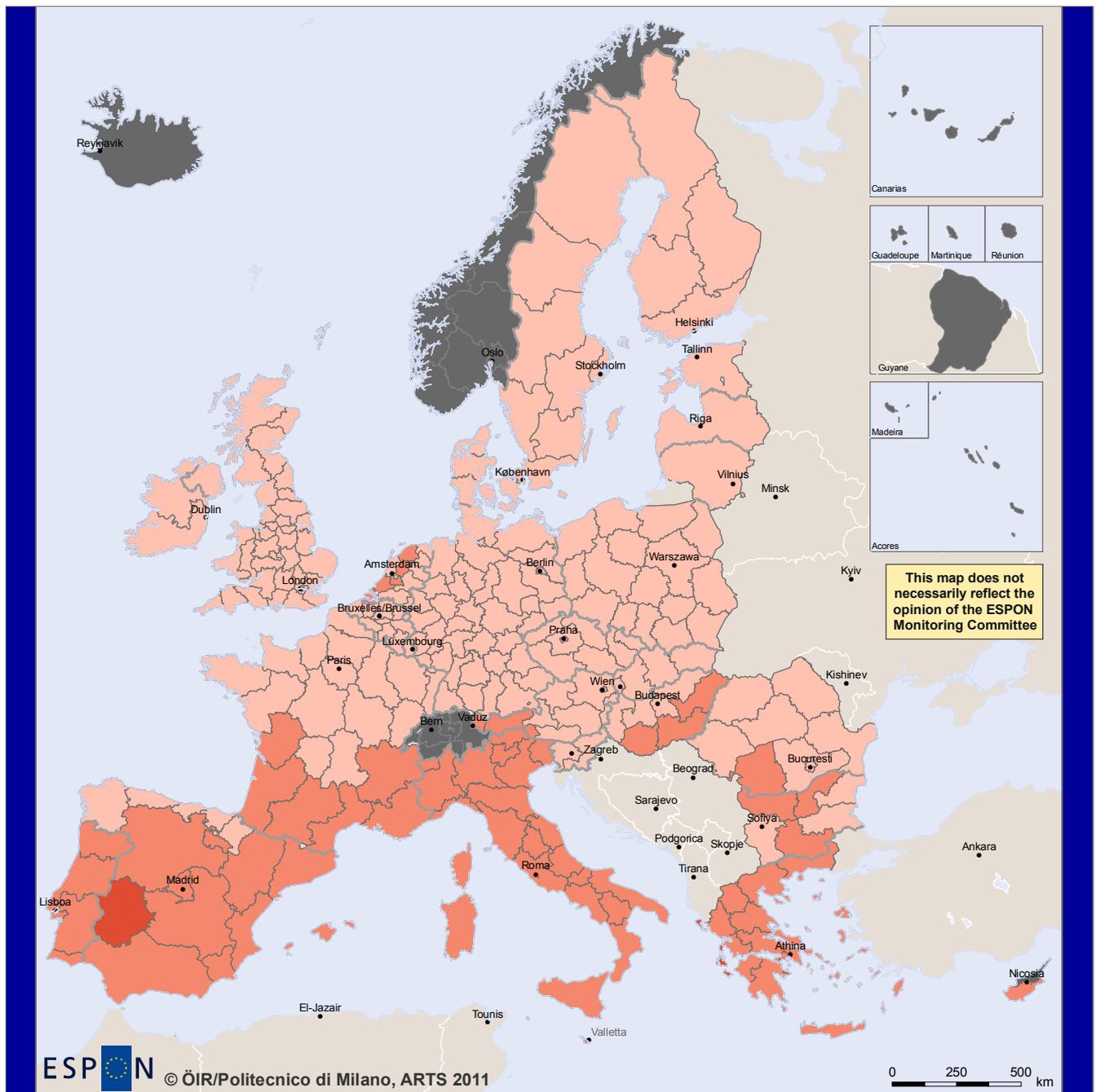
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### Positive Impact



Types of regions affected: urban, agglomerated, densely populated, high density of road, high density of rail, major airport location

# Regions affected by Directive on managing environmental noise branch c Fossil fuel consumption (F34)



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## Negative Impact



Types of regions affected: urban, agglomerated, densely populated, high density of road, high density of rail, major airport location

#### 4.2.4 Insights for policy options

Overall, not many negative impacts are expected to be evoked by this directive. The positive impacts outweigh the negative ones by far. There is however a difference in the extent of this beneficial impact depending on the kind of measures introduced within national jurisdiction and depending on the region's sensitivity in various fields.

The result of the territorial impact assessment – as realised in this project – allows to compare the different strategies and measures chosen by the member states for transposing the Directive.

With regard to the Directive on environmental noise, implementing traffic planning measures and providing financial incentives (**branch a**) show the least amount of negative impacts on the regions. Solely the accessibility of regions might be adversely influenced. On the other hand, the extent of benefitting effects can be observed on 11 indicators. Most of these indicators can be summarized as environmental but the highest impacts and the highest number of regions hit occur in health related fields.

However, the most positive impacts follow if the national government decides on technical measures (**branch c**) in order to fulfil the requirements of the noise directive. The immanent boost of manufacturing and R&D are particularly conducive to the regional economy and employment while at the same time the Directive succeeds in reducing the exposure to noise, benefitting human health and the habitat. Negative impacts on energy consumption and related environmental fields suggest a trade-off with the benefits of increased production.

The adoption of landscape planning measures (**branch b**) puts another complexion on things. In that case, the negative effects prevail the positive ones by far. The favourable effects on people's exposure to noise and transnational cooperation are thwarted by adverse impacts on accessibility, urban sprawl and subsequently on landscape diversity.

The analysis points to the implementation of policy measures, that integrate both technical and transport planning measures while at the same time providing financial incentives. Jointly pursued, regions can benefit not only in terms of improved conditions for human health, but also from growing economy with all its entailing socio-economic effects. Furthermore the disadvantageous impacts on the environment from installing technical measures can be countervailed by actions aiming at reducing the traffic volume.

### 4.3 Directives on the promotion of clean and energy-efficient road transport vehicles

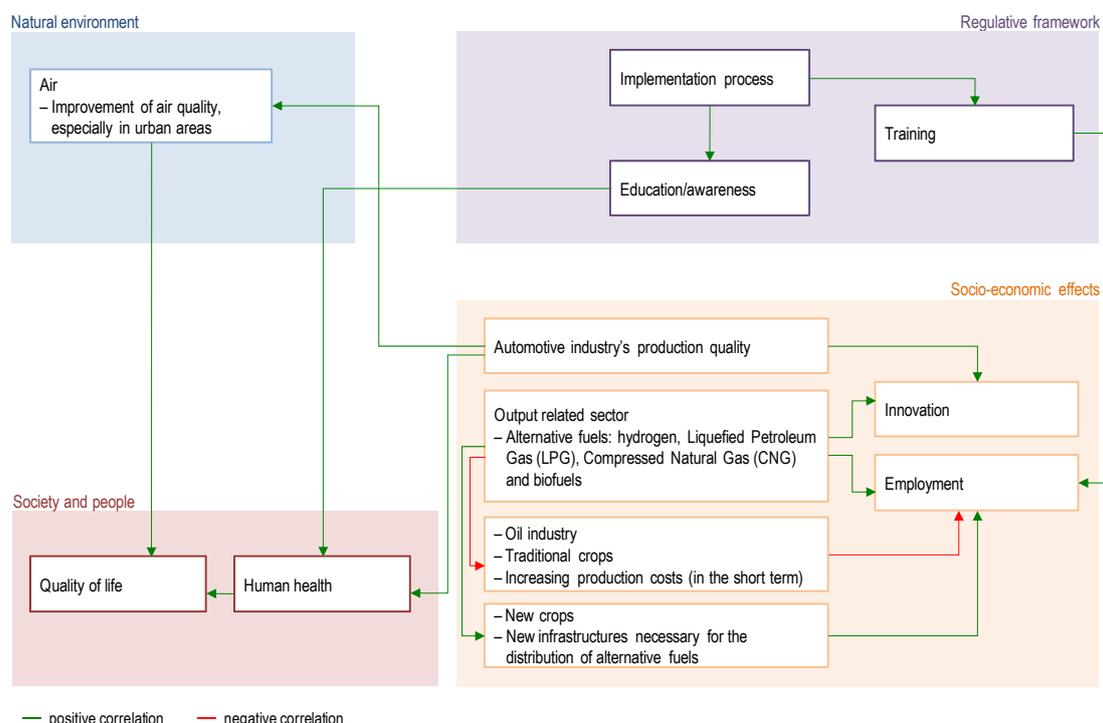
This directive aims at the introduction of specific measures in the transport sector to address energy use and greenhouse gas emissions with the ultimate goal of better integration of transport and energy policies. Specifically, this directive aims to stimulate the market for clean and energy-efficient road transport vehicles, namely standardised vehicles produced in large quantities such as passenger cars, coaches and trucks. Special attention is paid to the procurement of public-transport services. To this end, the directive includes a list of criteria to be met by vehicles purchased in accordance to public procurement rules. These criteria pertain to pollutants and lifetime energy and environmental impacts.

#### 4.3.1 The logical chain and exposure

The directive impacts are expected to follow two distinctive routes.

On the one hand, impacts are channelled on the demand-side through incentives for purchasing cleaner and more efficient vehicles. This is expected to lead to positive impacts on the natural environment in terms of lower emissions and pollutants in the air as well as reduced fossil-fuel consumption (branch a).

**Figure C 7: Logical chain of the directive**



On the other hand, impacts are channelled on the supply side through investment in and production of cleaner and more efficient vehicles. This is expected to influence employment and GDP and stimulate innovation in cleaner and green technologies (branch b).

These linkages are depicted in the figure above.

Various environmental exposure fields are hit in branch a of this directive, namely reduction of CO<sub>2</sub> emissions and the level of pollutants in air (PM<sub>10</sub>). This is linked to a moderate reduction on the dependency of fossil-fuel consumption. The impact is expected to be moderate since the directive does not aim at full substitution of the vehicle fleet, but addresses fleet renewal. Also vehicles can be considered as a substantial although not exhaustive component of CO<sub>2</sub> emissions.

On the other hand, the impact via the supply side (i.e. branch b) will be moderately positive on GDP and employment (namely in manufacturing) since it concerns a limited part of the manufacturing sector. Some impact may be expected on the share of arable area, permanent grass area and permanent crops areas since the extra production of biofuels may require an extension of cultivated areas. The impact on innovation is expected to be considerable as car producers invest more in alternative technologies.

#### **4.3.2 The regions affected by the directive**

We expect that the regions most affected by this directive are agglomerated regions in the first case, and regions with a considerable share of employment in vehicle production (identified as those regions falling in the top 25 percentile of the distribution of employment in vehicles production over total employment in manufacturing) in the second case. The rationale behind this expectation is as follows. In the first case, benefits from the directive will be particularly high in regions that are more congested and polluted, typically agglomerated ones. These regions cover mainly capital cities and highly densely populated regions in central Europe.

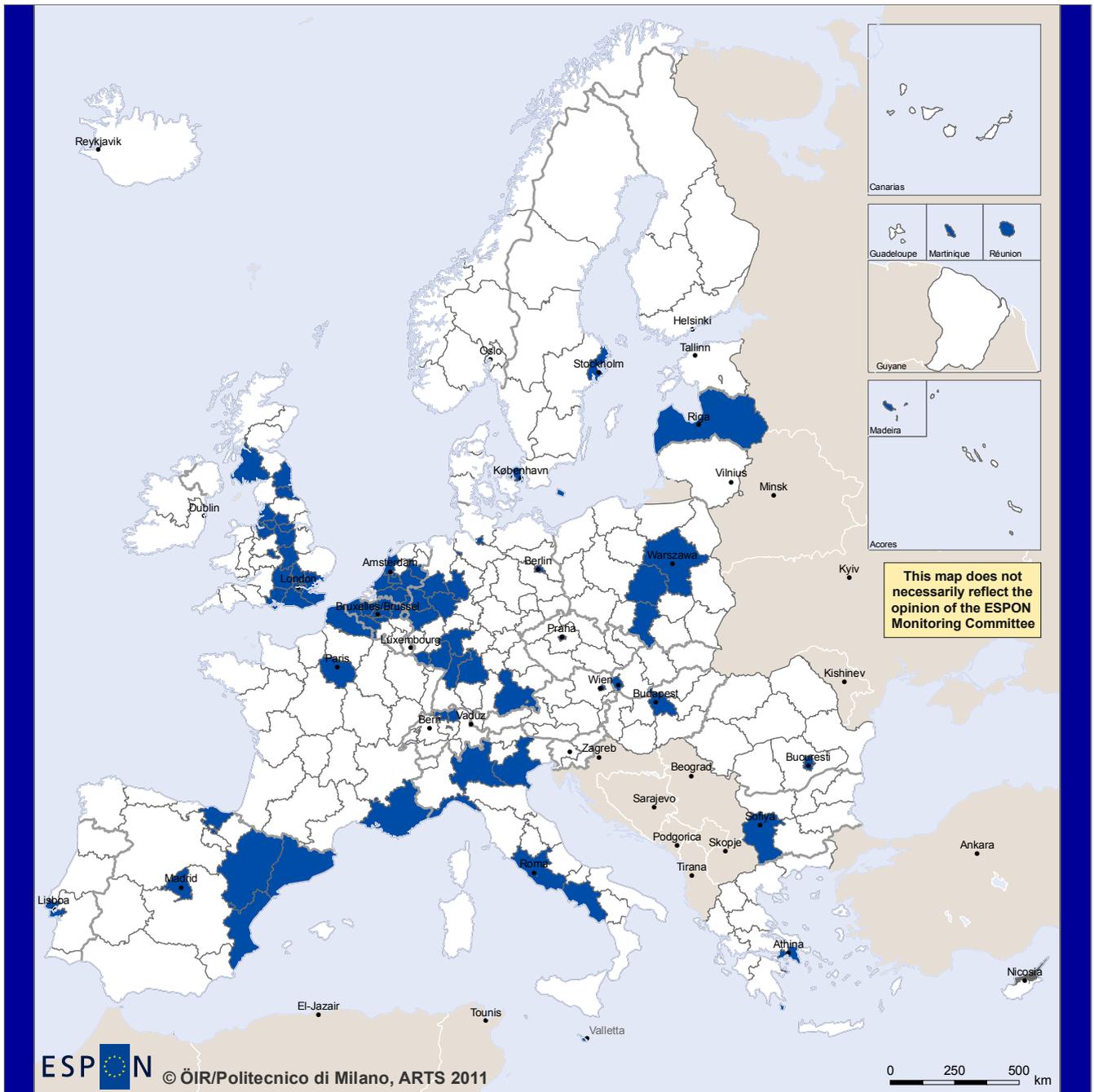
Conversely, benefits stemming from the implementation of this directive will mainly affect regions that are highly specialised in vehicle production. These may experience an increase in production and employment. These regions are also concentrated in central Europe, with some hotspots in Italy (namely Piemonte, Abruzzo, Molise and Basilicata), Spain (Galicia, Pais Vasco, Aragón, Castilla y León, Cataluña), France (Basse-Normandie, Nord–Pas-de-Calais, Franche-Comté) and British and Swedish regions in northern Europe. Also several eastern Europe regions look potentially affected by this directive especially in Slovakia, Poland, the Czech Republic and Hungary. The following map depicts the affected regions.

**Map C 15: Regions affected by directive on clean and energy-efficient road transport vehicles branch a**

**Map C 16: Regions affected by directive on clean and energy-efficient road transport vehicles branch b**

[following pages]

# Regions affected by Directive on clean and energy-efficient road transport vehicles branch a



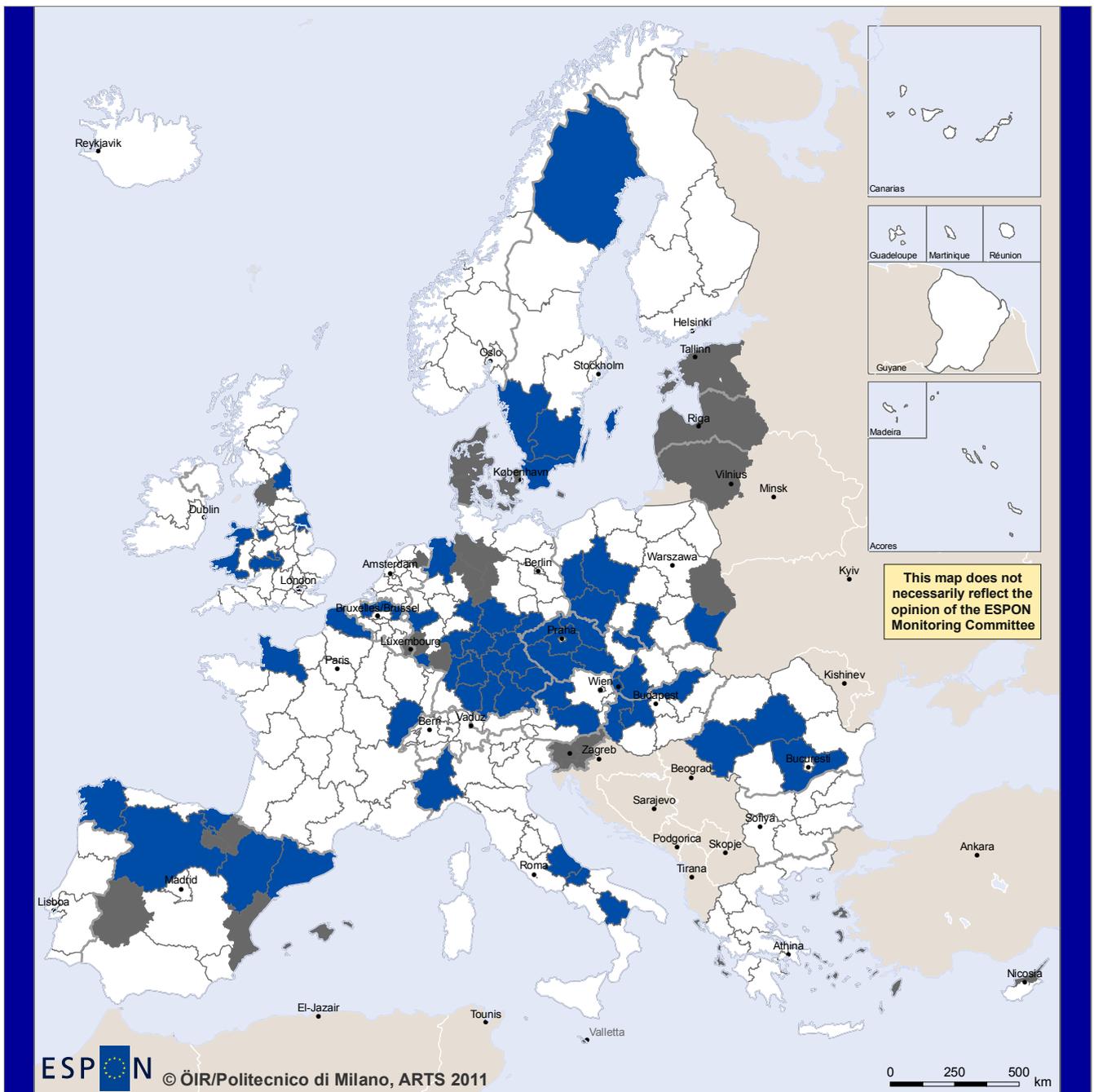

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-  Neighbourhood Countries
-  No Data

Types of regions affected: agglomerated

# Regions affected by Directive on clean and energy-efficient road transport vehicles branch b



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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: highest share of employment in automotive

### 4.3.3 The Territorial impact of the directive

Looking at the impacts on the demand side, this directive seems to produce minor positive impacts (i.e. a reduction of) on pollutants in air (F6) with the exception of Bucaresti that highly benefit from it. Similarly, impacts on the emission of CO<sub>2</sub> (F7) will be positive but minor with the exception of Brussels Capital Region and Ciudad Autónoma de Melilla (moderate) and Inner London (high). Lastly, impact on fossil fuel consumption (F34) will be again positive and minor but a larger number of regions seem to be moderately hit in Italy (Liguria, Lombardia, Veneto, Lazio, Campania), Spain (Aragón, Comunidad de Madrid, Cataluña, Comunidad Valenciana), and other Mediterranean regions (Provence-Alpes-Côte d'Azur, Attiki, Malta, Lisboa), as shown in Map C 17 below.

Looking at impact on the supply side, this directive seems to produce minor positive impacts on economic growth (F12) in all regions with the exception of five regions in eastern Europe (Észak-Magyarország, Podkarpackie, Centru, Sud, Vest) showing moderate impacts, as depicted in Map C 18 below. Here the influence of the sensitivity adjustment is clearly visible. Impacts on innovation (F13) are expected to be positive and high and (mostly) very high across all regions influenced by the directive. Also, impacts on the share of arable area (F17) will be overall positive and minor, ranging to moderate in some German and Czech regions as well as in some Polish, Romanian and Hungarian ones and high in a few regions (Basse-Normandie, East Riding and North Lincolnshire, Herefordshire, Worcestershire and Warwickshire) (Map C 19 below). Finally, impacts on employment in manufacturing (F18) are expected to be largely minor and moderate being high only in some eastern regions in the Czech Republic, Hungary, Slovakia and Romania (Map C 20 below).

Overall, in branch a, the model did not predict high negative impacts, and high positive impacts are limited to two regions only (and on one impact field only): Inner London and Bucaresti. In branch b, no high negative impacts were generated either. Other than branch a, most regions experience high positive impact on one indicator (53 out of 64 exposed regions) and some on two indicators (11 out of 64 exposed regions), namely in the Czech Republic, Hungary, Slovakia and Romania.

### 4.3.4 Insights for policy options

This directive touches on a very relevant aspect connected to the green economy (i.e. the shift towards clean and energy-efficient transport vehicles) and highlights two routes along which European directives may eventually show territorial impacts: the supply and production side on the one hand and the demand and adoption side on the other.

Interestingly, the impacts of the two branches look always positive and never offset each other (i.e. substitution effect). Instead, they seem to cumulate and to reinforce each other (i.e. complementary effect). This suggests that policy measures

undertaken in the frame of the two branches could be jointly promoted and pursued to better exploit the potential benefits accruing from the directive. This also suggests that policy options in this specific field should be conceived and developed in accordance with this double channel of impact.

In particular, policies may initially be aimed at stimulating the production side, for example through the support to investments in research and innovation to develop and produce more advanced and efficient (i.e. greener) technologies for transport vehicles. Next, and perhaps once technologies become sufficiently stable and affordable, policies may be aimed at stimulating the adoption side. This could be done at the European level either through additional ad-hoc directives or by specifically envisaging policy instruments in the new Structural Funds allocation in the upcoming Financial Perspective. Especially in this regard, coordination among member states in support of the adoption of greener technologies in transport seems crucial in order to limit selective and uneven adoption patterns across the European territory.

Finally, our analysis points to the potential connection and integration of this directive with policy measures influencing the production and adoption of other green technologies, especially in the energy sector (e.g. biomass, biofuels). In particular, this approach highlights the link of this directive with agricultural and energy policies since it has direct effects on the share of agricultural lands and may also introduce a shift in the crops been cultivated in order to meet a potentially increasing demand of biofuels.

**Map C 17: Territorial Impact of Directive 11 (branch a) on fossil fuel consumption**

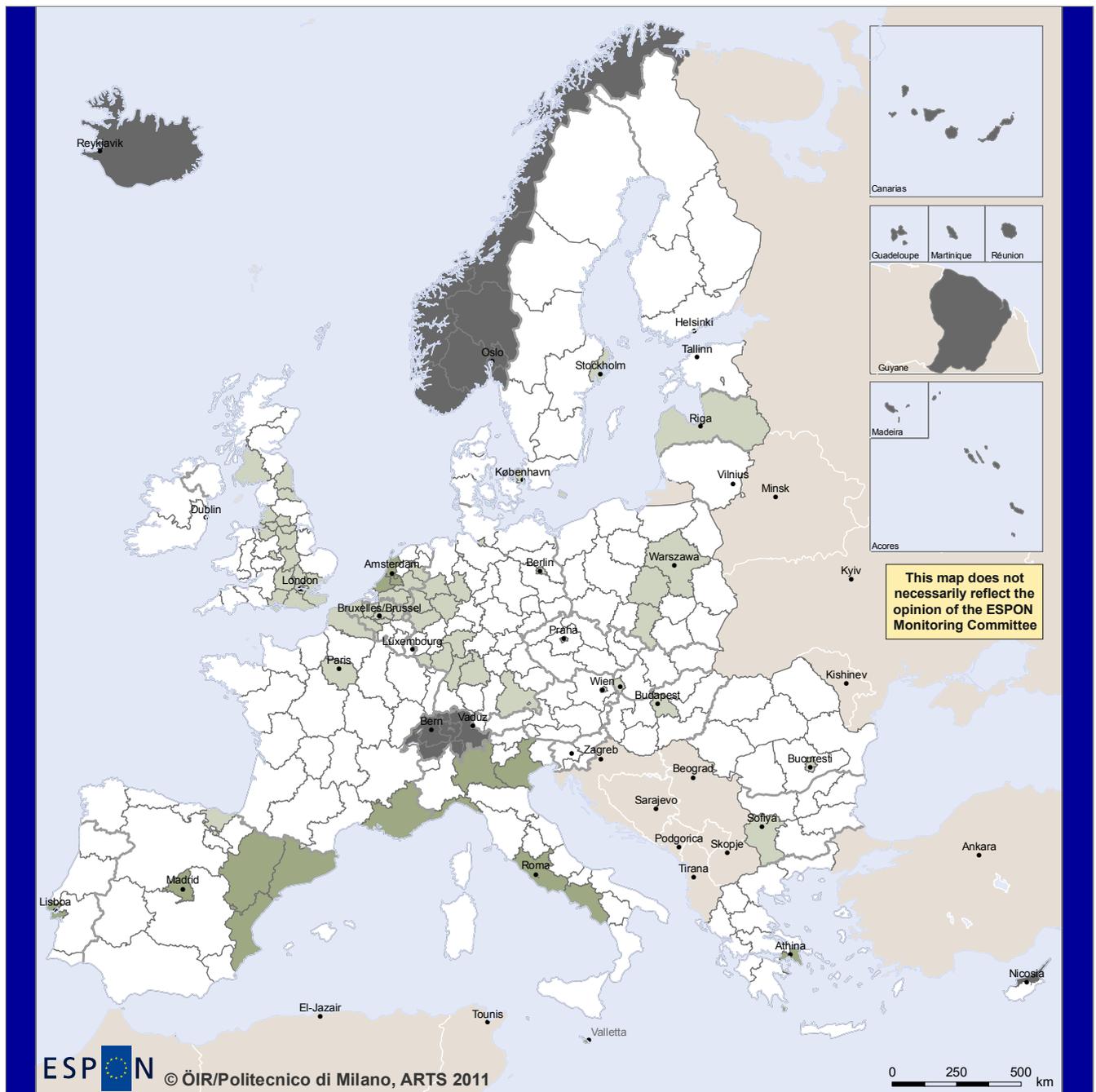
**Map C 18: Territorial Impact of Directive 11 (branch b) on economic growth (GDP/capita)**

**Map C 19: Territorial Impact of Directive 11 (branch b) on innovation**

**Map C 20: Territorial Impact of Directive 11 (branch b) on employment in secondary sector**

[following pages]

# Regions affected by Directive on clean and energy-efficient road transport vehicles branch a Fossil fuel consumption (F34)



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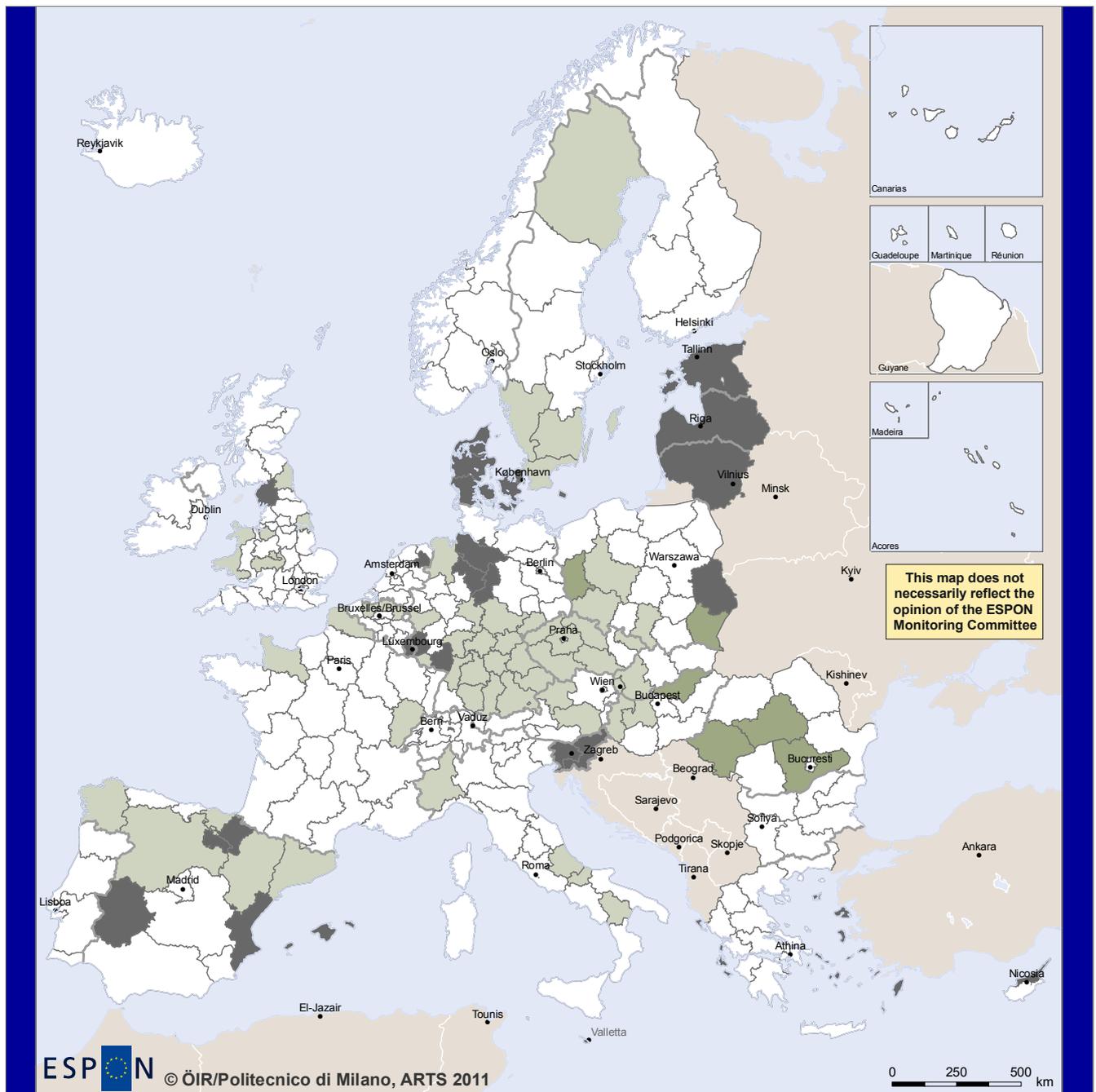
## Positive Impact



Types of regions affected: agglomerated

# Regions affected by Directive on clean and energy-efficient road transport vehicles branch b

## Economic growth (GDP/capita) (F12)



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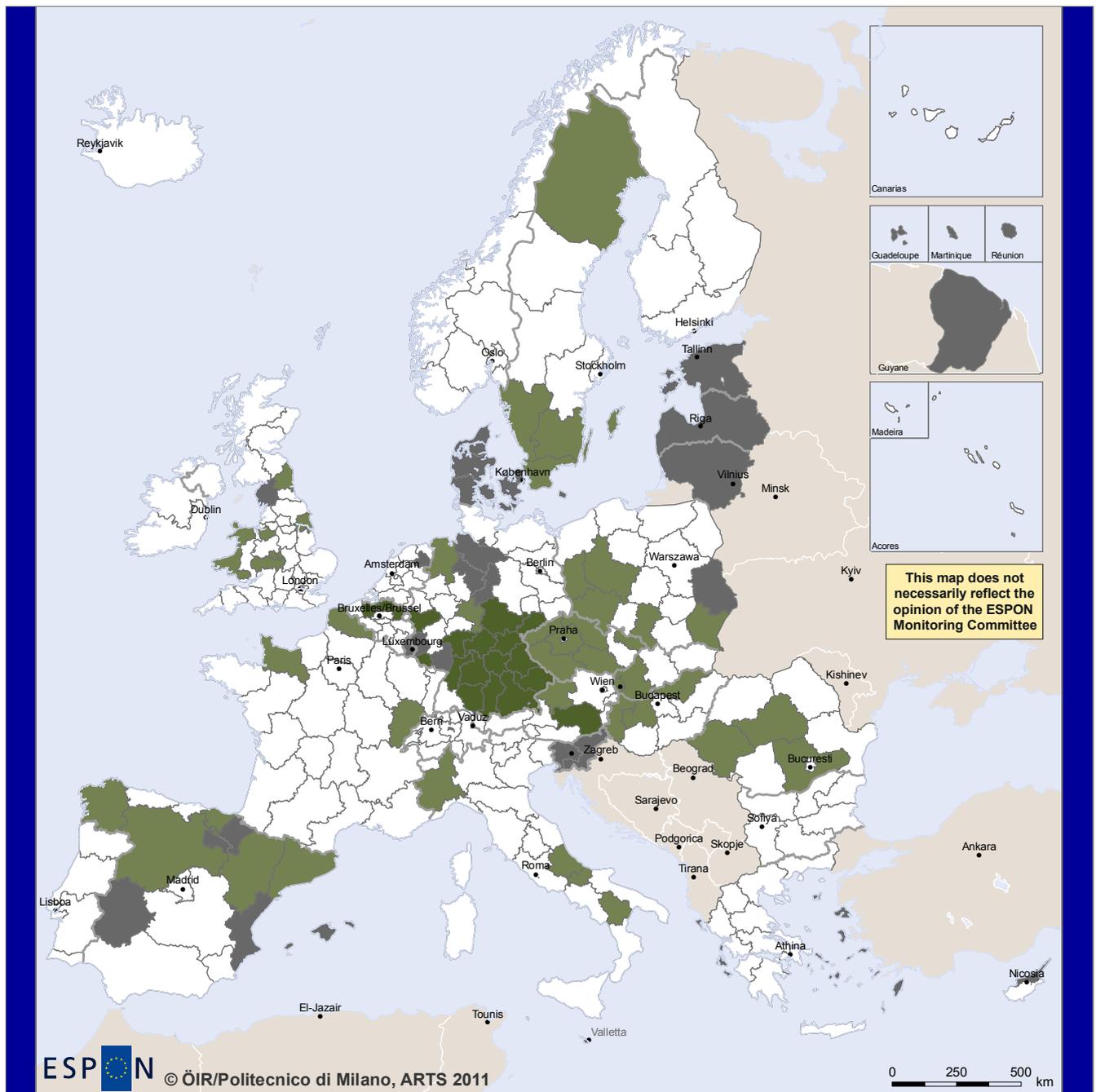
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### Positive Impact

- |   |                  |   |                         |
|---|------------------|---|-------------------------|
|  | Very high impact |  | No Data                 |
|  | High impact      |  | Neighbourhood Countries |
|  | Moderate impact  |   |                         |
|  | Minor impact     |   |                         |
|  | Not affected     |   |                         |

Types of regions affected: highest share of employment in automotive

# Regions affected by Directive on clean and energy-efficient road transport vehicles branch b Innovation (F13)



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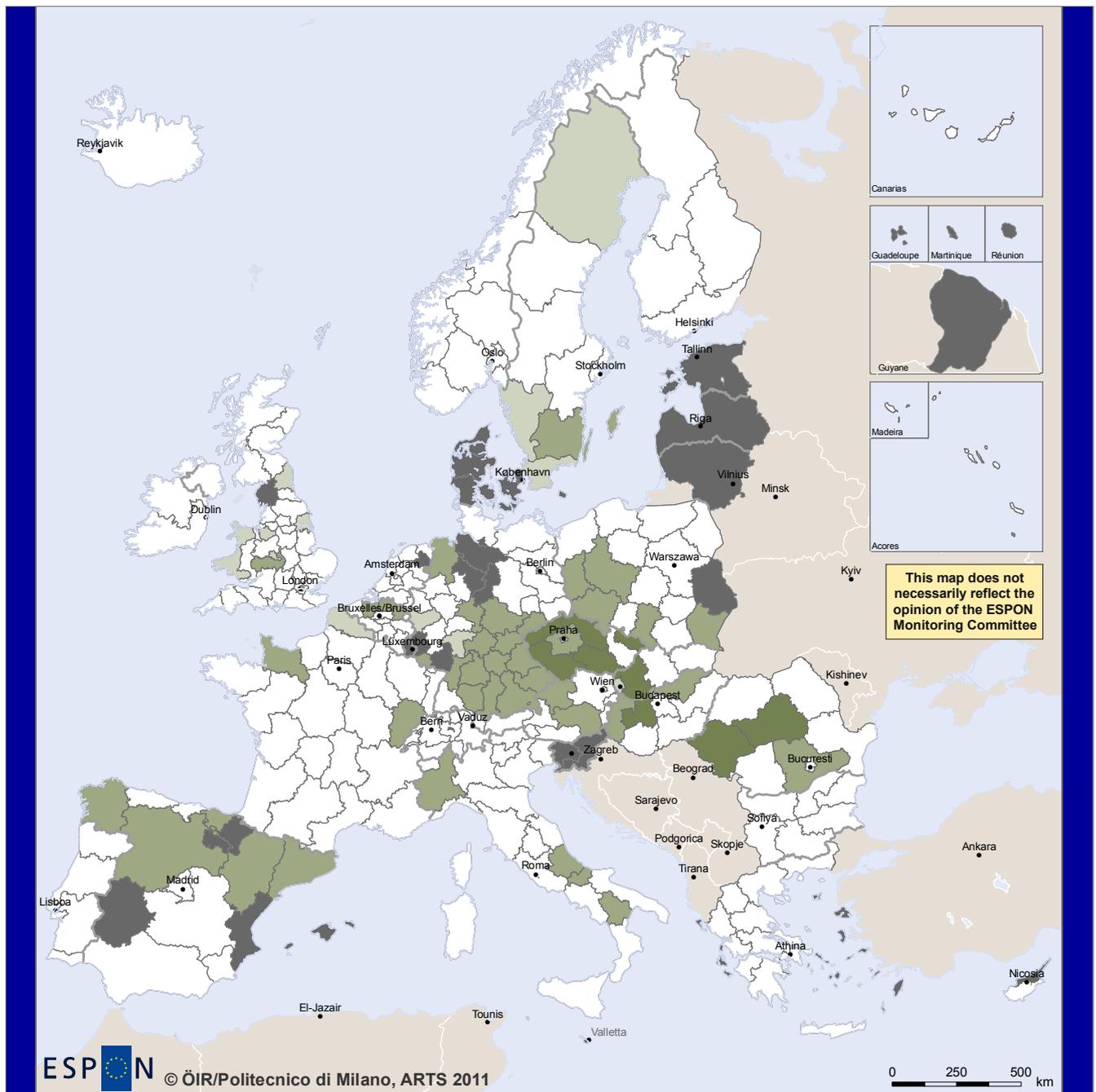
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## Positive Impact



Types of regions affected: highest share of employment in automotive

# Regions affected by Directive on clean and energy-efficient road transport vehicles branch b Employment in the secondary sector (F18)




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## Positive Impact



Types of regions affected: highest share of employment in automotive

## **5 Detailed results of the Case Study Directives**

### **5.1 Directive establishing a framework for Community action in the field of water policy**

The Water Framework Directive (WFD) concerns a comprehensive package of regulations on water. It applies to all types of inland water, including ground, transitional (i.e. from sweet to salt) and coastal waters. It therewith covers the entire water system, from spring to sea and from sweet to salt and provides a uniform regulatory framework for the management and protection of water across the European Union.

#### **Logical chain and exposure**

Its main aim is to secure good water quality. The focus is on chemical, system, nutrients and ecological quality indicators. The background is that water is a vital resource for both humans and nature. The aims and objectives of the WFD overlap greatly with existing EU (and domestic) policies, such as Natura 2000, Swimming water directive and the Nitrate directive.

In order to reach the overall aim, the WFD focuses on a number of indicators: chemical quality (priority hazardous substances), nutrients (phosphorous, nitrogen), ecological/aquatic quality (plants, algae, micro and macro fauna, and fishes) and the condition and morphology of water system. Groundwater levels and quality influence amongst others ecological quality of surface water bodies. The WFD has high ambitions too for the marine water environment and aims at the complete elimination of priority hazardous substances.

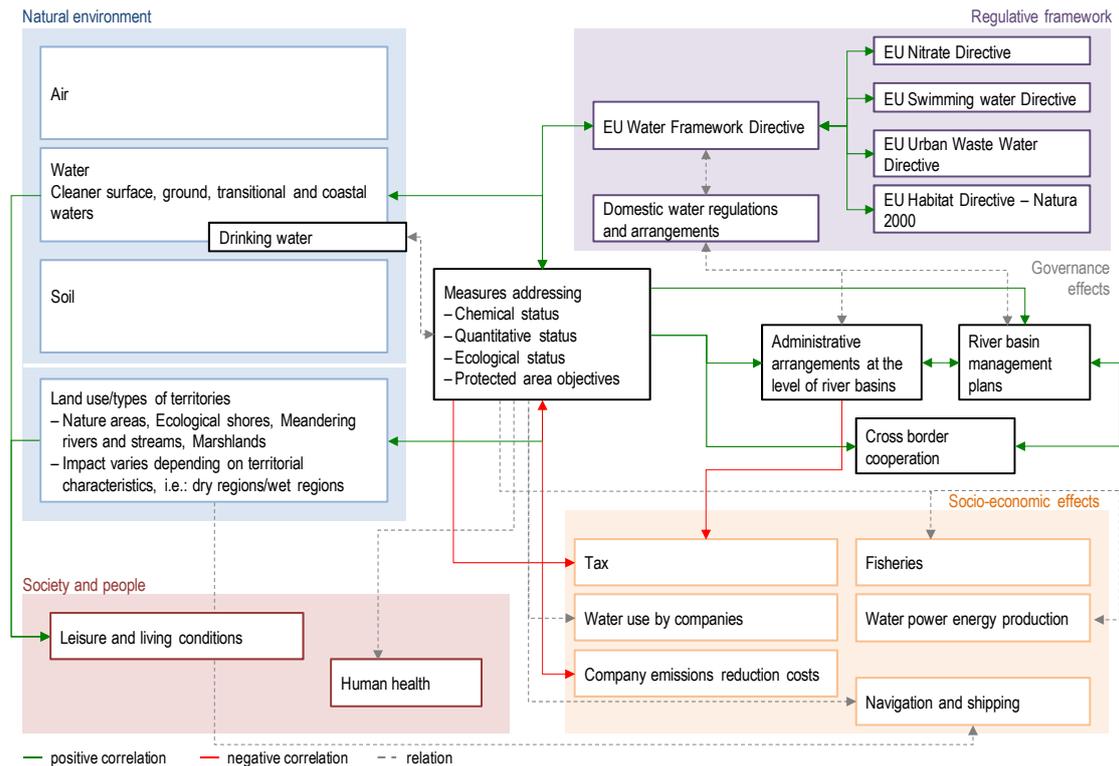
To achieve these goals member states are required to develop water management plans at a water (river) basin level, by 2009. These plans outline the measures and instruments taken in order to achieve the objectives. A good ecological and chemical water quality should be achieved by 2015 or at maximum by 2027 in case of technological constraints or excessive costs. There is a possibility for exception subject to convincing argumentation. In so doing a reasonable balance is to be achieved between water quality objectives and costs.

Plan development at river basin level requires coordination between national and regional level as well as cross border. Also the WFD requires the participation of stakeholders in setting objectives and plan development.

The WFD has significant territorial impact. The WFD applies to the complete water system in Europe which means that all regions in Europe will be impacted to some extent. It means that in all areas where water quality does meet the thresholds additional measures are to be taken. Measures range from filtering, end-of-pipe

solutions, ecological improvement, restoring traditional morphology to, finally, change or restrictions on certain types of land use, for example agriculture (F16/F17). The overall territorial impact should in particular benefit environmental aspects, such as a reduction of pollutants in ground and surface water (F5), biodiversity (F9), reduction of flood hazards (F8) and conservation of natural heritage (F10). What is not clear is the whether the WFD will have consequences for shipping purposes, the production of hydro energy and inland fishing industry.

**Figure C 8: Logical chain of the directive**



Due to the requirement of developing management plans at the level of water basins the WFD requires a redefining of the EU territory in terms of functional boundaries that follow the water system. This means that in regions where there already was a governance system for water management this system may need to attune to the logic of water basins, if it not did so already. Regions that do not have a water management governance system will need to install such a system. Since regional jurisdictions do not always neatly overlap with functional water basin boundaries, regions may be forced to co-operate with each other and develop joint water management plans. Where water basins cross national borders regions need to start to co-operate with regions in neighboring countries that make part of the same water basin. In the case of large rivers that flow through various countries this means that multinational co-ordination bodies need to be established. Changes upstream have impact on downstream regions. This is in particular apparent in the context of high rise water and flooding (subject to a WFD daughter directive on water flooding), but

also with regard to pollution. An infamous case was the accident in the Sandoz Chemical plant, Basel, in 1986 that caused a massive chemical pollution of the Rhine. Significant impacts are to be expected in the fields of efficient governance system (F37), complexity of planning procedures (F38) and cross-border cooperation (F41)

### **The regions affected by the directive**

Given the objectives relating to chemical and ecological water quality it is possible to become more specific about regions that will be affected relatively more thoroughly than others due to specific territorial characteristics and land uses. This concerns regions where the water quality is relatively bad or under pressure due to intensive and/or polluting territorial functions. Regions that will be relatively highly affected concern:

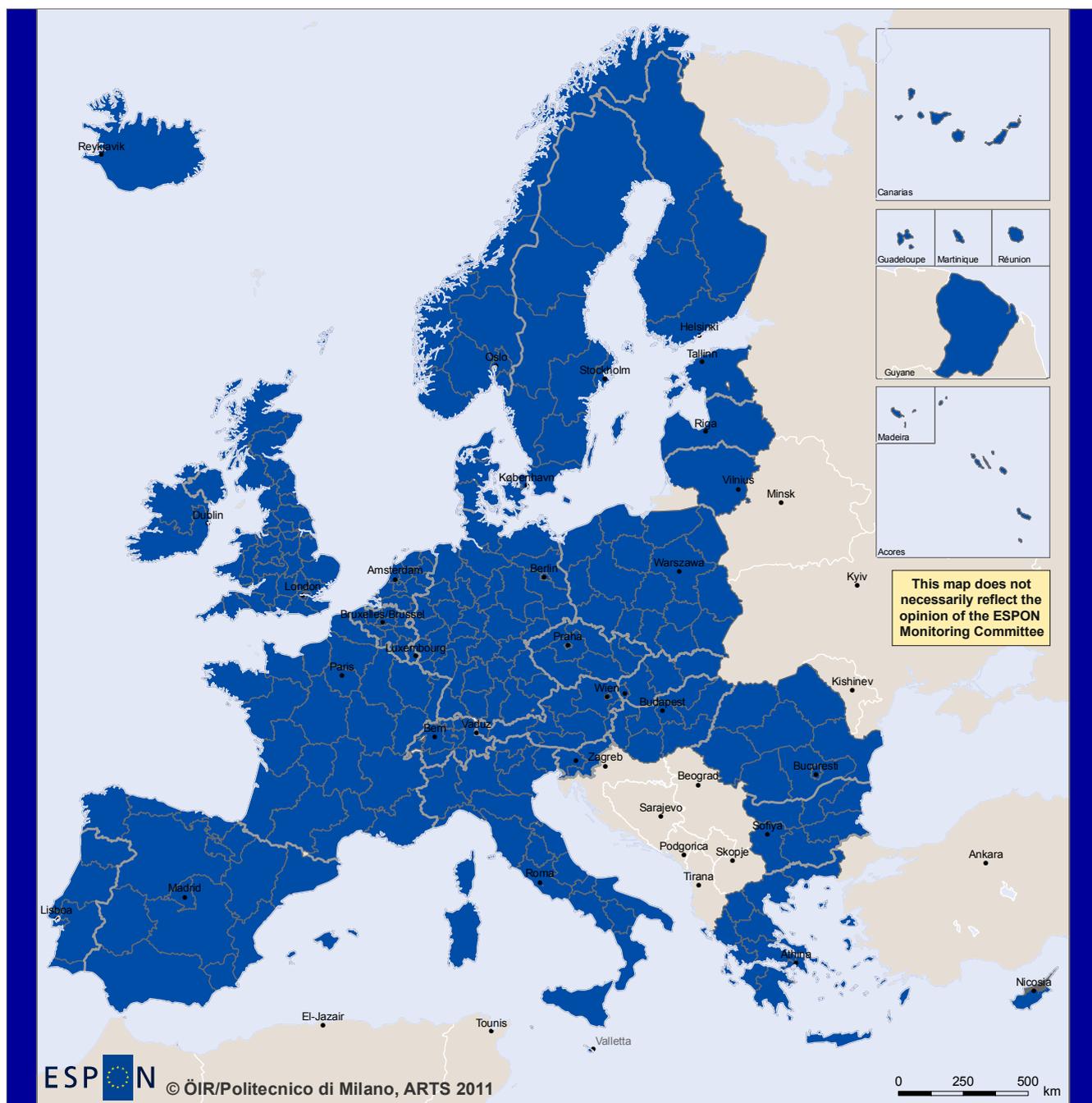
- Regions with a high share of agriculture
- Urbanized regions
- Regions with high share of inland water

The following map depicts the regions affected.

### **Map C 21: Regions affected by Waterframe Directive**

[following page]

# Regions affected by Waterframe Directive



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-  Affected
-  Not Affected
-  Neighbourhood Countries
-  No Data

Types of regions affected: all regions

## **The Territorial impact of the directive**

The WFD will have positive impacts in several areas: the natural environment, water consumption and probably in terms of employment in the tertiary sector. Whereas Natura 2000 areas will benefit all over the board, mainly in terms of biodiversity, a smaller selection of regions will benefit in terms of conservation of natural areas as such. As regards water consumption only the large metropolitan areas will benefit. At the same time, however, this positive impact is reflected by significant investments, or costs, that are necessary to reach this situation. Also in terms of growth in the tertiary a limited number of regions will benefit.

In terms of negative impact we see impacts in the fields of arable land, employment in the primary and secondary sector and in terms of disposable income. The latter is the case in terms of additional tax raising that will be necessary to forward the various measures of the WFD. Only in terms of arable land most regions across Europe will be hit significantly. The reason is that less use can be made of pesticides and fertilizers which may negatively influence water quality and are difficult to monitor due to their diffuse nature.

Such functions concern: industry and agriculture (F16/F17), which generally cause pollution to surface and ground water (F6). In particular regions where intensive agricultural production, which in contrast to industry cause a dispersed pattern of pollution, takes place will be impacted. Following the available indicator and data, in this case ESPON data, much of the EU territory can be characterized as agricultural and is expected to be concerned. In terms of regional differentiation it could be expected that in particular areas with intensive agriculture will be influenced as well as areas where agricultural sector is one of the main sources of income. With the current data, however, this is difficult to show. Interestingly, the indicator 'agriculture as part of GDP' points out that in particular in highly urban areas, such as Vienna, Brussels, Ile de France, Inner London, rather than in rural areas, the share of agriculture is significantly higher. This counterintuitive outcome probably can be explained from the fact that agricultural products are traded in these urbanized areas where also the headquarters of large food multinationals are located.

Other types of land where water quality is under pressure concern urbanized regions in general which produce considerable amounts of urban waste water. It means that in these regions the WFD will have a high positive impact in terms of a reduction of pollutants in surface and groundwater. This is also the outcome of the model (F5). At the same time it has to be realized that the reduction of pollutants requires significant effort. This means that the outcomes (of F5) could also be read inversely, i.e. as negative impact. The outcomes then show the regions where additional investments are required.

A last type of region where impact can be expected is simply those regions with a high share of natural water bodies as a percentage of the total surface. Such regions are more prone to water quality issues. Moreover such regions will need to spend

considerable effort in maintaining the ecological and morphological conditions of the water system.

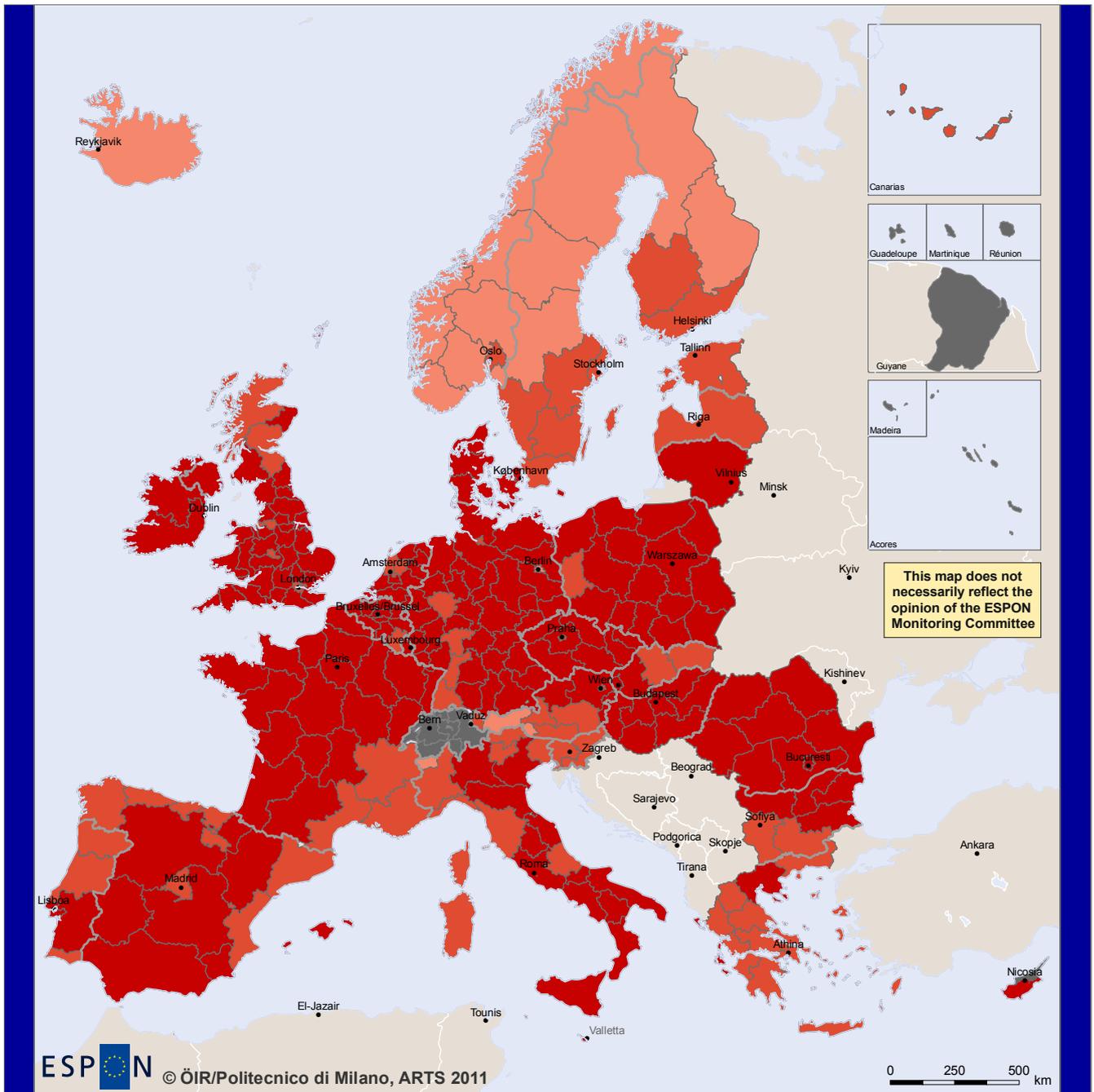
The ambitions of the WFD are high and generally exceed those of individual member states. Regions that are highly impacted by the WFD will be required to make considerable additional effort in order to comply with the objectives. It is to be expected that this translates in higher taxes (F40), and thus slightly lower disposable income (F21), in order to fund these efforts.

**Map C 22: Territorial Impact of Directive 2 on the share of agricultural areas**

[following page]

# Regions affected by Waterframe Directive

## Share of arable area, permanent grass area, permanent crops area (F17)



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### Negative Impact



Types of regions affected: all regions

## **5.2 Directive on the control of major-accident hazards involving dangerous substances (so-called Seveso II Directive)**

This Directive is aimed at the prevention of major accidents that involve dangerous substances, and the reduction of their effects for man and the environment. It also aims at ensuring high levels of protection throughout the Community in a consistent and effective manner.

### **Logical chain and exposure**

This directive induces a comprehensive regulative framework. The operator of plants dealing with dangerous substances must notify the competent authority of the particular member state about its establishment and installation. He also has to submit reports covering safety issues as well as the operator's major-accident prevention policy. In addition, internal as well as external emergency plans must be prepared. The public must have access to the safety report and be able to voice its opinion about the planning of new plants and developments around existing establishments. The appointed competent authority's assigned tasks are to monitor and inspect the establishments and to provide information to other member states and the public in cases of major accidents. This introduction of new administrative tasks has two implications. First, it increases the potential for transnational cooperation (F41) and mitigates the risk of major-accident hazards (F27) and hence increases the efficiency of governance (F37). Second, it complicates operations, leading to increased consumer prices and consequently a decline in household disposable income (F21).

The member states have the option to influence land-use planning depending on the situation. After the establishment of a site, it may opt to limit residential land use in the area or zone land for nature, which could reduce mixed-land use (F36), leading to isolated industrial districts and emigration. Before the establishment, options range from prohibiting the installation to specific measures to protect the ecosystem.

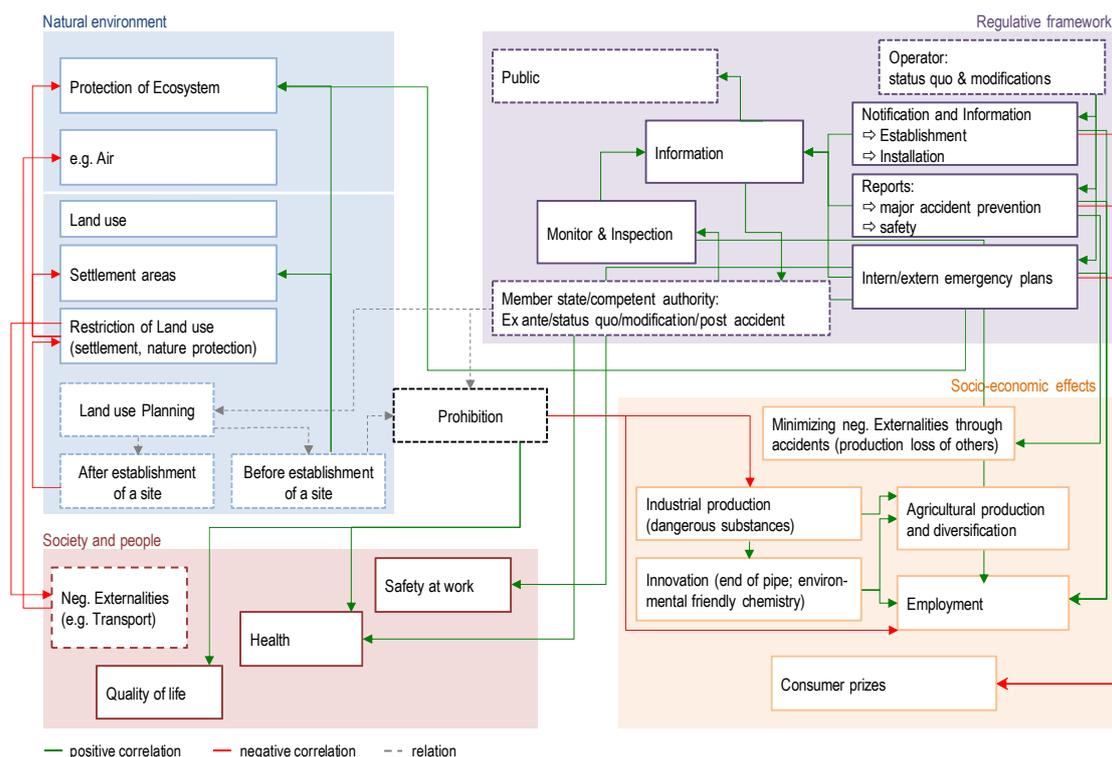
These measures have effects on the regional economy. They form market barriers (F15) and hamper production in industries related to the directive, but at the same time they can stimulate innovation (F13) in end-of-pipe technologies and environmentally friendly and safer chemical products. In the industrial sector (F18) there is expected to be a balance between the loss of jobs in hazardous industries and the gain of workplaces in end-of-pipe technology. In the service sector, people will be needed to deal with the enlarged administrative tasks (F19). In agriculture, environmentally friendly chemical products require increased production and diversification as an input which increases the need for employment in that sector (F16).

The directive's most direct effects are on the environment (F2, F5, F6, F9) and human health in case of an accident with hazardous substances. Better and more

efficient repair measures should have positive effects on the quality of soil, water and air and is expected to ameliorate general health (F28) as well as safety at work.

According to the logic of the logical chain, the directive is likely to have an effect on several fields (18 fields out of 41). Most of these effects can be considered positive for the regions. Only three fields are negatively influenced: mixed land use (F36), soil sealing (F3) and disposable income (F21). The highest positive effects occur on human health (F28) and transnational cooperation (F41).

**Figure C 9: Logical chain of the directive**



### The regions affected by the directive

This directive principally affects those regions where establishments dealing with dangerous substances are located. The mere presence of these potentially harmful substances implies a risk of accidents. Natural hazards can also play a part in setting off major accidents, e.g. the nuclear power plant accident in Fukushima in the aftermath of an earthquake. Hence, we expect regions showing a high technological or environmental risk to be more likely to be affected by this directive.

We identify those regions as those falling in the top 10 percentile of the technological or environmental risk distribution of the aggregated hazard typology (based on 15 hazard indicators) developed within ESPON Project 1.3.1.

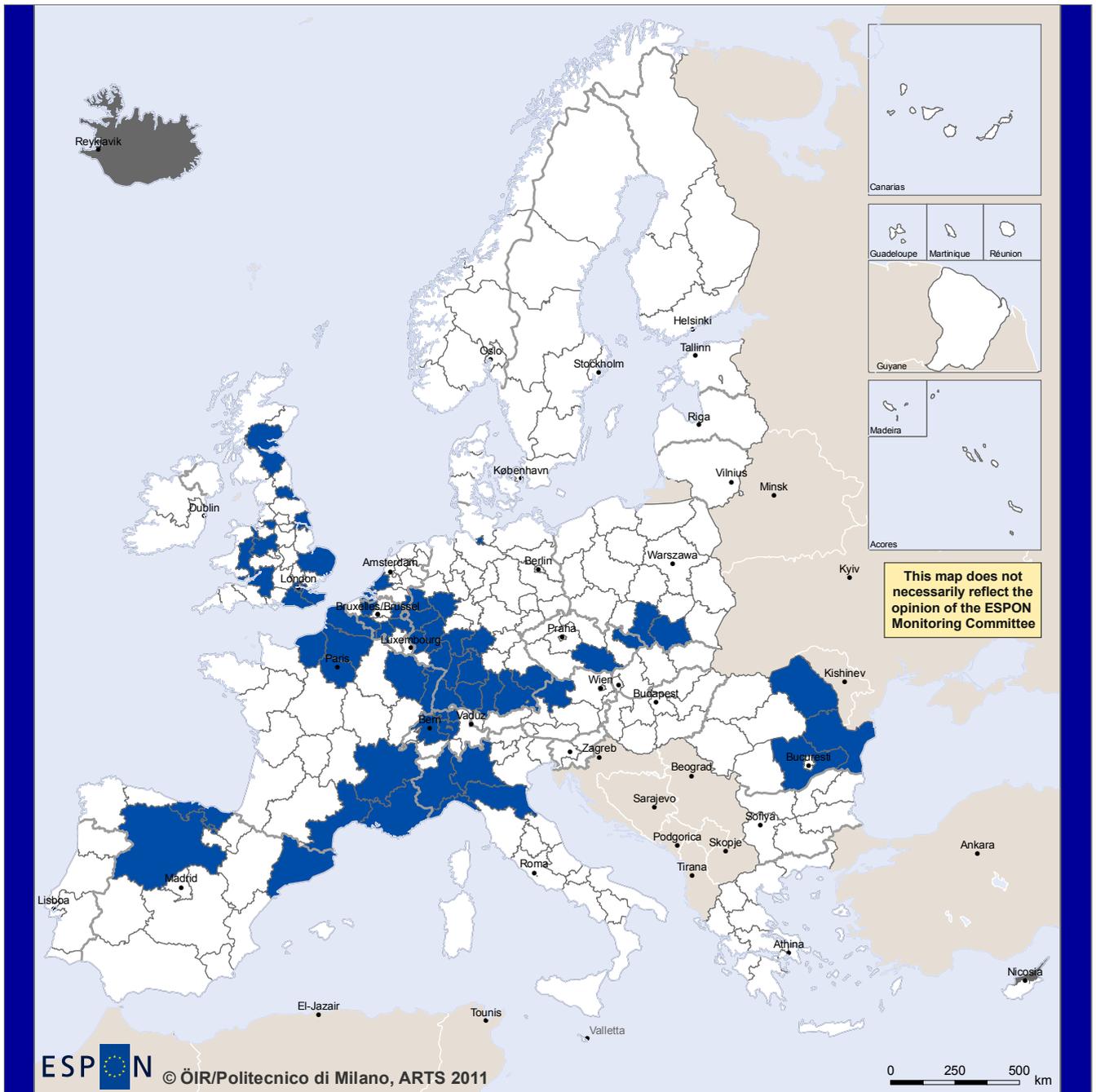
- These regions are scattered through the UK, include northern and central Spain as well as north-eastern France and French regions boarding the Mediterranean Sea. Also affected are great parts of Belgium, south-western regions of

Germany, northern Italy and Switzerland. In Romania, the Czech Republic and Poland the eastern Regions are affected. The following map depicts the regions exposed to the directive.

**Map C 23: Regions affected by Sewese Directive**

[following page]

# Regions affected by Seweso Directive



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-  Affected
-  Not Affected
-  Neighbourhood Countries
-  No Data

Types of regions affected: areas at highest technological/environmental risk

## **The Territorial impact of the directive**

For all exposed regions, the impact on the natural environment are generally minor and positive, and not highly differentiated. This is true for impacts on soil (F2), water (F5) and air quality (F6). An exception is biodiversity (F9): Languedoc-Roussillon, Provence-Alpes-Côte d'Azur in France and Sud-Est in Romania are all moderately but still positively impacted. Impacts on soil sealing (F3) tend to be negative and minor. Cities, already having a high share of artificial area like Greater Manchester, Outer London and Hamburg are hit moderately.

Minor positive impact on the regional economy was found on employment in the primary sector (F16) and moderate positive impact on the share of agricultural areas (F17). The British regions East Anglia and East Riding and North Lincolnshire experience a high impact of the latter.

Moderate negative impacts on a household's disposable income (F21) were observed in all concerned region albeit Nord-Est in Romania is strongly impacted, being very sensitive to this exposure already (see Map C 24). For all exposed regions, the impact on transnational cooperation (F41) is moderately positive, and even greatly so in Castilla y Leon (ES), Limburg (NL), Prov. Liège and Limburg in Belgium.

Impacts on technological and/or environmental risk (F27) of regions are pervasively positive and very strong which also shows positive (although differentiated) impacts on health (F28). Eastern European regions displayed stronger impacts (moderately in Moravskoslezsko in Czech Republic, Malopolskie, Slaskie in Poland; strong impacts in Nord-Est, Sud-Est and Sud in Romania) than all other concerned regions, the impact there being minor (see Map C 25).

Overall, out of the 64 exposed regions, all showed a high impact on at least one indicator (technological and/or environmental risk). Romania (Nord-Est, Sud-Est, Sud), Castilla y Leon (ES), Limburg (NL), East Anglia, East Riding and North Lincolnshire (UK) had high positive impacts on two indicators. In contrast, high negative impact is limited to the regions Nord-Est, Sud-Est and Sud in Romania in the field of disposable income.

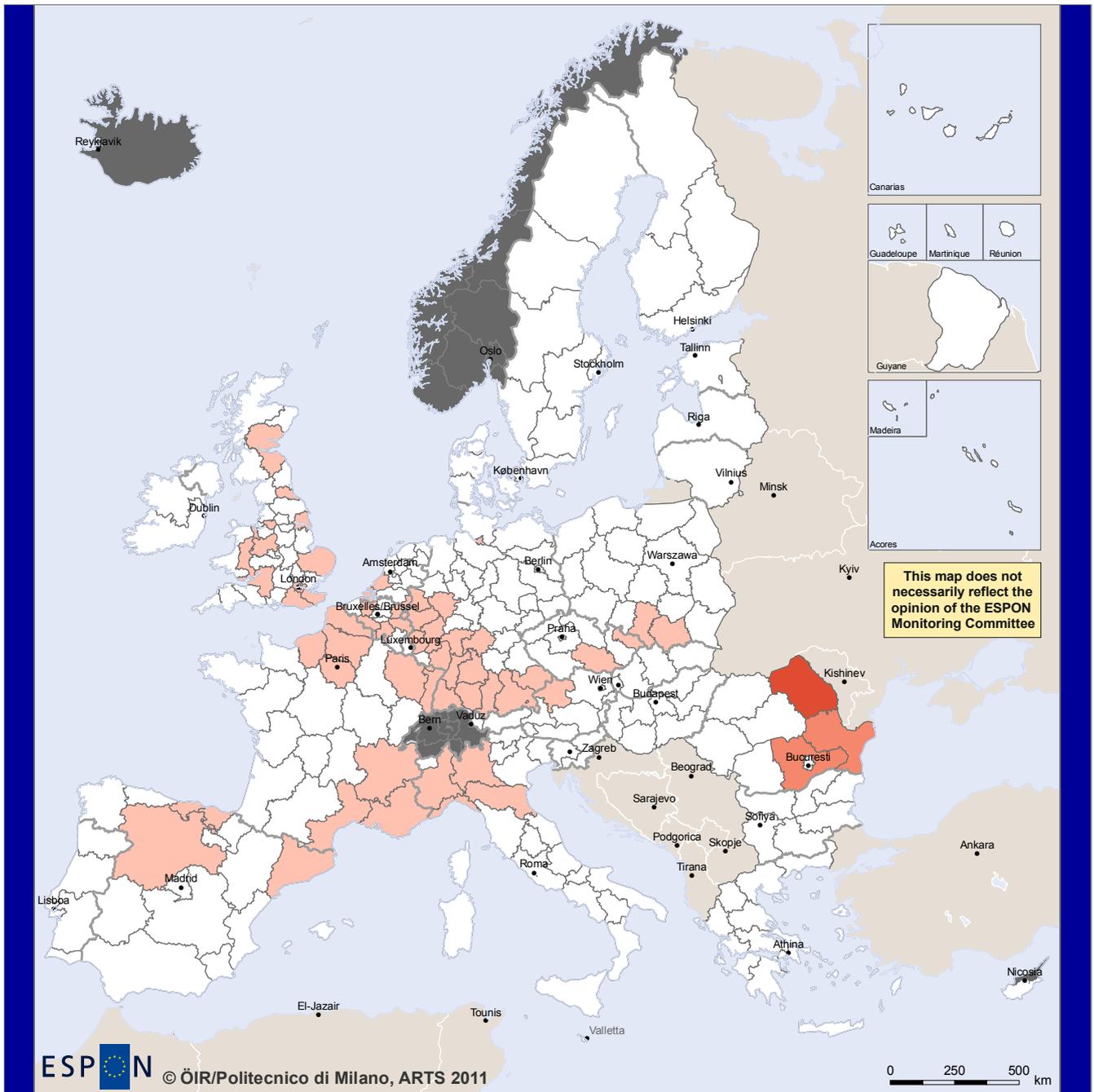
**Map C 24: Territorial Impact of Directive 3 on disposable income in PPS/capita**

**Map C 25: Territorial Impact of Directive 3 on healthy life expectancy at birth**

**Map C 26: Territorial Impact of Directive 3 on transnational cooperation**

[following pages]

# Regions affected by Seweso Directive Disposable income in PPS /capita (F21)



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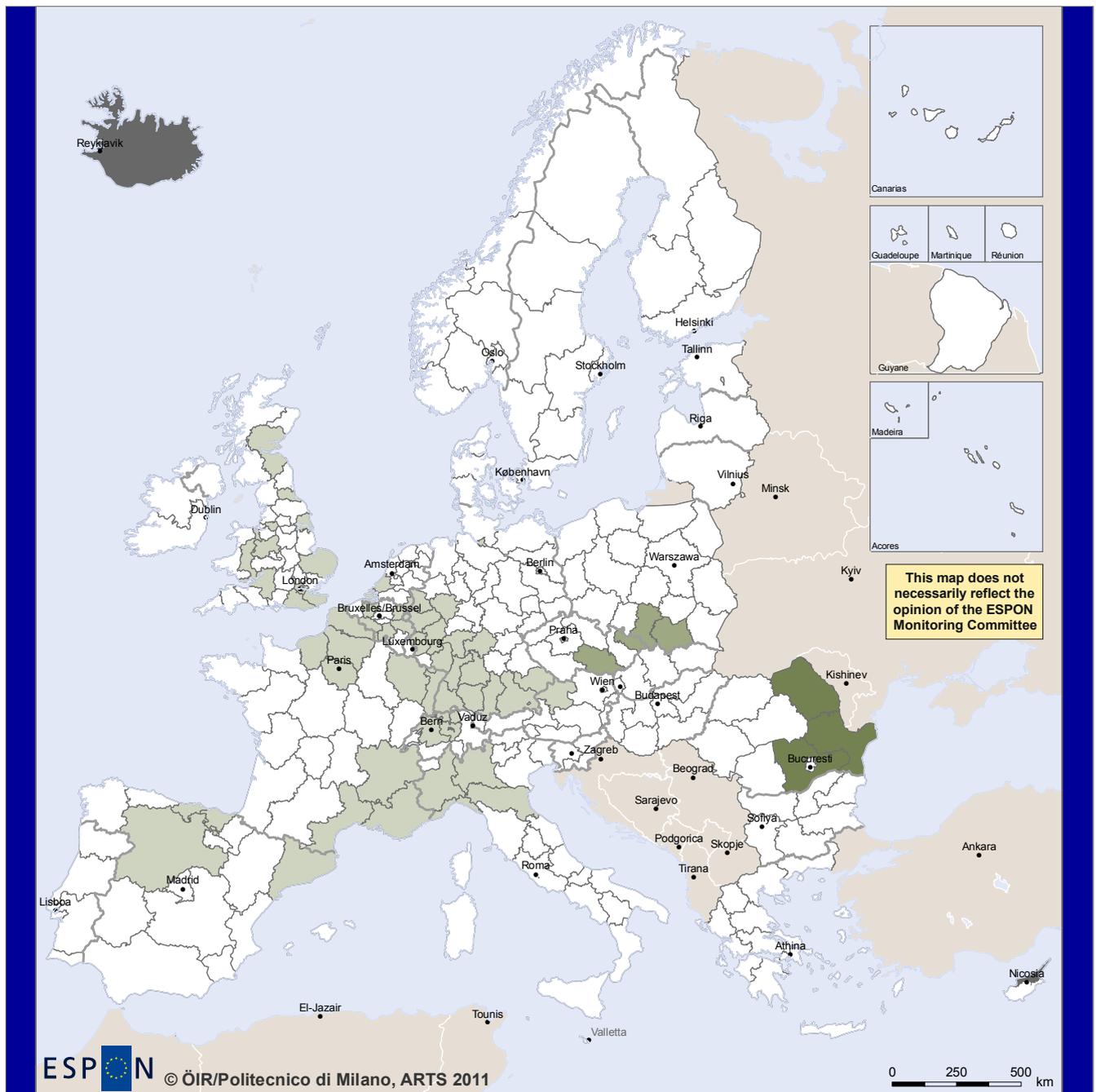
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## Negative Impact



Types of regions affected: areas at highest technological/environmental risk

# Regions affected by Seweso Directive Healthy life expectancy at birth (F28)



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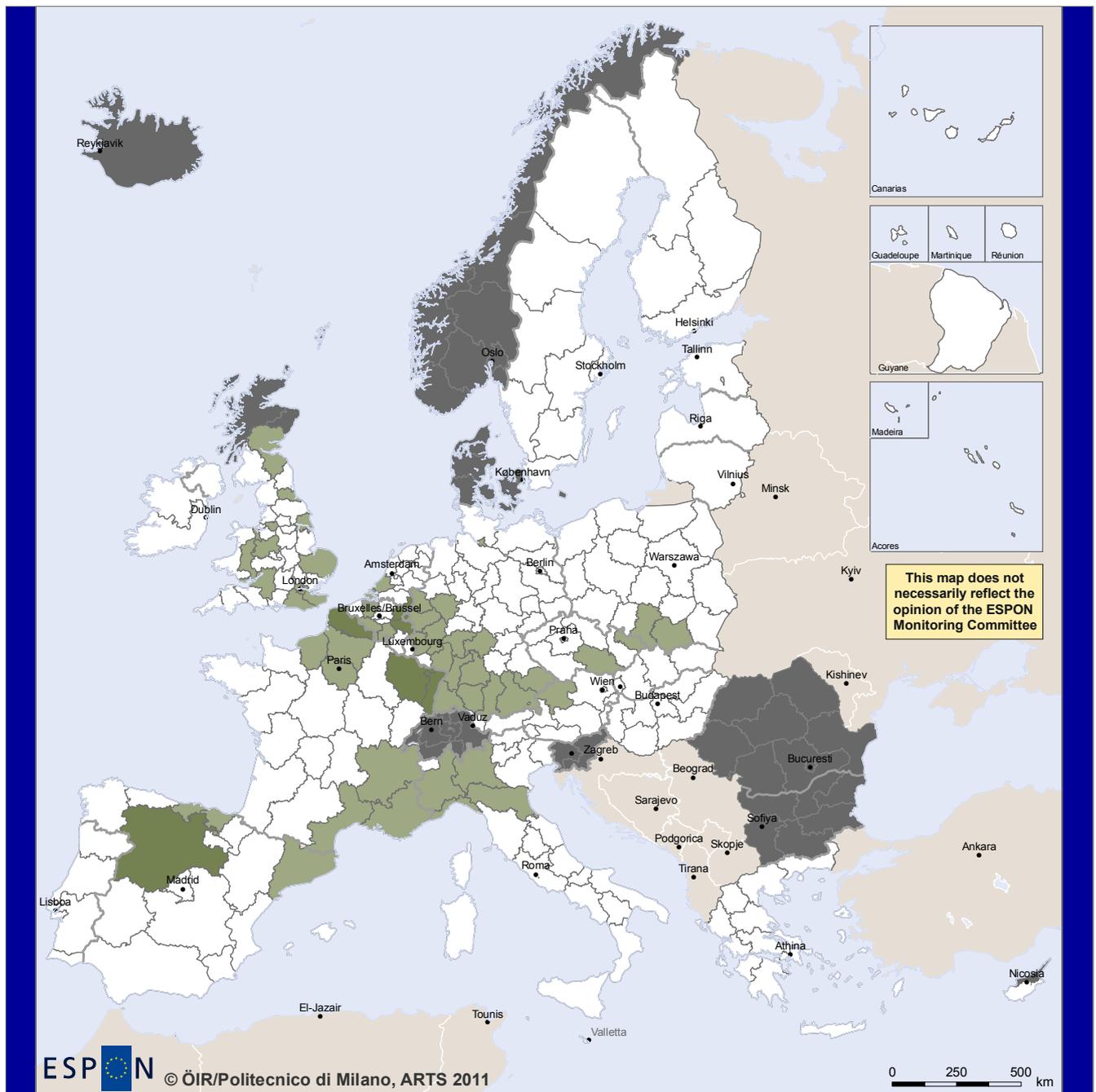
## Positive Impact



Types of regions affected: areas at highest technological/environmental risk

# Regions affected by Seweso Directive

## Transnational cooperation between member states (F41)



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### Positive Impact

- |   |                  |   |                         |
|---|------------------|---|-------------------------|
|  | Very high impact |  | No Data                 |
|  | High impact      |  | Neighbourhood Countries |
|  | Moderate impact  |   |                         |
|  | Minor impact     |   |                         |
|  | Not affected     |   |                         |

Types of regions affected: areas at highest technological/environmental risk

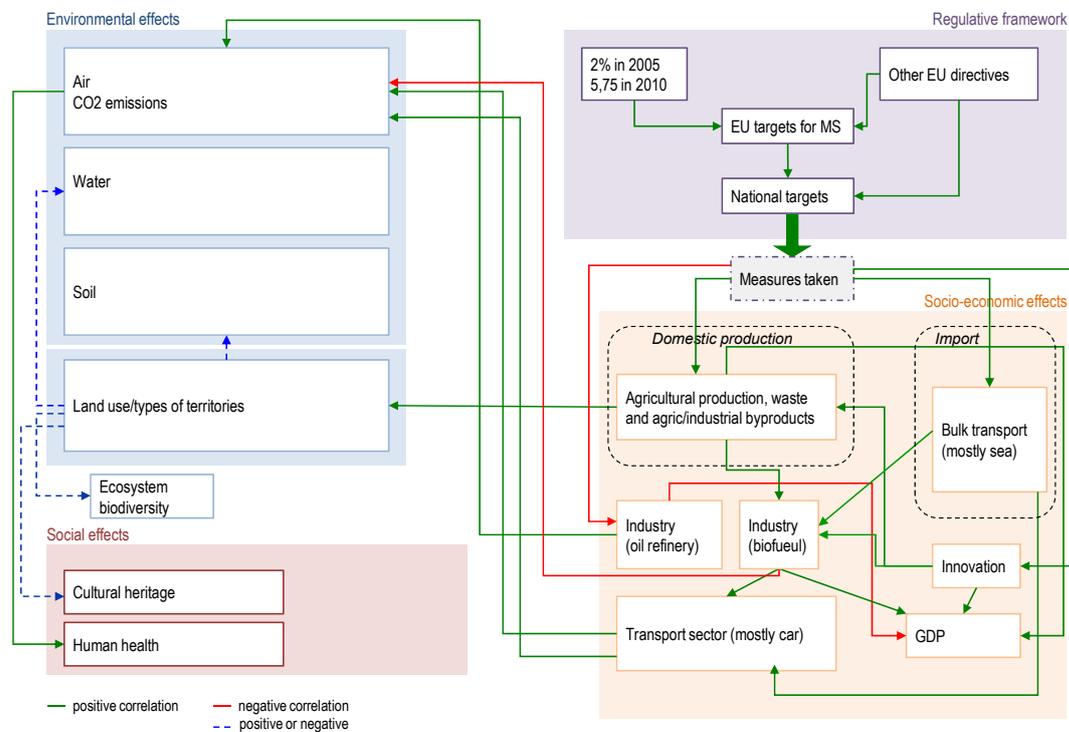
### 5.3 Directive on the promotion of the use of biofuels or other renewable fuels for transport

This directive sets minimum percentages for renewables in transport fuels in order to promote the transition to renewable energy.

#### Logical chain and exposure

According to the directive, member states can determine for themselves how to meet the renewable fuel targets. Because of this, the territorial impacts are branched according to the measures taken by member states. As shown in the figure below, these generally fall into two main categories: domestic production or import from abroad.

Figure C 10: Logical chain of the directive



Branch a pertains to large-scale import of raw materials from overseas (Rienks e.a. 2009), which are then industrially converted into biofuels. Such bulk transport generally occurs over water, both over sea as well as inland waterways. Raw materials have to be off-loaded, stored and processed, which means intensification of activities in industrial areas situated next to waterways. The conversion itself requires industrial installations that can be large-scale (in the case of second generation biodiesel) or more modest in size (in the case of first-generation biodiesel and gasoline). These activities are bound to have effects on social, environmental and economic fields in their respective regions and reduce activities in the traditional fossil fuel supply chain. This is in addition to the direct impact of the directive (in all

branches) on the use of renewables and net reduction of CO<sub>2</sub> emissions. Specifically for branch a, fields such as soil sealing and pollutants in ground, local CO<sub>2</sub>-emissions and biodiversity will be negatively afflicted against gains in fields such as GDP and employment. Finally, the directive can also have economic impact on harbours in richer regions. An example is the harbour of Harlingen in Friesland, the Netherlands, which welcomes biomass-based energy factories to support the small regional harbour in its competition with other ports (Van Hoorn, Tennekes & van Wijngaarden, 2010). Biofuel plants can contribute to an image of a 'green harbour', which may attract other activities as well.

As opposed to importing biofuels in branch a, in branch b the production of raw material for biofuel takes place in the European territory itself. The norm set in the directive is expected to generate demand for biofuels, prompting some farmers to switch from food to biofuel production. This decision depends on the price of biofuels, the price of alternative crops, subsidies and local specificities, such as the local soil quality. In many areas of Europe, biofuels simply cannot compete with other crops. Only in areas where food crop production is relatively unprofitable is there a chance that farmers will switch to biofuels— both first-generation biofuels (sugar, starch, vegetable oil) as well as second-generation biofuels (cellulose) (Rutz & Janssen, 2007). The impact of this branch on ecological factors like biodiversity will mainly depend on the land use prior to conversion, namely whether this was intensively used farmland for food production, abandoned farmland, moderately degraded lands or nature (Eickhout et al. 2008, Van Oorschot et al 2010).

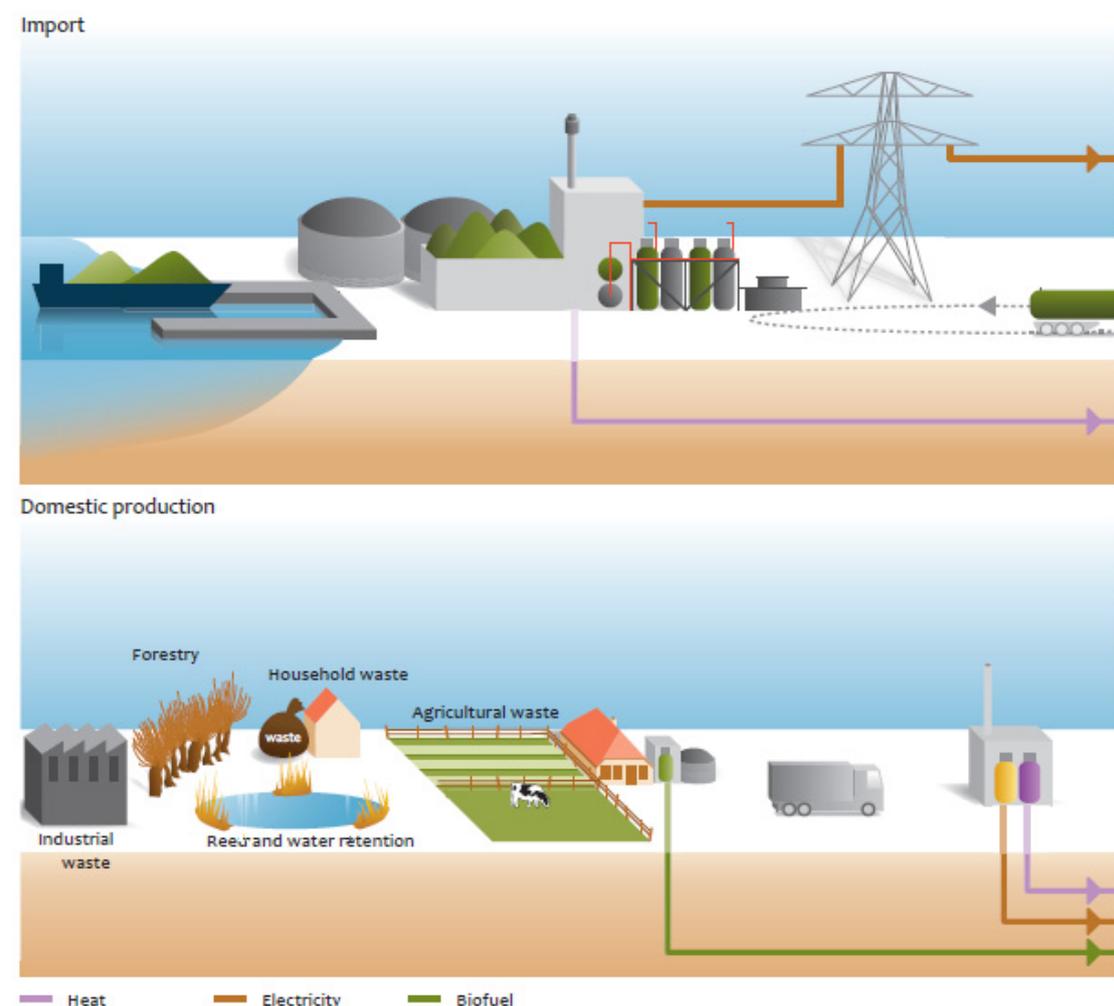
Two further branches (c and d) relate to the use of waste material from food crops for producing biofuels and the management of nature areas respectively (Van Hoorn, Tennekes, & van den Wijngaard 2010). Within the logic of branch c, farmers use waste material from their crops to produce biofuels (this implies second-generation biofuels where fuel can be produced from any organic material such as inedible parts of food crops, wood, straw, etc.). Because waste is being reused, branch c will not impact land use, but it may have an effect on the appearance of the traditional landscape because of the industrial-like installations being built next to farms. More generally, the directive in this branch will influence the profitability of farming in the region and with it, the social-economic prospects of the population.

The management of natural areas, and forests in general, produce waste material such as wood (or reeds, in the case of wetlands), which can be used for second-generation biofuels. This is the fourth branch (d) in the logical chain. Although this will not lead to a different land use directly, it can have an important indirect impact. The extra income that is generated in these natural areas from biofuels will make it easier to preserve them. Biofuel production therefore can result in the protection of natural areas which would otherwise have been converted into agriculture or become urbanised.

The raw materials in branches b, c, and d are brought by road to the nearest conversion plant. These can be the same as in branch a, or more small-scale local

facilities. As the raw materials in these branches often have relatively low energy content (e.g. wood or reed), only transportation over small distances is feasible, both from an economic standpoint, as well as from the perspective of efficient energy use, as transportation uses fossil fuel too. Branches c and d were not taken into account in the Territorial Impact Matrix because the two first branches are expected to show the most impact. Branch c will not alter land use, only contributing a little to the profitability of farming (although this can mean the difference for survival in some cases). Branch d is an interesting, but relatively indirect possible impact of the directive.

**Figure C 11: Energy production**



Source: Van Hoorn et al. 2010

### Type of regions affected by the directive

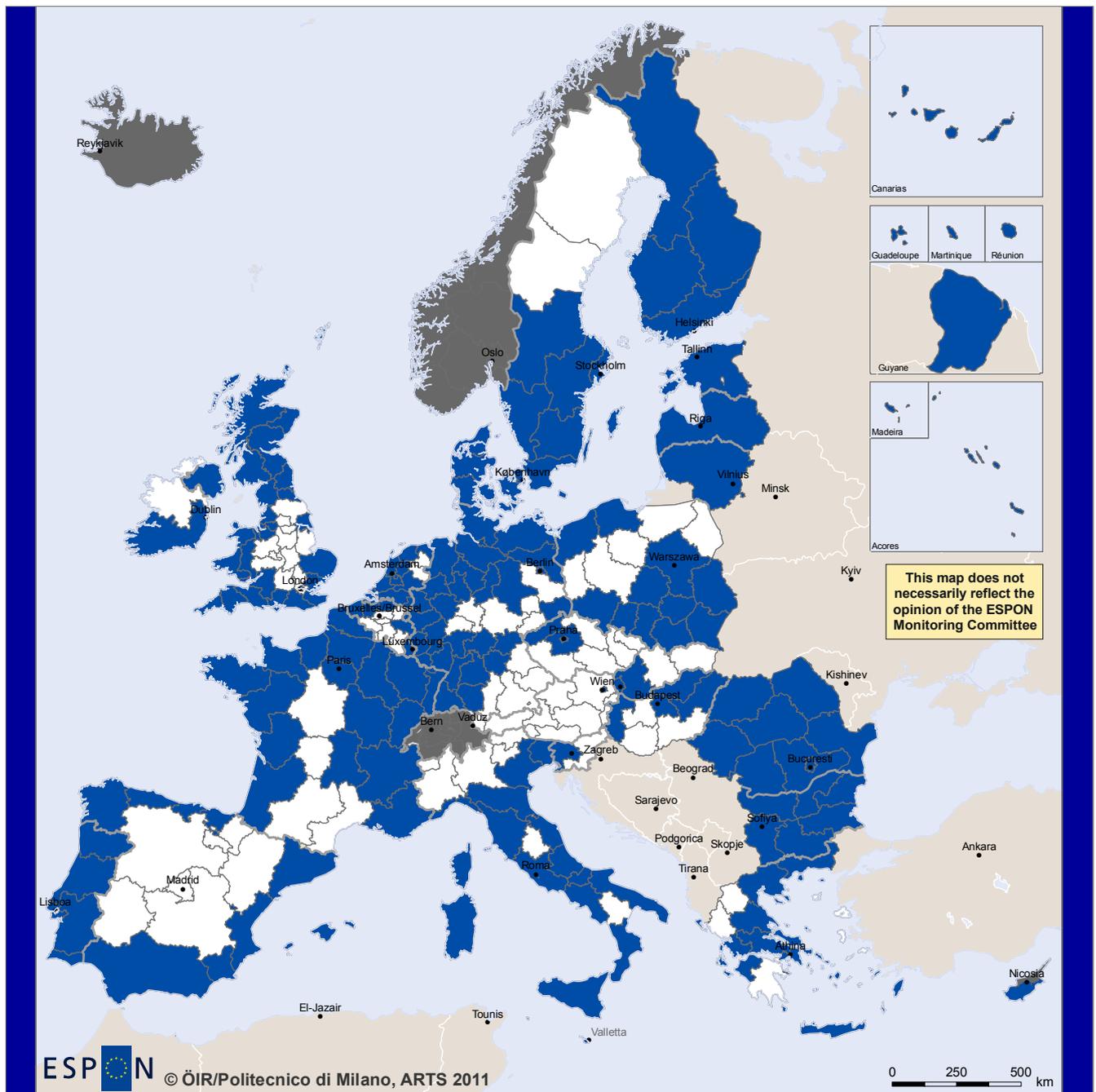
As with the description of impacts of the other directives, the types of regions which are exposed to the directive have been identified and then impacts estimated. Due to time constraints, only the first two branches were analysed using the model. For branch a, harbours (both sea and inland ports) were selected (ESPON indicator:

accessibility of sea harbours within 30 min). For branch b, unlike other studies that take theoretical potential for biomass production as an indicator (e.g. EEA 2005), our model took the farmers economic decision as a departure point to grow biofuel crops instead of alternatives like food crops or conversion of the land to new uses (cf. Rienks 2009). The model assumed that in regions with a low agricultural profitability, the chance that farmers make this choice is higher. As no economic data on farms was available, a proxy indicator of farm size was used to select regions that may have a low profitability. That does not mean that in other European regions local circumstances (including market circumstances) cannot be favourable for biofuel crop production

**Map C 27: Regions affected by directive on promotion of use of biofuels**

[following page]

# Regions affected by Directive on promotion of use of biofuels



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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: rural, unprofitable farming, natural areas, forest, harbour regions

## **The territorial impact of the directive**

A few words can be said as regards the cumulative impacts. As regards branch a, the highest positive impacts were found in Romania and Hungary, due to the sensitivity correction. The negative impacts of this branch were too low to notice. As regards branch b, the main positive effects were found in Estonia and Romania, again mainly due to the sensitivity correction. Only one region in Romania was marked as having a high negative impact.

The impacts of the directive along branch b are particularly of interest in areas where normal crop production is relatively unprofitable. As crops for biofuel compete with normal crop production (unlike branch c, where waste products of agricultural production are used), it is more likely that farmers in these areas will switch to biofuels. Still, very local circumstances such as soil fertility, the availability of specialist knowledge, or the proximity of conversion plants are crucial. Conversely, even in areas with more profitable farming, poor market conditions could prompt farmers to make the switch to first-generation biofuel crops for a limited period. The introduction of subsidies for biofuel production on EU or national level can facilitate this.

The territorial effects of the directive along branch b are all situated in the rural areas. According to the model results, there is a great deal of uncertainty of the positive or negative effects with regard to the natural environment (e.g. biodiversity) because this will depend on the local land use before the directive. For this reason, the economic indicators are most interesting. Impacts on the regional economy are generally seen as positive, due to the promise of another source of income in disadvantaged rural areas. The impact on economic growth (F12) is most significant in areas where the regional sensitivity is highest, namely poorer regions. In fact, the top ten most impacted regions are all in Romania and Bulgaria, with Nord-Est in Romania topping the list. The variable employment in the primary sector (F16) is also positive in Eastern Europe, but is much more spread out than GDP. The main beneficiaries (in order) are: Közép-Magyarország (HU), Bucuresti (RO), Ionia Nisia (GR), Nyugat-Dunántúl (HU) Slaskie (PL) and Lithuania.

With regard to the production of biofuels – whether imported (branch a) or from domestic origin (branch b) – industrial areas will need to be expanded, plants built and put into operation. This can have various impacts of a rather local nature. The NUTS2 classification used on the maps render in this case a relatively crude picture. Impacts are very local, such as the expansion of harbour or industrial areas, or building conversion plants that could harm landscapes and cultural heritage.

According to the model results, the directive will have an effect on the natural environment in a number of ways. As regards soil sealing (F3), the greatest (negative) impacts occur in already heavily urbanized regions such as Inner London, Wien and Berlin. This is clearly an artefact of the way in which the model calculates sensitivity: areas with high soil sealing (very urbanized) are highly sensitive. It is of

course inconceivable that the biofuels directive will change land use in inner London, let alone that this area is singled out as most significant. In the logical chain, soil sealing was intended for situations of building biodigesters and similar structures, usually in rural areas near biomass, not in downtown Vienna. One must therefore be wary about interpreting results. In this case, the distortion was obvious, but in other cases it may be less noticeable, thus requiring more vigilance. Regarding biodiversity (F9) the picture is different: the two most impacted regions are both in Spain: Canarias and Comunidad Valenciana. Other areas that show negative impacts on this indicator are western Slovenia, Abruzzo (IT), Yugoiztochen (BG) and Algarve (PT). Finally, as regards land use, the most significant negative impacts can be found in the largest cities, which is – like soil sealing – most likely the product of the sensitivity measure used, rather than an expectation that these areas will experience the most urban sprawl as a result of the biofuels directive.

The model predicts that extra harbour activity resulting from the directive is also expected to have a negative impact on air quality, and more specifically, that pollution in the air (F6) and CO<sub>2</sub> emissions (F7) will increase. The areas with the most impact are: Sud (RO), Mazowieckie (PL), Düsseldorf (DE), the Dutch regions of Limburg and Noord- Brabant, and the Paris region Île-de-France. CO<sub>2</sub> emissions are expected to have the most impact in harbour regions where there is already a high level of vehicular traffic (sensitivity) such as Bremen (DE), Greater Manchester and Merseyside (UK) and Hamburg (DE).

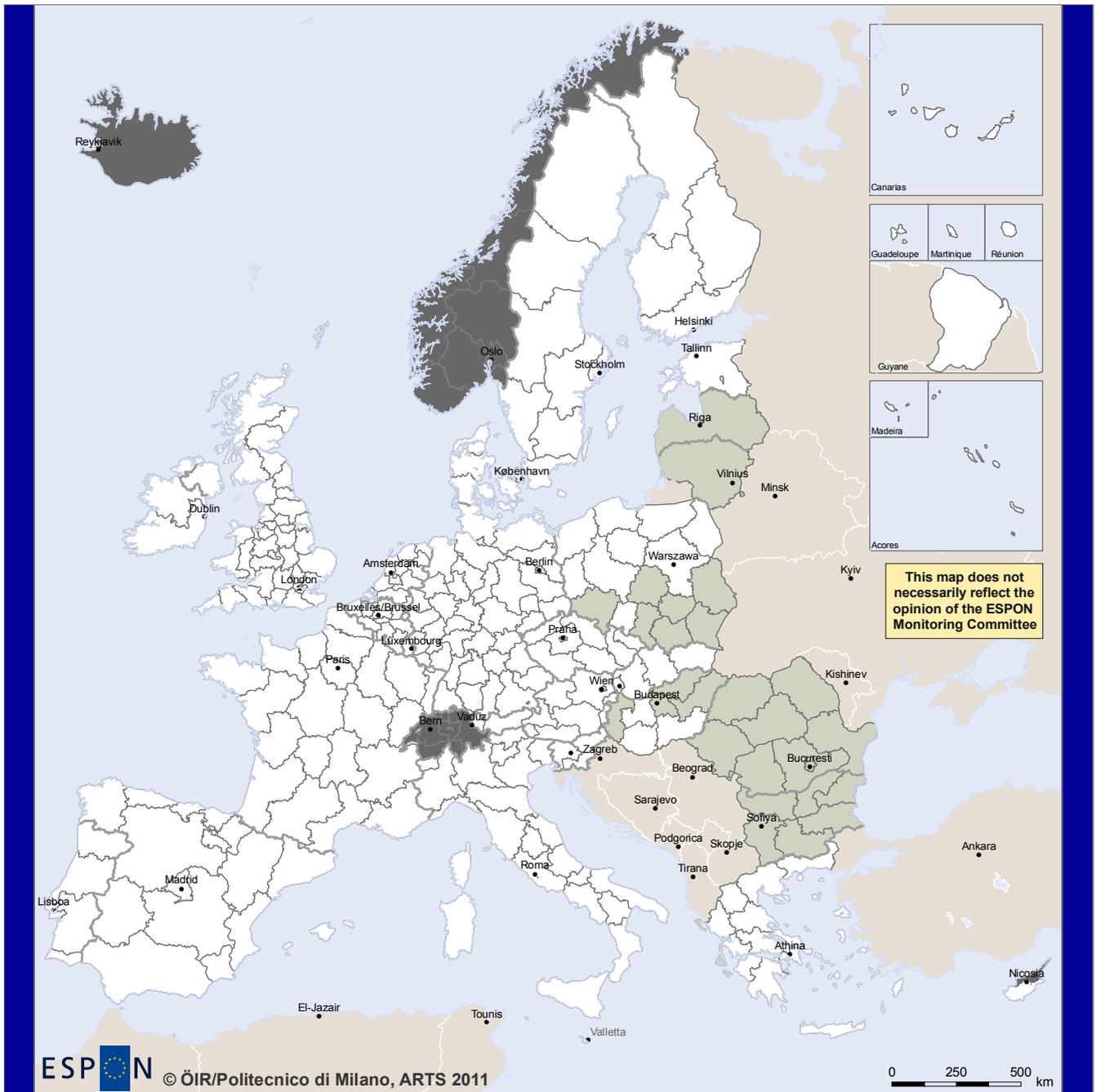
Regarding the economic impact of importing biofuels via harbours, the most significant positive results on economic production (F12) can be found in relatively poor regions, which reflects more the effect of the sensitivity adjustment than estimations on the magnitude or value of biofuels actually being transported. The top five regions profiting are all in Bulgaria and Romania, with Severozapaden and Severen tsentralen (BG) and Sud-Vest and Sud (RO) topping the list. A similar situation is apparent as regards the impact on employment (F23) – areas with high unemployment are more sensitive and thus stand more to gain from the benefits from the directive. Interestingly, the top three regions are all French peripheral island regions (Reunion, Guadeloupe and Guyane). These are followed by Zachodniopomorskie (PL) and three eastern German regions.

**Map C 28: Territorial Impact of Directive 5 (branch a) on employment of primary sector)**

**Map C 29: Territorial Impact of Directive 5 (branch b) on economic growth (GDP/capita**

[following pages]

# Regions affected by Directive on promotion of use of biofuels branch a Employment of primary sector (F16)



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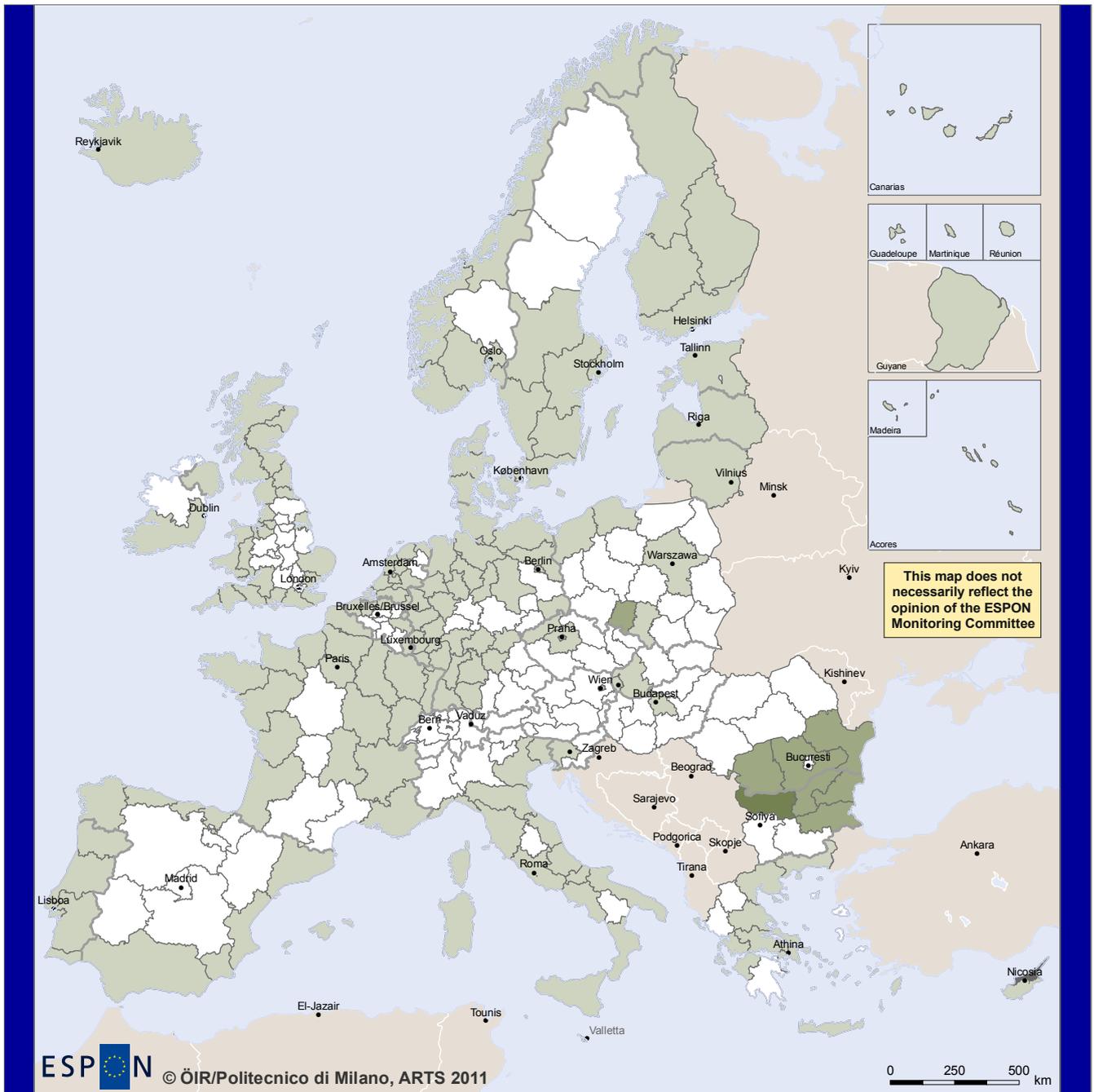
## Positive Impact



Types of regions affected: rural, unprofitable farming,  
natural areas, forest

# Regions affected by Directive on promotion of use of biofuels branch b

## Economic growth (GDP/capita) (F12)




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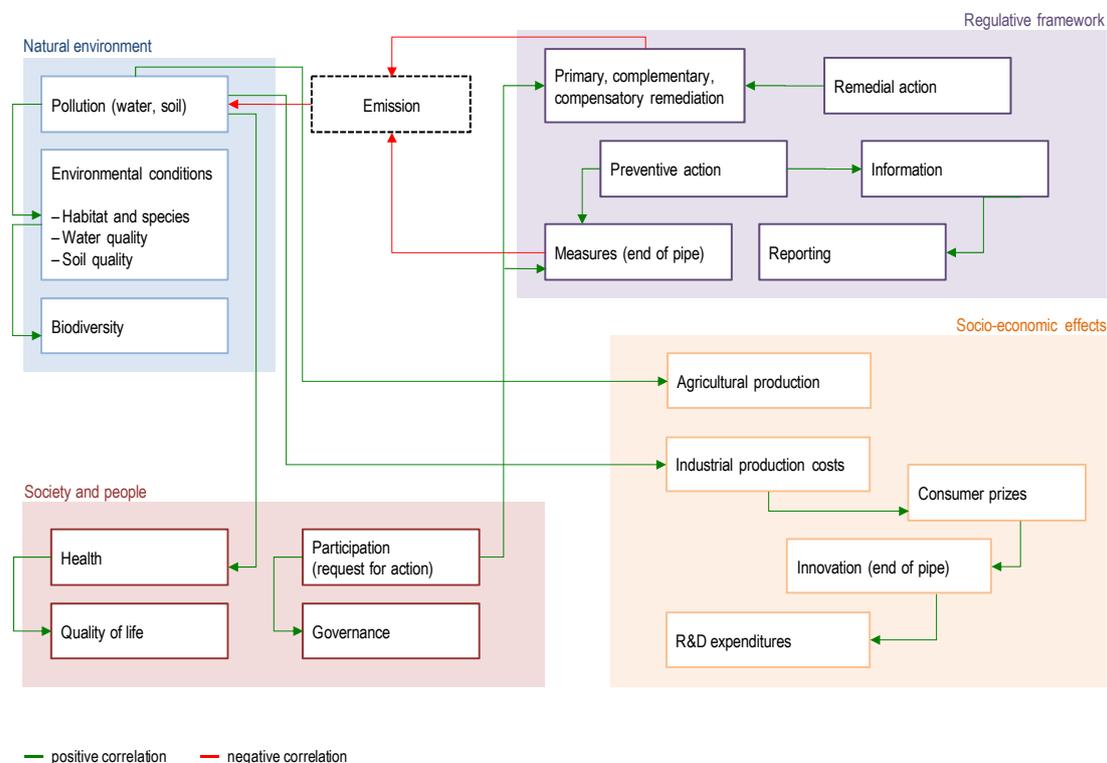
### Positive Impact



Types of regions affected: harbour regions

## 5.4 Directive on environmental liability with regard to the prevention and remedying of environmental damage

Figure C 12: Logical chain of the directive



This directive introduces a framework of environmental liability based on the polluter-pays principle in order to prevent and remedy environmental damage. The directive provides for holding an operator responsible whose activity has caused environmental damage or in cases where there is an imminent threat of this. The directive allows for the public to express a request for action.

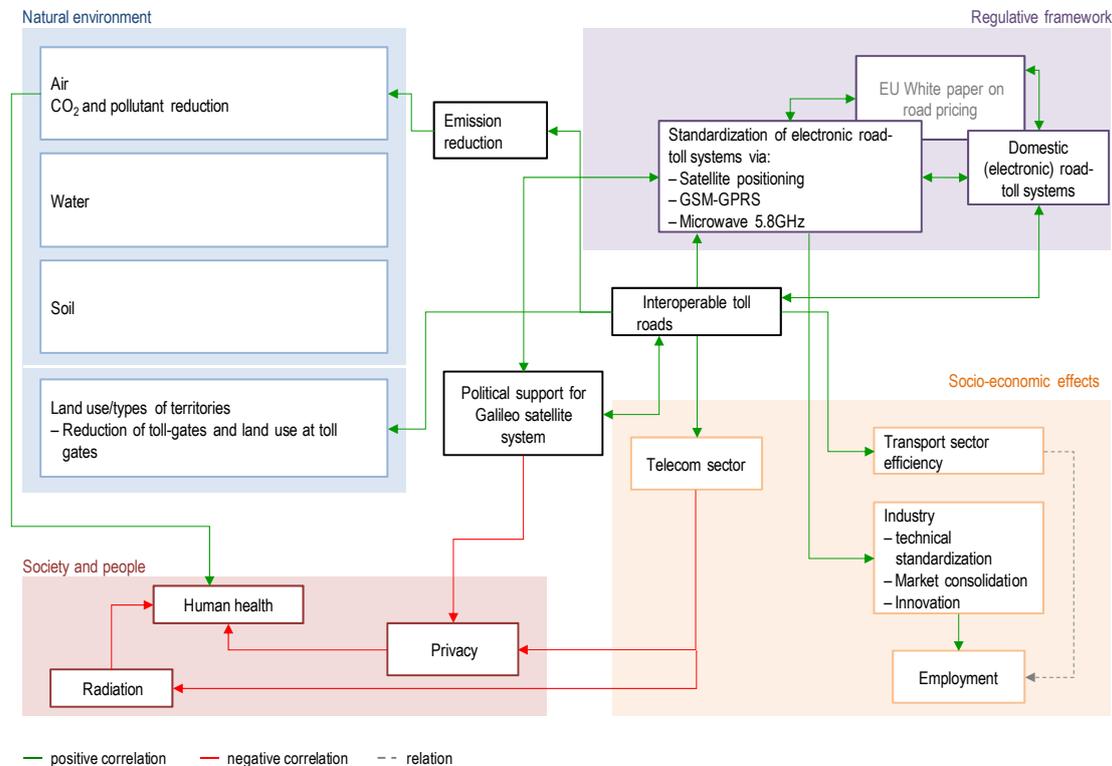
Remedial action (primary, complementary or compensatory) mitigates pollution of water, soil and air while at the same improves the otherwise severely damaged condition of habitats. In case of preventive action, whether this means providing information or implementing end-of-pipe measures, similar effects can be expected since the measures aim at reducing the operator's carelessness. In either case, the positive effects for the environment correlate positively with human health.

Another effect of the directive is that additional expenses for the industry are passed onto consumers through increased prices, ultimately reducing household disposable income. In order to find ways to decrease production costs, new processes or products are invented.

Although one can deduce this logical chain from the directive, all regions are equally exposed to these effects. Even if not equally sensitive, territorially differentiated impacts cannot be derived from this directive.

## 5.5 Directive on the interoperability of electronic road toll systems in the Community

Figure C 13: Logical chain of the directive



This directive lays down the conditions necessary to ensure interoperability of an electronic toll system in the EC. This is of relevance for the removal of artificial barriers to the operation of the internal market. The directive is part of a larger body of policies that aim at more uniform road pricing in Europe. The combined territorial impact of this policy package is expected to be rather high.

In contrast to the entire package, the territorial impact of this single directive is expected to be rather modest. Interoperability of electronic road toll systems (namely for highways) is a means to improve road traffic and accessibility, mainly in cross-border regions, thus improving economic performance and reducing emissions and congestion time; it will also impact on competitiveness of road versus rail.

Effects will occur where road toll systems are in place or planned that are not already interoperable. This potentially has an impact on all regions with a high share of motorways. However, it is to be expected that electronic systems within member states already are interoperable, which means that this directive will mainly influence border regions.

Based on available data and indicators (high share of motorways) no regional differentiation was found.

## **5.6 Directive on the recognition of professional qualifications**

This directive establishes a framework for the recognition of professional qualifications within the EU. It aims to clarify and consolidate current rules and facilitate free movement of qualified professionals between member states.

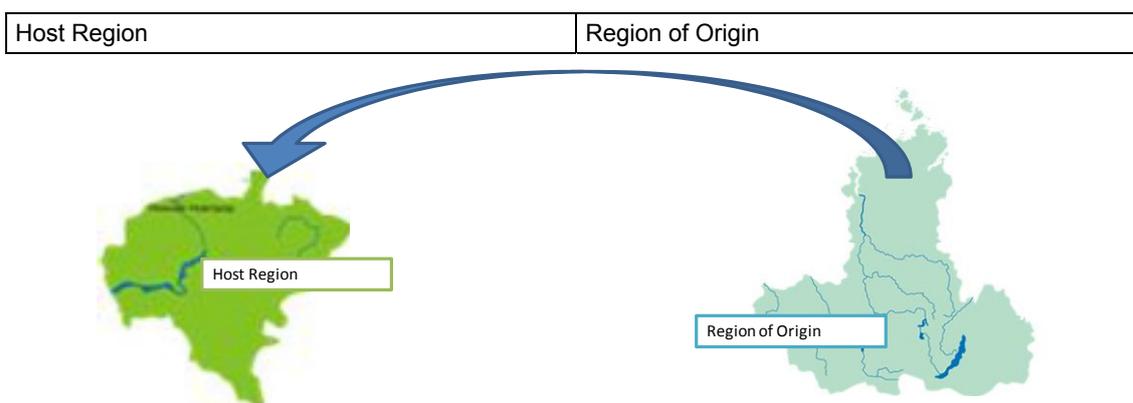
### **Logical chain and exposure**

The simplification and harmonisation of recognising professional qualifications should benefit governance mechanisms in all regions. When considering the effects of this directive it becomes apparent that urban and wealthy regions (branch a) are concerned differently than shrinking regions (branch b). Mobile professionals are inclined to leave 'unattractive' regions and migrate to urban and wealthy regions where working conditions and wage levels are more promising. The access to labour markets facilitates freedom of movement and service provision and also enables citizens to profit from cultural exchange.

The recognition of professional qualifications is expected to trigger regional development in all sectors of economy in wealthy regions by creating a favourable environment for the mobility of workers thus creating additional supply of labour and in due course prepares the ground for the establishment of service enterprises. For shrinking regions, the effect can be opposite: jobs are lost in the secondary and tertiary sector, which has negative effects on economic growth in the short run. In the long run rebound effects are expected due to relocation of production to regions with lower production costs.

The primary sectors face competitive disadvantages vis-à-vis the high attractiveness of jobs in all other sectors in both wealthy and shrinking regions.

The following table provides an overview of the short and long term effects for labour markets and income for both the host regions and the regions of origin.

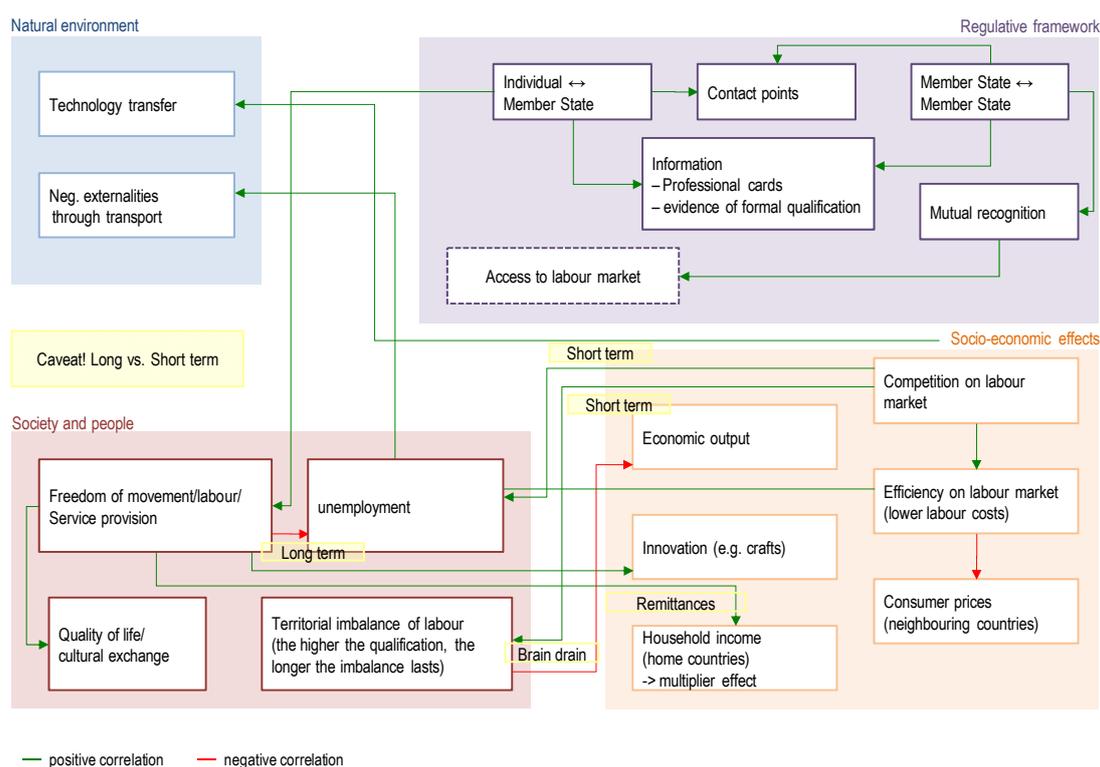


<i>Original condition</i>	
High labour demand ⇒ relatively high wages due to underuse of resources/demand surplus in goods and services together with relatively higher cost levels	Relatively low wage levels ⇒ due to sufficient labour supply or supply surplus together with relatively lower cost levels
Consequence: short term movement of labour	
<i>Labour market effects</i>	
Labour market equilibrium on a relatively lower wage level compared to the original condition The in-migration of labour continues until the marginal wage gains are compensated by the costs (transaction costs and additional cost levels to be borne in the host region) ⇒ stop of movement.	Labour shortage and rising wage levels ⇒ increasing attractiveness of the region for in-migration of labour ⇒ possible counter movement of workforce or in-migration of labour from other regions.
<i>Income equality effects</i>	
Declining household income due to increased competition on the labour market for the economic sector concerned (e.g. health care). ⇒ generally increase in income inequalities (ceteris paribus).	Increasing household income due to labour demand over time ⇒ general increase in income inequalities although in the long run closing of this gap if countermovement of the work force sets in.
<i>Disposable Income</i>	
In the economic sectors concerned, the disposable income will go down on average with an overall increase of the workforce. However this will not influence the general income level on the macro scale significantly.	In the long run the income level in the sectors concerned will rise – however with limited overall effect on the macro scale.

Generally in the short run this development will increase income inequalities due to labour surplus in the host countries whereas in the long run labour market equilibrium will create a more equal income distribution.

The general increase of economic activities and transport cause the CO<sub>2</sub> emission to rise. Furthermore population growth in the host regions increases demand for housing, water and energy. The opposite can be expected for the regions of origin. This also has effects for landscape diversity: population growth and urban sprawl entails a loss of characteristics in growing regions.

**Figure C 14: Logical chain of the directive**



### The regions affected by the directive

The directive is expected to affect urban, agglomerated and wealthy regions (branch a) differently than shrinking regions (branch b). The rationale behind this is that agglomerations and wealthy regions are attractive to mobile professionals seeking better working conditions. While these regions attract further population, regions with less promising job prospects are left behind. This dynamic of demographic decline can be observed particularly in rural and peripheral regions. In order to capture these regions a typology indicating regions with shrinking population – regardless if caused by migration loss and/or death surplus – was chosen.

For this reason, effects stemming from branch b of the directive touch regions that can be found mainly on the eastern side of the ESPON space. The Baltics as well as Bulgaria, most of Romania, Hungary and eastern Germany belong to the affected regions. Great parts of Slovenia, Czech Republic, Poland and Greece also are touched by the implementation of the directive, as are the sparsely populated regions in northern Sweden and eastern Finland.

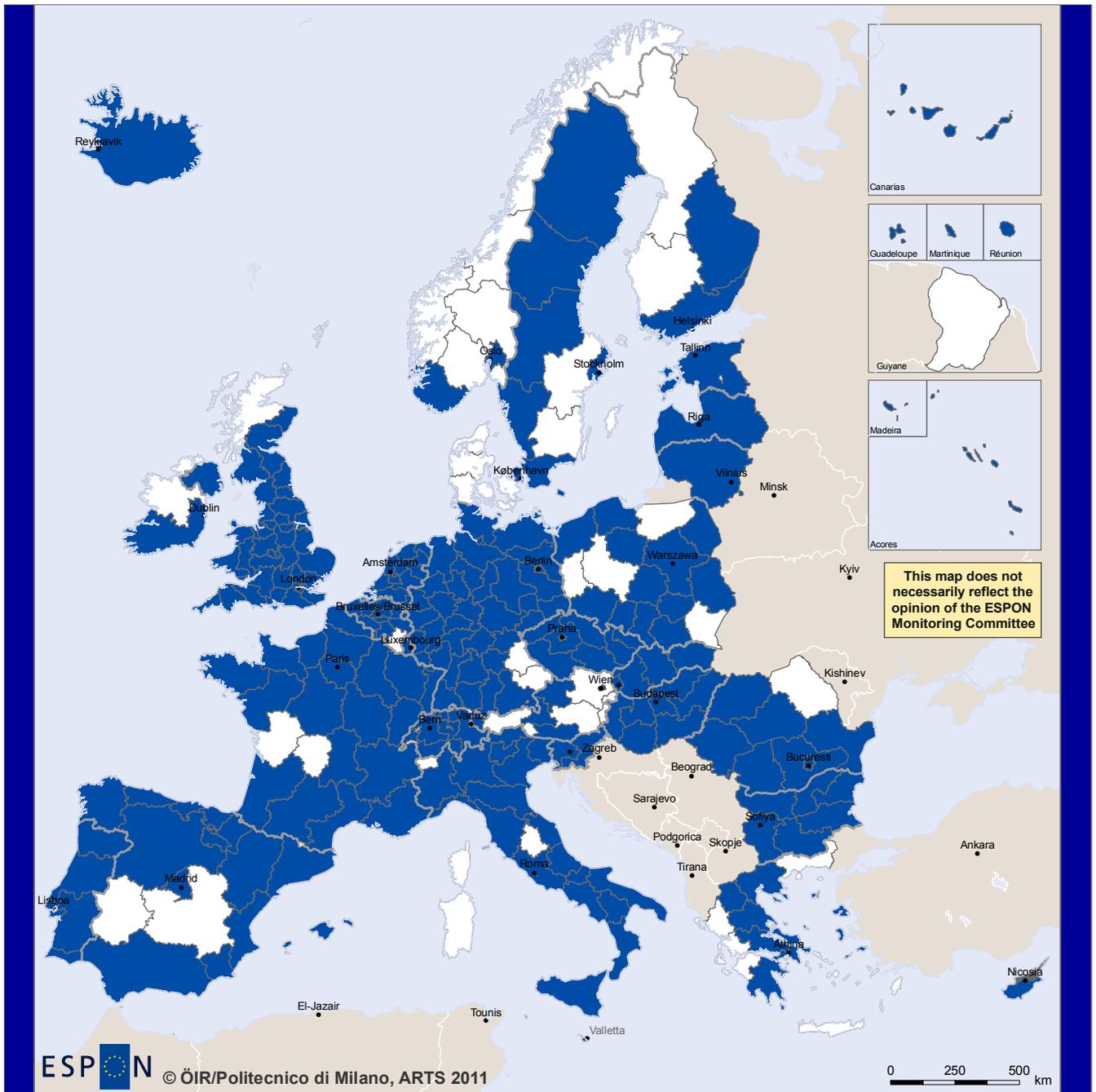
In the case of branch a, agglomerated and prosperous areas stick out. They encompass vast parts of Europe. Germany, Czech Republic, Slovakia, Switzerland, the Netherlands the Baltics, Lichtenstein, Luxembourg, Cyprus, Iceland and Malta. In the UK this branch impacts all but Highlands and Islands, in Ireland all but Border, Midlands and Western, in Portugal Alentejo, in Spain Castilla-La Mancha and Extremadura, in France Corse, Poitou-Charentes, Guayane and Limousin, in Belgium

Prov. Luxembourg (B), in Bulgaria Severozapaden and in Germany all but Oberpfalz and Niederbayern. In Scandinavia only the most southern regions, including the capital regions are affected. The effects in Denmark (only Hovedstaden) and Romania (Bucuresti and Sud-Est) are similar. In Poland, Austria, Italy, Hungary, Greece, France and Slovenia the situation is more differentiated. The following map depicts the regions affected.

**Map C 30: Regions affected by directive on recognition of qualifications**

[following page]

# Regions affected by Directive on recognition of qualifications



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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: wealthy regions, urban, agglomerated, shrinking regions

## **The territorial impact of the directive**

According to the model calculations, the directive has various impacts on the regional economy. All in all, the economy (F12) in wealthy regions will be stimulated further whereas that in shrinking region is impacted negatively. However, in both branches this effect will usually be minor. Only in already poor regions in Bulgaria, Romania, Hungary and Poland will the impact be stronger (moderate). The greatest magnitude of positive effects can be found in regions in terms of entrepreneurship (F14) for both wealthy and shrinking regions, an exception being Peloponnisos (GR) where the impact is only moderate. Considering employment in agriculture (F16) both branches show minor negative impacts for all regions, especially in city regions like Vienna, Brussels, Hamburg, Munich in Oberbayern, Île-de-France, Luxemburg, Groningen, Stockholm and London where there is only a small share of farming. Positive effects on Tourism (F20) in exposed regions are minor, except shrinking regions in Poland, Bulgaria and Romania, which benefit more than others due to the sensitivity calculation.

Harmonising the recognition of professional qualifications within the EU has very high positive impacts on income distribution (F22) in shrinking regions. Within the agglomerated and wealthy regions, those in southern Europe, especially in Portugal and Malta benefit on this indicator. This improved social situation has strong positive effects on health (F28) in eastern European regions and the Baltics.

More differentiated are the impacts on employment (F23) and migration balance (F24). Shrinking regions will suffer in both regards. While the effect on employment is negative but mostly minor (exception for some parts in Germany and Poland where it is moderate), the negative impact on migration is on a greater scale and more differentiated, ranging from moderate to very high.

In agglomerated regions, the effects are the opposite. As they attract new residents, the impact on migration is strong and positive. Similarly, increased economic activity provides workplaces, which shows on the consistently high to very high positive impacts on the employment rate (F23). Most pronounced are the effects in the European periphery, where agglomerated or wealthy areas stand out even more as centres for economic activity and which have a higher sensitivity.

Following the logic of branch a, wealthy regions attract population, leading to the construction of housing, which has negative impacts on the share of soil sealing (F3) and leads to urban sprawl (F35). This is accompanied by negative impacts on the level of CO<sub>2</sub> emissions (F7). These effects are generally minor, although big urban agglomerations, being more sensitive, show a moderate negative impact. These include regions like Brussels, Praha, Vienna, many cities in Germany (Bremen, Berlin, Hamburg) and the UK (London, West Midlands, Greater Manchester, Merseyside) and Ciudad Autónoma de Melilla (ES). Increased fuel consumption (F34) results in minor to moderate negative impacts on the regions, mostly in southern Europe. The top 20 are found in Spain, Portugal, Greece and Italy. To a

lesser degree the regions' landscape diversity (F10) is impacted negatively, the Canarias (ES) being hit the most.

The impact on the environment in shrinking regions is very limited and minor: slightly negative on the level of CO<sub>2</sub> emissions (F7) and slightly positive on landscape diversity (F10), mostly so in Greece. The decrease in fuel consumption (F34) mainly profits (to a moderate extent) shrinking regions vulnerable to climate change, especially in Bulgaria, Hungary and Greece and Alentejo in Portugal.

For both branches put together, the directive evokes a great deal of high positive effects. All of the 243 affected regions (summarizing wealthy, agglomerated and shrinking) show a high impact on at least one indicator and 207 regions on two to five indicators. In Lativa, Sud-Est (RO), Közép-Dunántúl and Észak-Magyarország (HU) very high impacts are expected on six indicators and most prominently Inner London (UK) on seven indicators. Conversely, Inner London is also the region with the highest number (four indicators) of high negative impacts. Inner London is followed by Közép-Dunántúl (HU), Jihovýchod, Moravskoslezsko (CZ) and Západné Slovensko (SK), which show high negative impacts on two indicators, and 41 other regions – mostly found on the European Union's periphery – on one indicator. When considering the negative unintended effects it becomes clear that the effect on shrinking regions is problematic. In general, the trade-off between two main principles of the EU becomes visible by the analysis of intended and unintended effects of this directive.

#### *Principle of freedom of movement of factors of production (labour)/goods and services*

The European Union's internal market seeks to guarantee the free movement of goods, capital, services, and people – the EU's four freedoms – within the EU's 27 member states. The internal market is seen as conducive to increased competition, increased specialisation, larger economies of scale, allows goods and factors of production to move to the area where they are most valued, thus improving the efficiency of the allocation of resources.

It is also intended to drive economic integration so that the once separate economies of the member states become integrated within a single pan-European economy. Half the trade in the EU is covered by legislation harmonised by the EU.

The free movement of persons, which is also touched by this directive, is a fundamental right guaranteed to European Union (EU) citizens by the Treaties. It is realised through the area of freedom, security and justice without internal borders. Abolishing internal borders requires strengthened management of the Union's external borders as well as regulated entry and residence of non-EU nationals, including through a common asylum and immigration policy.

### *Principle of Territorial Cohesion*

Since the Treaty of Amsterdam (1997) the term has been embedded in EU constitutional law – originally in connection with Services of General Economic Interest – SGEI. It is often seen as synonym for the encouragement of regional development within the EU and still shows a certain vagueness of its concrete meaning (Waterhout, 2008; Evers et al 2009).

However in principle there are four dimensions to be distinguished:



### *Balance/Justice*

One interpretation of territorial cohesion is that access to services of general economic interest (SGEIs) is ensured even in peripheral, disadvantaged areas. This goal can be at odds with complete market liberalization, as market failures in certain fields are apparent and can lead to unwanted societal results (Faludi, 2003). In this context, services of general economic interest are regarded as precondition for the use of the territorial capital, and thus the improvement of competitiveness.

This aspect is also connected to the notion of "social justice and equity" and adds a spatial dimension (Rawls, 1971). The premise is that social and economic inequalities, such as differences in health or power, are only justified if they lead to benefits for all, especially the weaker parts of society.

### *Reduction of disparities and global competitiveness*

Territorial cohesion is also used to influence the direction of EU regional policy, with arguments for the continued support of the less-favoured and peripheral regions on the one hand. On the other hand – in conjunction with the polycentricism debate – arguments in support of cities as engines of regional development to fully exploit their potential are raised. Both approaches have the aim to allocate economic activity more evenly over the territory of the EU and to enhance competitiveness.

A paradigm shift in Europe's spatial development policy was initiated in the context of the debate on territorial cohesion. While the traditional spatial development strategy of the European regional policy had been oriented upon the regional structural weaknesses and disadvantages, the new approach focuses more on the development potential of regions and exploiting their development potential. At the same time transnational and cross-border co-operation are more emphasized. The term "territorial capital" plays a central role in this debate. It means that each region

has its own specific territorial capital (social, human or technical) and should use this capital in an optimal way.

### *Cooperation*

In order to use the regional potential as mentioned above optimally, it is necessary to establish partnerships and networks. This is reflected in the Community Strategic Guidelines (CEC, 2005) where continued co-operation programs on the cross-border, transnational and interregional level for the future structural funds period has been established.

### *Governance*

Furthermore, it is clearly to be seen that under the concept of territorial cohesion increased attention to the spatial dimension of sector policies is paid. This consciousness of the spatial dimension of EU sector policies has increased and can be shown in various examples. First is the White Paper on European Governance (which explicitly emphasizes the need for increased spatial coherent governance), the Fifth Report on Economic, Social and Territorial Cohesion, but also other EU publications (e.g. Robert et al 2001; Barca, 2009) stress the spatial dimension of sector policies and their interconnections. Several efforts were made to identify the spatial effects of sector policies in the context of the ESPON programme but also the costs of non-coordination of different policies at different levels (European, national and regional) were demonstrated and therefore an improvement of the horizontal (between sector policies) and vertical (between levels) was deemed necessary. This leads to the issue of multi-level governance, which recognizes that hierarchical, clear decisions are not enough any longer in a complex world, which is constantly changing like ours.

Based on our assessment, this directive impedes economic growth in already shrinking regions by supporting emigration of professionals that leave these regions in search for a more favourable economic environment. In this sense the directive is favouring the goal of freedom of service provision and movement. On the other hand, the directive can hamper the objective of territorial cohesion at least in the short run. More specifically the aspects of “reduction of disparities” and “balance” clearly contradict the primacy of the free market logic underlying the free movement principle. The negative effects at the regional scale are neglected in favour of the expansion of the global/EU development path. Following this train of thought we can conclude that policy alternatives should focus on mitigating negative effects due to brain drain.

**Map C 31: Territorial Impact of Directive 8 (branch a) on entrepreneurship**

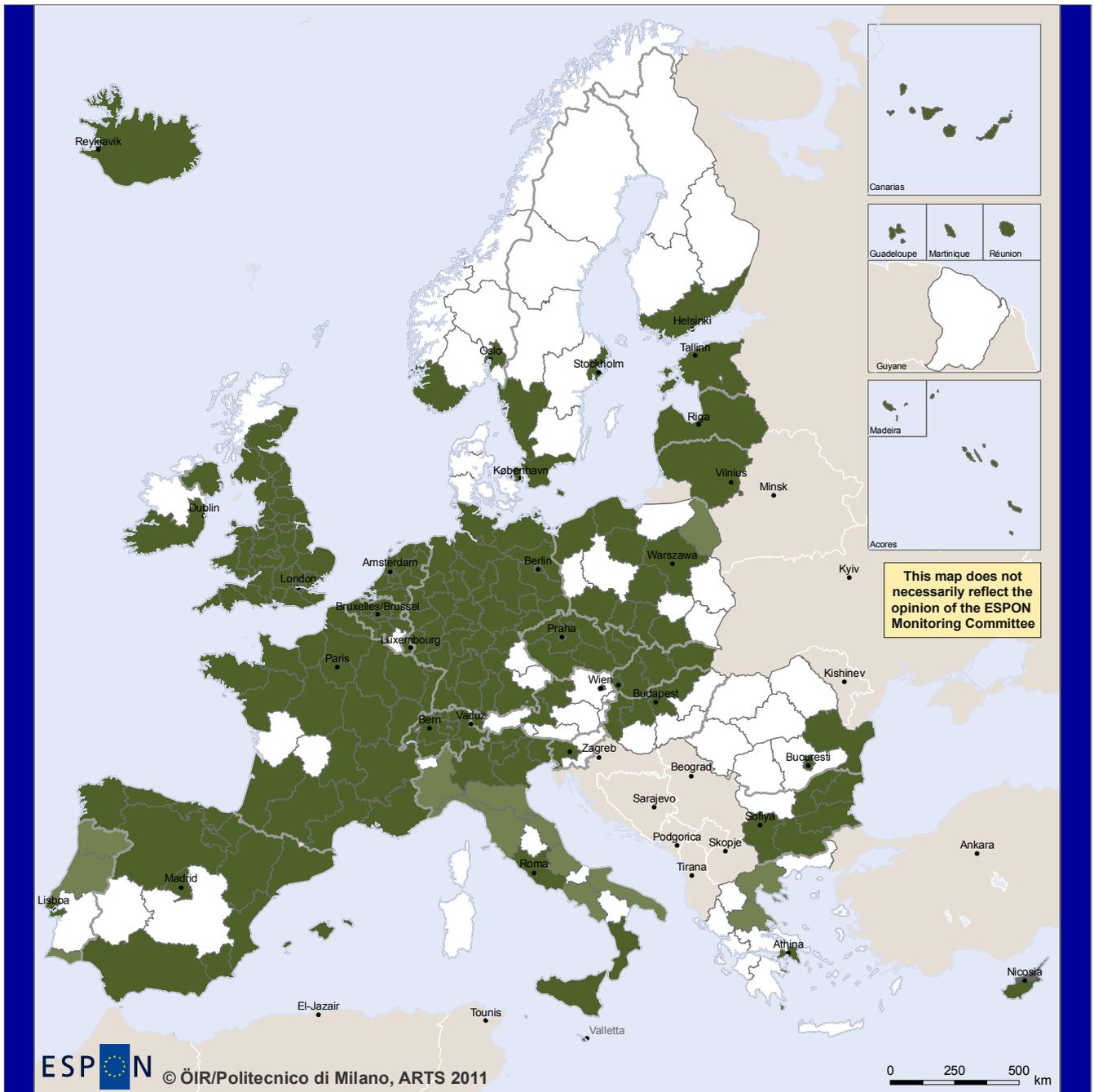
**Map C 32: Territorial Impact of Directive 8 (branch a) on employment rate**

**Map C 33: Territorial Impact of Directive 8 (branch b) on entrepreneurship**

**Map C 34: Territorial Impact of Directive 8 (branch b) on out-migration/brain drain**

[following pages]

# Regions affected by Directive on recognition of qualifications branch a Entrepreneurship (F14)



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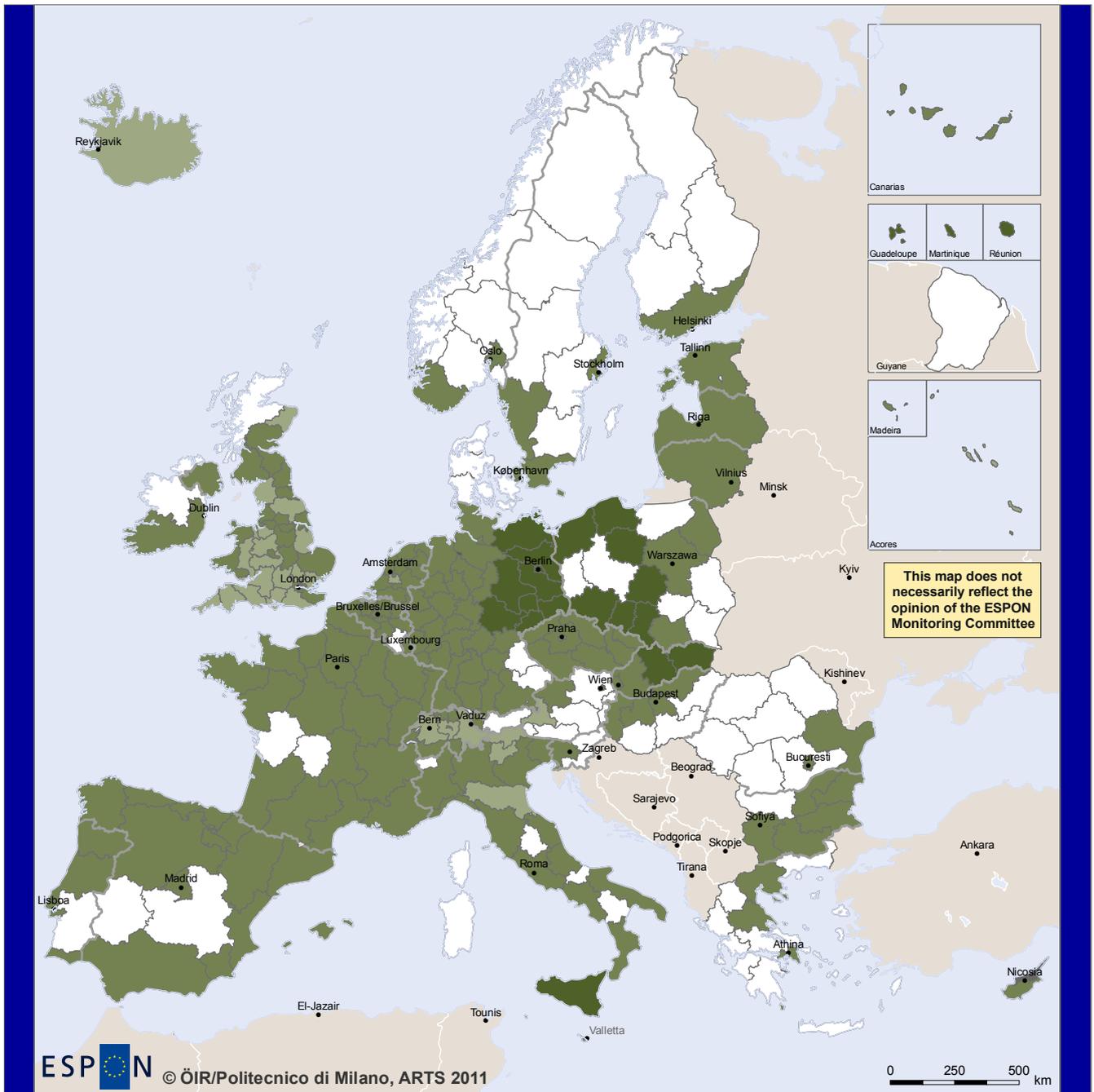
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## Positive Impact



Types of regions affected: wealthy regions, urban, agglomerated

# Regions affected by Directive on recognition of qualifications branch a Employment rate (F23)




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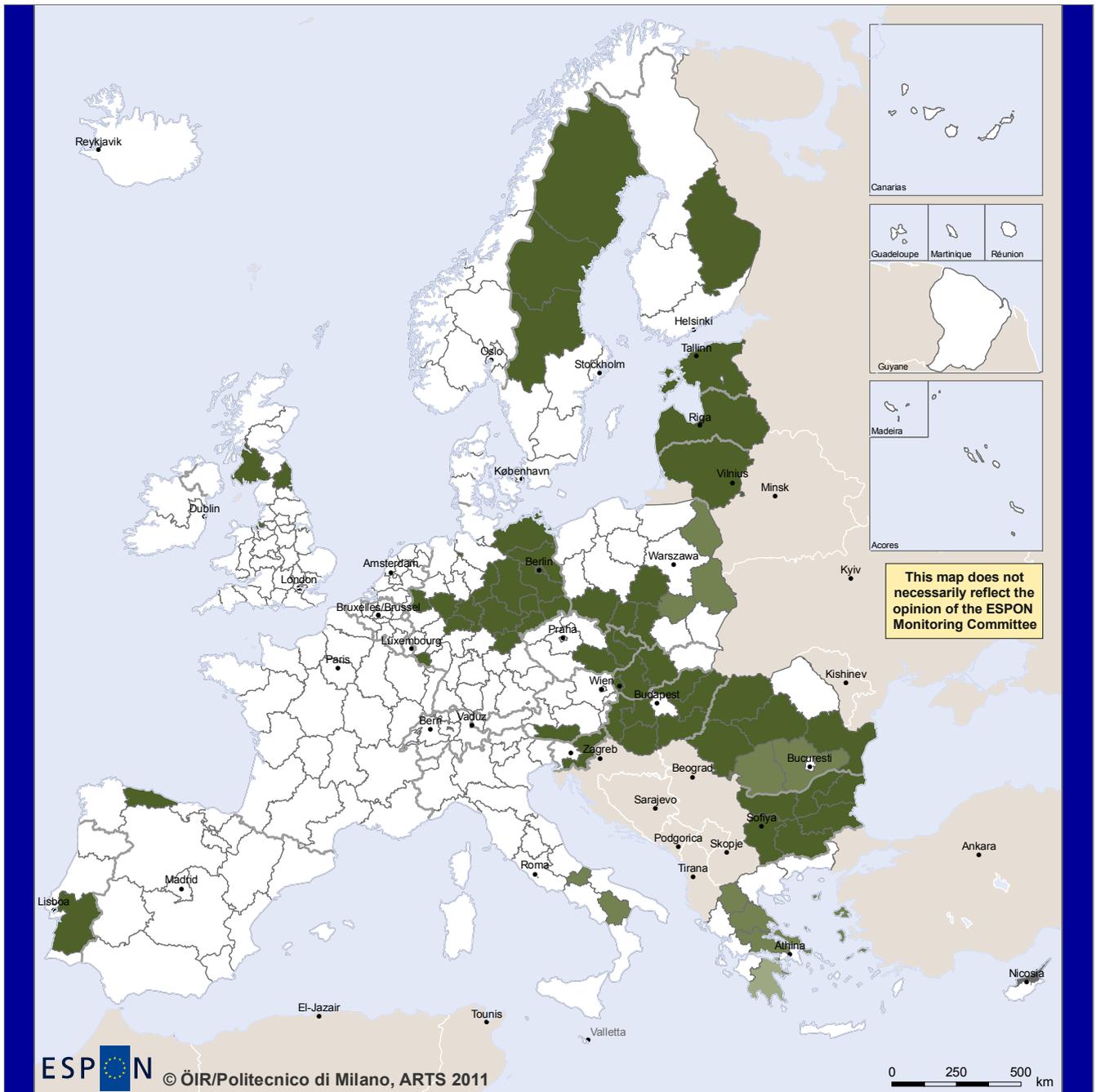
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## Positive Impact



Types of regions affected: wealthy regions, urban, agglomerated

# Regions affected by Directive on recognition of qualifications branch b Entrepreneurship (F14)



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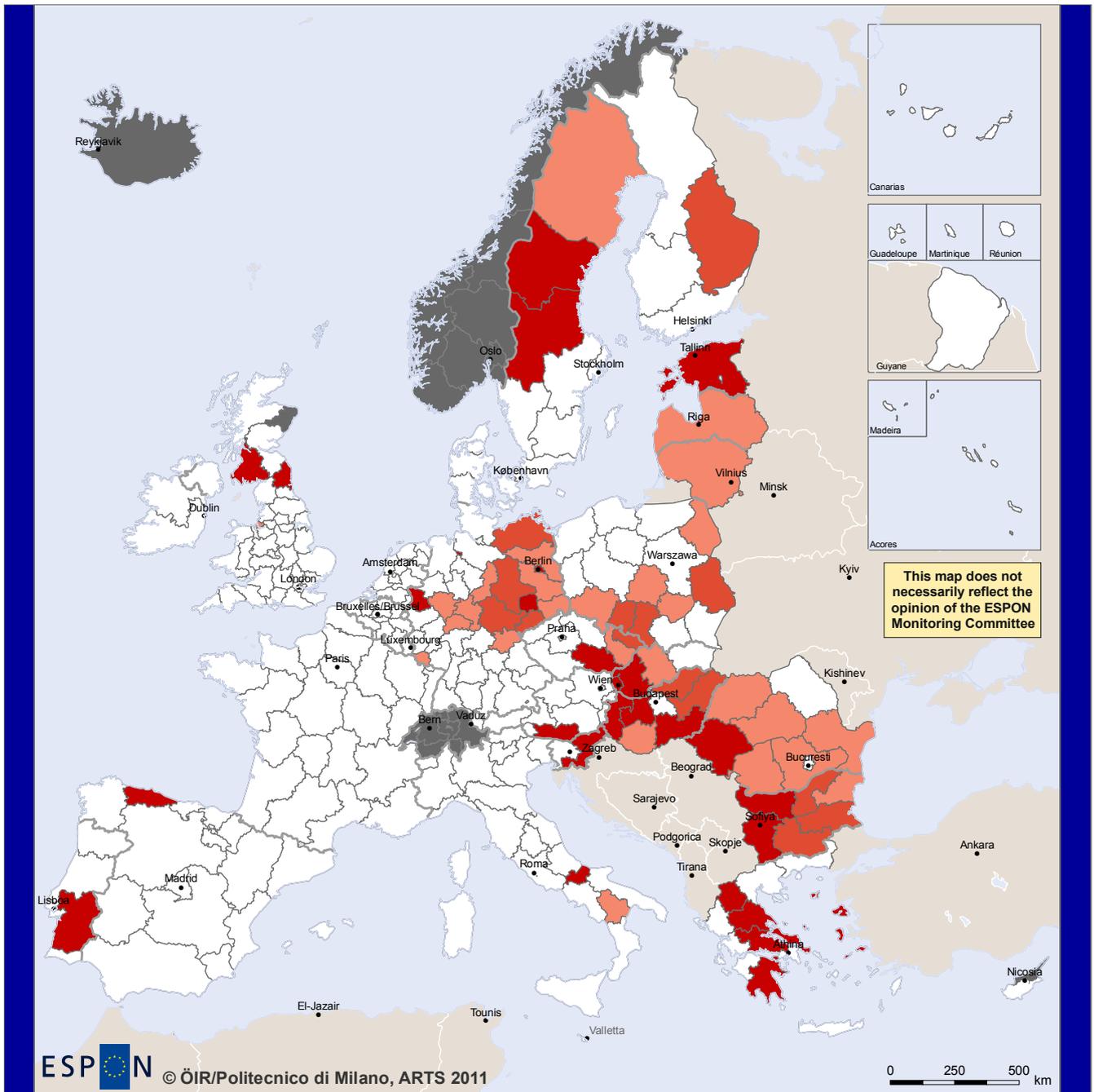
## Positive Impact



Types of regions affected: shrinking regions

# Regions affected by Directive on recognition of qualifications branch b

## Out-migration / brain drain (F24)



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### Negative Impact

- Very high impact
- High impact
- Moderate impact
- Minor impact
- Not affected
- No Data
- Neighbourhood Countries

Types of regions affected: shrinking regions

## **5.7 Directive on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection**

This directive establishes a procedure for the identification of European critical infrastructures (ECIs) and a common approach to the assessment of the need to improve human safety. The specific focus of the directive is on the energy and transport sectors.

To achieve this goal, the directive envisages the definition of a European programme for critical infrastructure protection (EPCIP) coupled with the development of operator security plans (OSPs), strengthening of contacts with Security Liaison Officers in the owners/operators of designed ECIs and the institutions of ECIs contact points (ECICP) to facilitate communication, coordination and cooperation at national and Community level. All in all, this directive provides common methodologies for the identification and classification of risks, threats and vulnerabilities of infrastructure assets.

### **Logical chain and exposure**

The expected impact of the directive is likely to be most relevant in two fields.

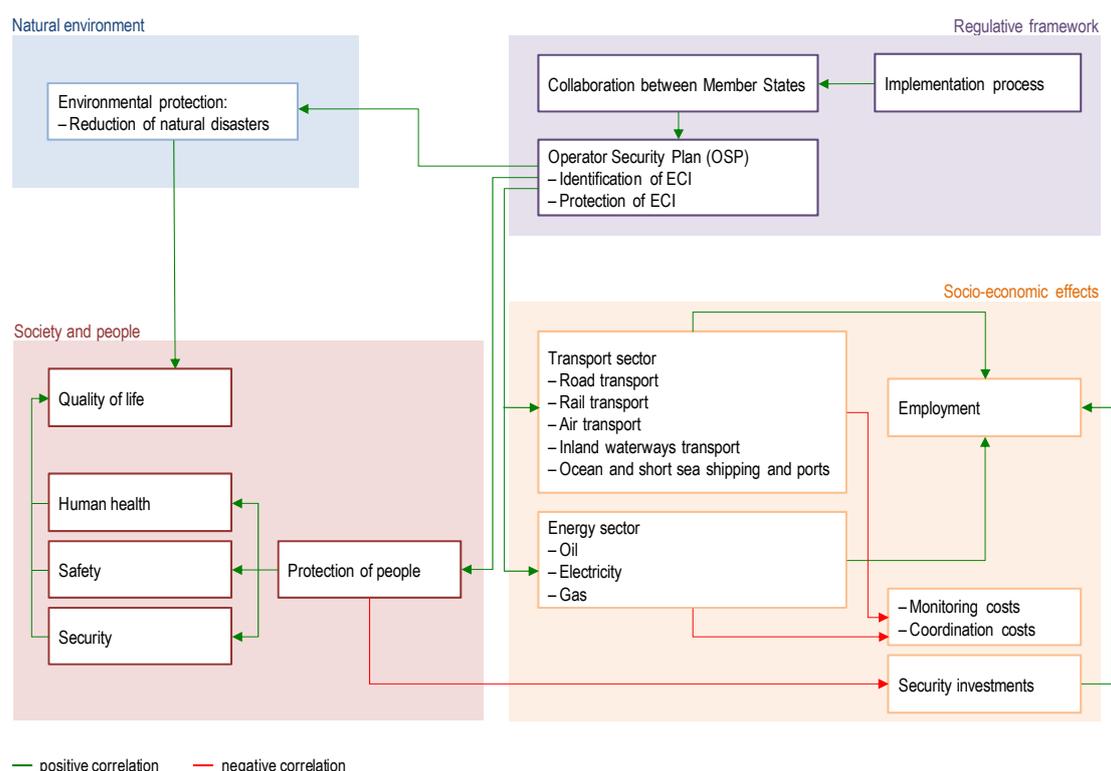
First, regarding the natural environment, the directive should lead to a lower risk of environmental and technological disasters, although this may come at the cost of extra investments in construction which may eventually negatively impact on natural heritage.

Second, and probably more importantly, are the impacts on accessibility. Greater protection of critical infrastructure such as airport, rail and road networks may positively influence accessibility and in turn economic growth (i.e. GDP) and (marginally) employment by creating jobs in security services and the construction sector. GDP and employment may also benefit from the extra investments undertaken to improve critical infrastructure safety conditions. Overall, these have some impact on human safety, both in terms of reduced accident rates and lower technological and/or environmental risks.

Lastly, the implementation of the directive requires the creation of specific plans and bodies. This may ultimately impact on governance. For example, the increased duration or complexity of planning procedures as well as coordination and monitoring costs could have a positive impact on the efficiency and the effectiveness of public administration. Also, the necessity to develop joint OSPs in some cases may enhance transnational cooperation between member states.

These cause/effect linkages are depicted in the following figure.

**Figure C 15: Logical chain of the directive**



This directive is likely to hit several fields (overall 16 out of 41), ranging from society and people and natural environment to economy and governance. The explanation of the impacts of these fields can be derived from the discussion of possible impacts of the directive above.

### The regions affected by the directive

Regions showing either a relatively high technological/environmental risk or with a relatively high density of rail and road networks should be more likely to be affected by this directive since they are more likely to have critical infrastructures.

We identify these regions as those falling in the top 10 percentile of the distribution of an aggregated index of technological/environmental risk and/or in the top 10 percentile of the distribution of rail and road network density. These regions are concentrated in Central Europe, namely Germany, Austria, Belgium, the Netherlands and Switzerland.

In addition, new member states are limitedly exposed to this directive with a few exceptions in Zahodna Slovenija (SI), East and South Romania (RO) and Malopolskie and in Slaskie (PL), Jihovýchod and Moravskoslezsko in the Czech Republic. Southern Europe is not affected much, and Greek regions are not affected at all. A few exceptions do exist, especially in Northern Italy (Lombardia, Piemonte, Liguria, Valle d'Aosta and Emilia-Romagna, Provincie Autonome di Trento e Bolzano), in Northern Spain (Cantabria, Pais Vasco, Comunidad de Madrid, Castilla

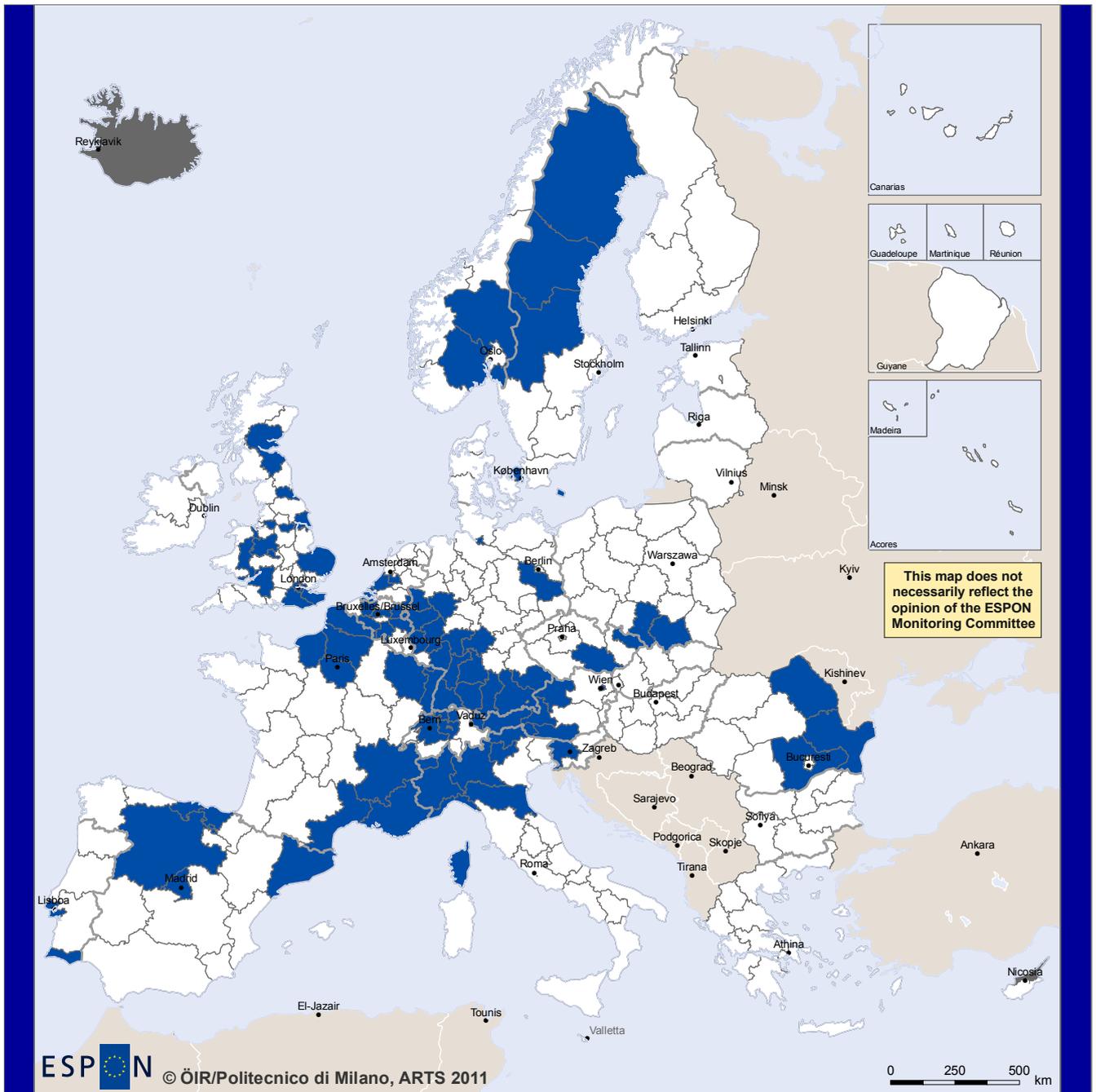
y León, Cataluña) and Lisboa and Algarve in Portugal. Mediterranean and Alpine regions in France appear exposed to this directive as well as Northern ones, pointing to the fact that more central regions seem affected by this directive. Lastly, some Nordic regions too appear exposed to this directive especially in Norway (Hedmark og Oppland and Sør-Østlandet), Sweden (Norra Mellansverige, Mellersta Norrland, Övre Norrland) and, to a larger extent, in the UK.

The following map depicts the regions affected.

**Map C 35: Regions affected by directive on critical infrastructure**

[following page]

# Regions affected by Directive on critical infrastructure



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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: highest density of rail and road network, areas at highest technological/environmental risk

## **The territorial impact of the directive**

According to the model results, the impacts on the natural environment are limited. Soil erosion (F1) shows positive but minor impacts in all the exposed regions as well as pollutants in soil (F2), the latter with the exception of two regions, Brussels Capital Region (BE) and Ciudad Autónoma de Ceuta (ES) which are, respectively, moderately and highly impacted. Impacts on soil sealing (F3) tend to be positive and minor as well with some exceptions, notably Wien (AT), Brussels Capital Region, Hamburg (DE), Ciudad Autónoma de Melilla (ES), Greater Manchester, West Midlands and Outer London (UK), which show moderate impact. Lastly, impact on the conservation of natural heritage (landscape diversity, F10) will generally be minor and negative although some regions are moderately hit, namely Tirol, Vorarlberg (AT), Cantabria, Comunidad de Madrid (ES), Corse (FR), Valle d'Aosta, Provincia Autonoma Bolzano (IT), Övre Norrland (NO), Eastern Scotland (UK).

The model shows that impacts on the regional economy will be relatively limited and not highly differentiated. More specifically, the impact on economic growth (F12) looks positive but minor in all the exposed regions except for four in Eastern Europe, namely East and South Romania and Malopolskie and Slaskie in Poland where it seems moderate. On the other hand, impact on employment in manufacturing (F18, Map C 36 below) appears positive, ranging from minor to moderate in most of the regions, except in Jihovýchod and Moravskoslezsko where impacts are high, due to the regional sensitivity adjustment. Similarly, impacts on employment in services (F19, Map C 37 below) are mostly moderate although high in Brussels Capital Region, Ciudad Autónoma de Ceuta and Ciudad Autónoma de Melilla in Spain and minor in the following regions Oberösterreich in Austria, Jihovýchod and Moravskoslezsko in Czech republic, Stuttgart, Tübingen, Niederbayern, Schwaben in Germany, Malopolskie and Slaskie in Poland, Nord-Est, Sud-Est and Sud in Romania.

Impacts on society and people concern a greater number of fields and are, on average, of greater magnitude. As regards accidents in road transports (F26), the model results predict that impacts will be generally positive but minor, becoming moderate in a handful number of regions, namely Prov. Namur (BE), Castilla y León (ES), Corse (FR), Provincia Autonoma Bolzano, Emilia-Romagna (IT) and Algarve (PT). As regards accident risk in industry/energy supply (F27, Map C 38 below), most regions show positive moderate impacts with only a few showing either minor impact (namely, Ciudad Autónoma de Ceuta and Ciudad Autónoma de Melilla in Spain, Norra Mellansverige and Mellersta Norrland in Sweden) or high impact (namely Hamburg (DE), Haute-Normandie, Nord-Pas-de-Calais, Alsace, Piemonte (FR), Liguria (IT), East Riding and North Lincolnshire (UK)). More interesting is accessibility. Regarding air accessibility (F29, Map C 39 below), the model predicts generally positive and high impact, but more moderate impacts in western capital regions such as Brussels Capital Region, Madrid, Paris, London, Zurich, Wien, Hovedstaden (DK). Impacts are very high in a few regions, namely Hedmark og

Oppland (NO), Nord-Est and Sud-Est in Romania. In addition, the impact on road accessibility (F31, Map C 40 below) looks positive and moderate across all European regions exposed to the directive and high in just three Nordic regions, namely Hedmark og Oppland, Mellersta Norrland and Övre Norrland. Similarly, impact on rail accessibility (F32, Map C 41 below) looks positive and moderate across all European regions exposed to this directive and high only in the Swedish region of Övre Norrland.

Lastly, the model predicts that impacts on governance will be moderately positive in terms of efficiency of government/governance mechanisms (F37), but moderately negative in terms of duration or complexity of planning procedures (F38). The effect of this will be equal across all European regions exposed to this directive as the sensitivity was kept constant. Finally, transnational cooperation between member states (F41) seems to be enhanced by this directive. Impacts are however minor except in Algarve and Övre Norrland.

As a final note, of the 93 exposed regions, 47 show high impact on one indicator only and 12 regions (mostly in France, Czech Republic and Italy) on two indicators and just 3, namely Ciudad Autónoma de Ceuta, Ciudad Autónoma de Melilla, and Övre Norrland, on more than two indicators. On the other hand, there is only one region (Valle d'Aosta in Italy) showing a high negative impact in one indicator only. Overall, thus, this directive seems to bring rather high positive impact.

**Map C 36: Territorial Impact of Directive 9 on employment in secondary sector**

**Map C 37: Territorial Impact of Directive 9 on employment in tertiary sector**

**Map C 38: Territorial Impact of Directive 9 on the accident risk in industry/energy supply**

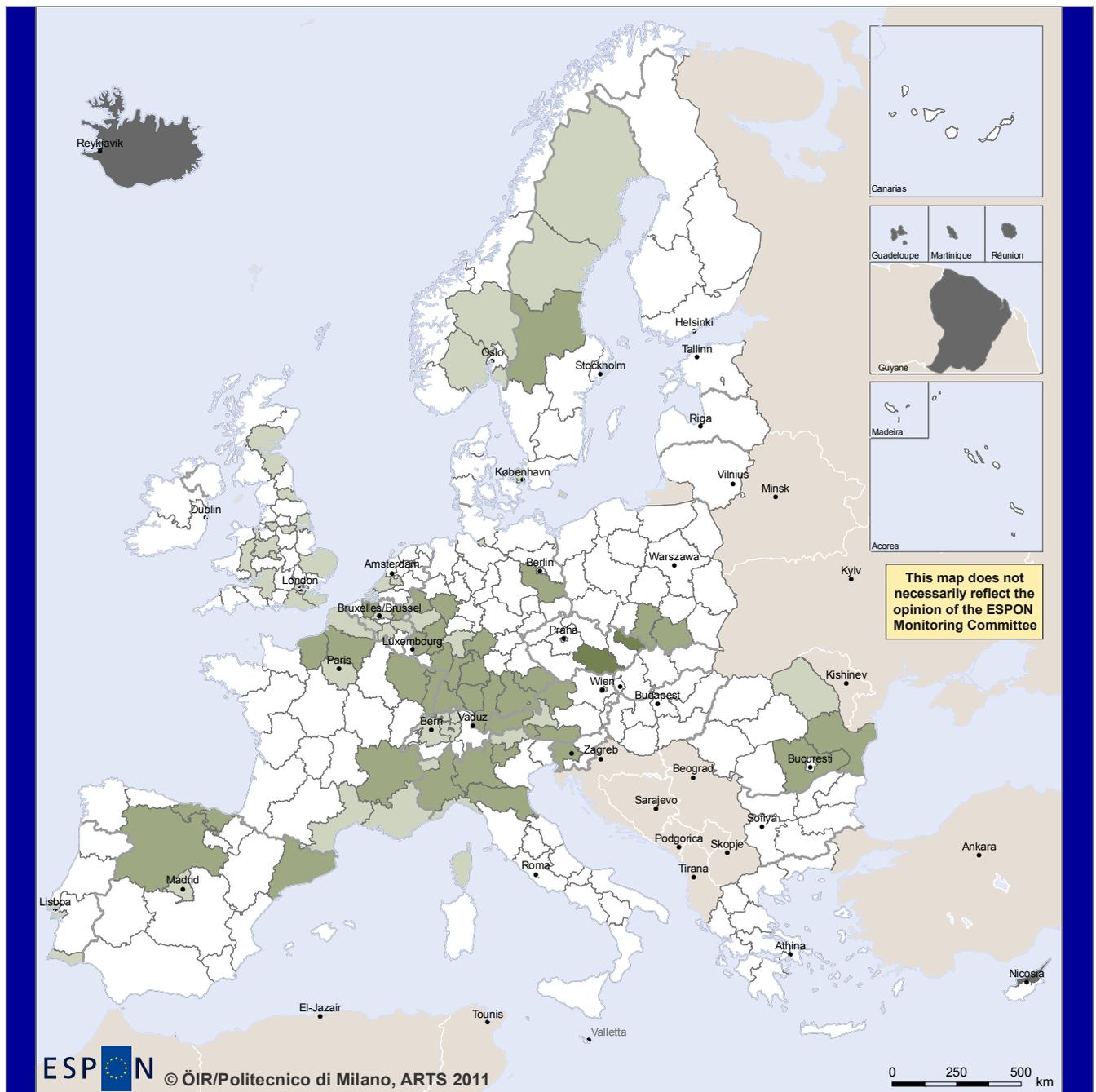
**Map C 39: Territorial Impact of Directive 9 on daily accessibility by air**

**Map C 40: Territorial Impact of Directive 9 on daily accessibility by road**

**Map C 41: Territorial Impact of Directive 9 on daily accessibility by rail**

[following pages]

# Regions affected by Directive on critical infrastructure Employment in secondary sector (F18)



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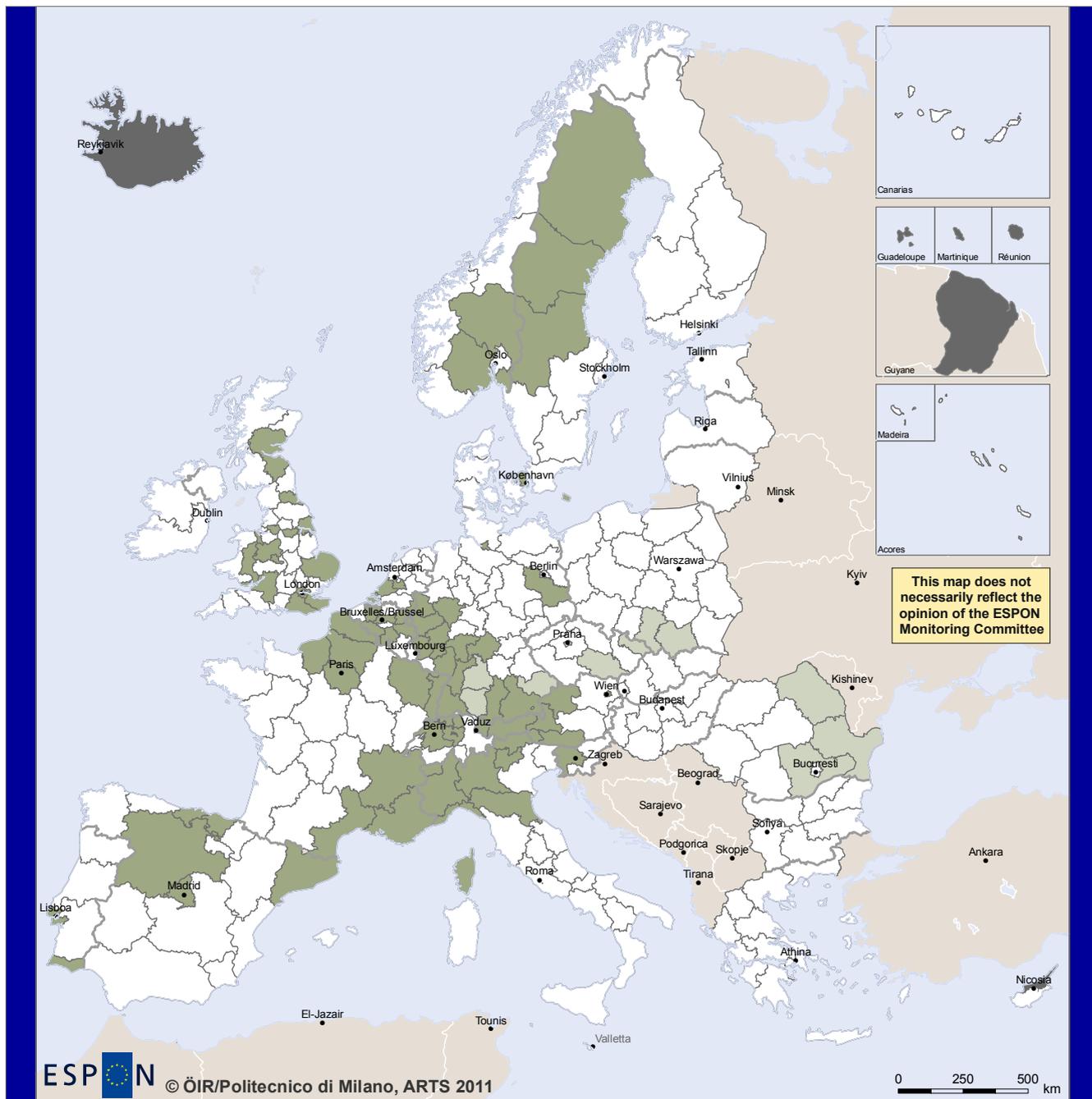
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## Positive Impact



Types of regions affected: highest density on rail and road network,  
areas at highest technological/environmental risk

# Regions affected by Directive on critical infrastructure Employment in tertiary sector (F19)



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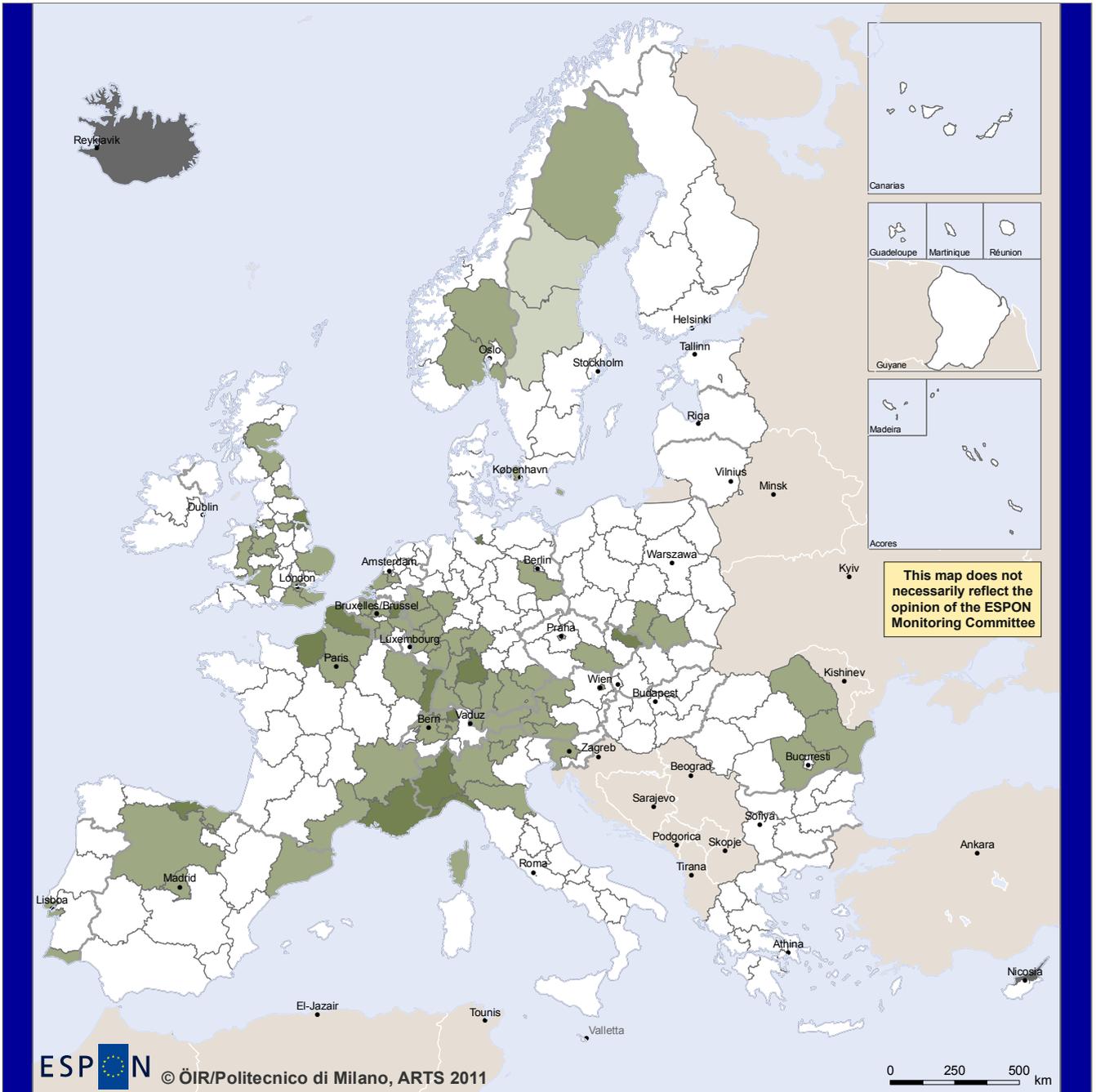
## Positive Impact



Types of regions affected: highest density on rail and road network,  
areas at highest technological/environmental risk

# Regions affected by Directive on critical infrastructure

## Accident risk: industry / energy supply (F27)




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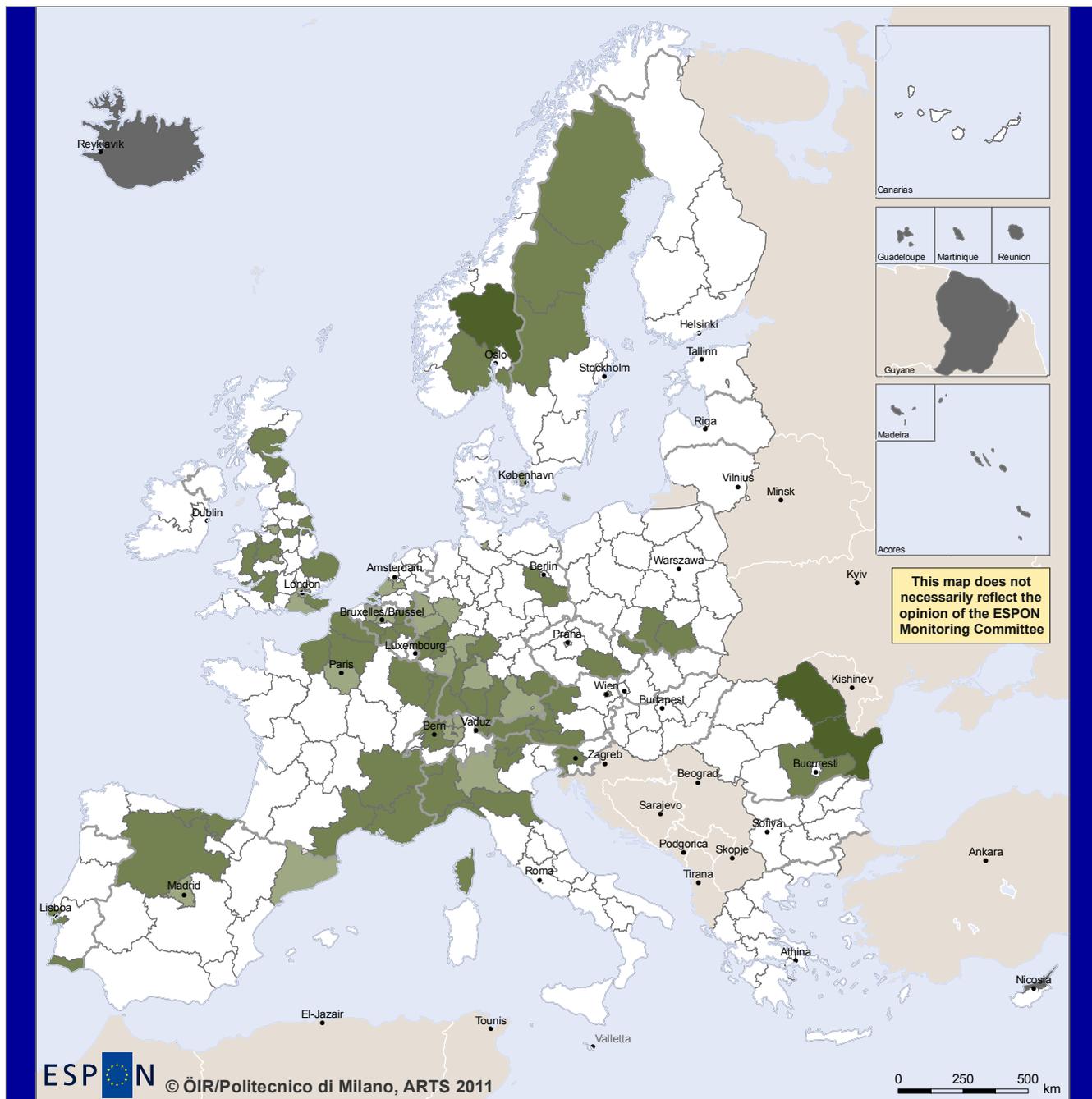
### Positive Impact



Types of regions affected: highest density on rail and road network, areas at highest technological/environmental risk

# Regions affected by Directive on critical infrastructure

## Daily accessibility by air (F29)



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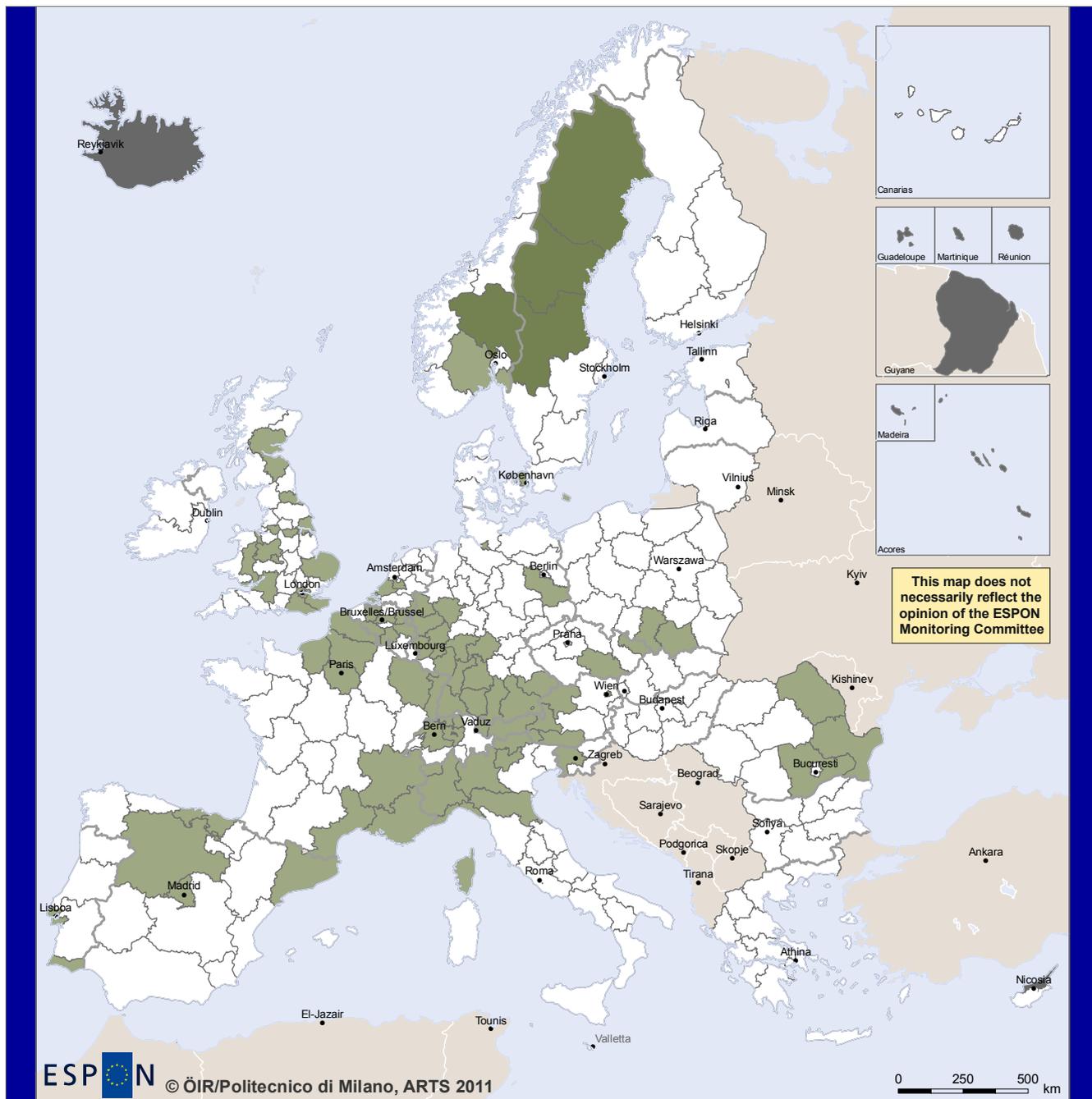
### Positive Impact



Types of regions affected: highest density on rail and road network, areas at highest technological/environmental risk

# Regions affected by Directive on critical infrastructure

## Daily accessibility by road (F31)



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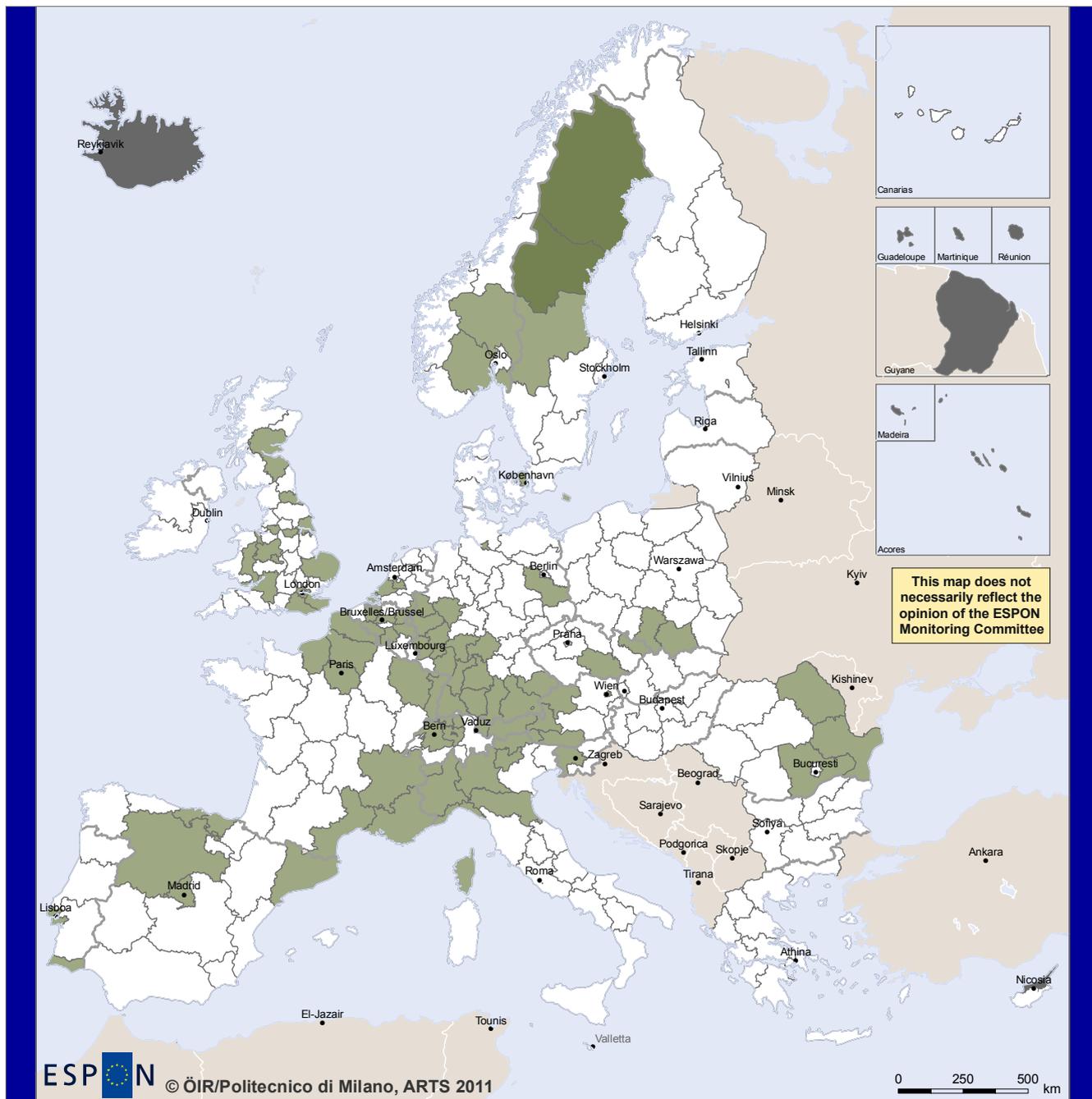
### Positive Impact



Types of regions affected: highest density on rail and road network, areas at highest technological/environmental risk

# Regions affected by Directive on critical infrastructure

## Daily accessibility by rail (F32)



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### Positive Impact

- Very high impact
- High impact
- Moderate impact
- Minor impact
- Not affected
- Neighbourhood Countries
- No Data

Types of regions affected: highest density on rail and road network, areas at highest technological/environmental risk

## **5.8 Directive on the establishing a framework for Community action to achieve the sustainable use of pesticides**

This directive establishes a framework to achieve a sustainable use of pesticides by reducing the risks and impacts of pesticide use on human health and the environment and promoting the use of integrated pest management and of alternative approaches or techniques such as non-chemical alternatives to pesticides.

### **Logical chain and exposure**

The aim of the directive is to ensure that member states draw up action plans to reduce the potential damage to human health and environment caused by pesticides. The directive also requires that appropriate inspections of equipment are carried out and training and certification schemes for all professional users of pesticides are set up. Furthermore, the necessary are taken to inform the general public on health and environmental hazards relating to pesticide use and awareness-raising programmes on those dangers and possibilities of switching to non-chemical alternatives are drawn up (F39). These added administrative tasks provide jobs in the service sector (F38, F19). This directive is expected to influence rural regions (branch a) differently than regions with a high number of chemical plants (branch b). The first being the recipient and the latter being the producer of pesticides.

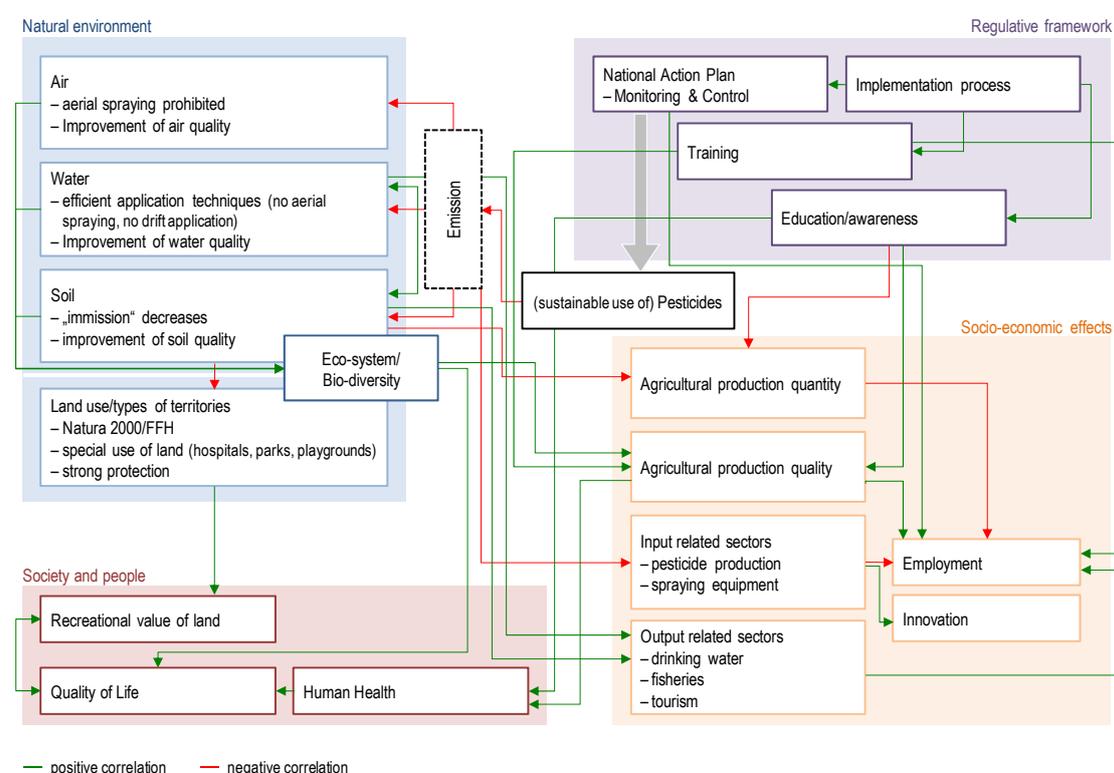
Regulations concerning the sustainable use of pesticides and therefore constrain their use. This should bring about less pollution in water, soil and air (F2, F5, F6). The prohibition of aerial spraying, which has caused harm to the environment and human health through spray drift, is seen as beneficial. Additionally chemical industries reduce the production of pesticides which also decreases their level of emissions. Obligatory establishment of buffer and safeguard zones (i.e. for surface and groundwater used for the abstraction of drinking water, areas used by the general public or by vulnerable groups) involves changes in land use. The decrease in quantity but much more the regulations concerning transport and storage of pesticides mitigate the risk for users but also accidents in chemical industries (F27).

On one hand, these developments have positive effects on the eco-system (F9) and public health (F28). On the other hand they hinder economic growth (F12). Producers of pesticides and other input-related sectors (F18) suffer financial losses as do agricultural producers due to falling crop yields, at least in the short run. The promotion of alternative approaches fosters innovation (F13), alters the region's range of arable crop and entails labour intensive agricultural production (F17). Low regional labour costs lead to substitution gains from replacing pesticide costs with labour. However in regions with high labour costs (especially in areas with high competition for labour) the reverse is true (F23 branch a and b). High value-added farm products due to environmentally friendly production, together with inelastic demand for aliments, increase the disposable income of rural population (F21 branch

a). The opposite is true for workers in the chemical industry (F21 branch b). First-tier effect of losses and gains in different sectors lead to a short-term imbalance of regional income distribution (F22). This has an effect on migration flows as the high-qualified workforce may move away (F24 branch b) whereas low-skilled farm workers are more likely to immigrate to rural regions (F24 branch a).

Summing up, the logical chains conclude that 17 out of 41 fields are touched by this directive. The highest positive effects can be expected on human health (F28) but also on the environment, especially on the quality of water (F5) and soil (F2). Employment in the secondary sector (F18) is the one field highly negatively influenced in both branches.

**Figure C 16: Logical chain of the directive**



### The regions affected by the directive

This directive has different effects on regions that are primarily rural (branch a) and those that contain a fair number of chemical industries (branch b). A characteristic of rural regions is their comparably high share of agricultural production, which makes them the primary recipient of pesticides. Regions with a high density of chemical plants are more likely to be affected by changes in the pesticide production. These regions are defined by a high density of chemical plants as regards the EU average.

Rural regions cover almost all of Scandinavia, Romania, Greece, Hungary, Slovenia and Austria. Also affected are Highlands and Islands in the UK, Border, Midlands and Western in Ireland, Alentejo in Portugal, Castilla-La Mancha and Extremadura in

Spain as well as Corse, Sardinia and Guayane. As are scattered Regions in Poland, Italy, mainland France (Poitou-Charentes, Limousin) and south-eastern Germany (Oberpfalz and Oberfranken). In Belgium and Bulgaria only one region is considered rural.

As regards regions with a rather high density of chemical industries, they can be best described as those regions that are not considered rural. There are only a few exceptions to this rule: being considered rural and at the same time having many chemical plants. These are Denmark, Länsi-Suomi in Finland, Malopolskie in Poland, Észak-Alföld in Hungary, Molise in Italy, Niederösterreich in Austria and Poitou-Charentes in France. Regions not affected by this directive are scattered throughout Europe.

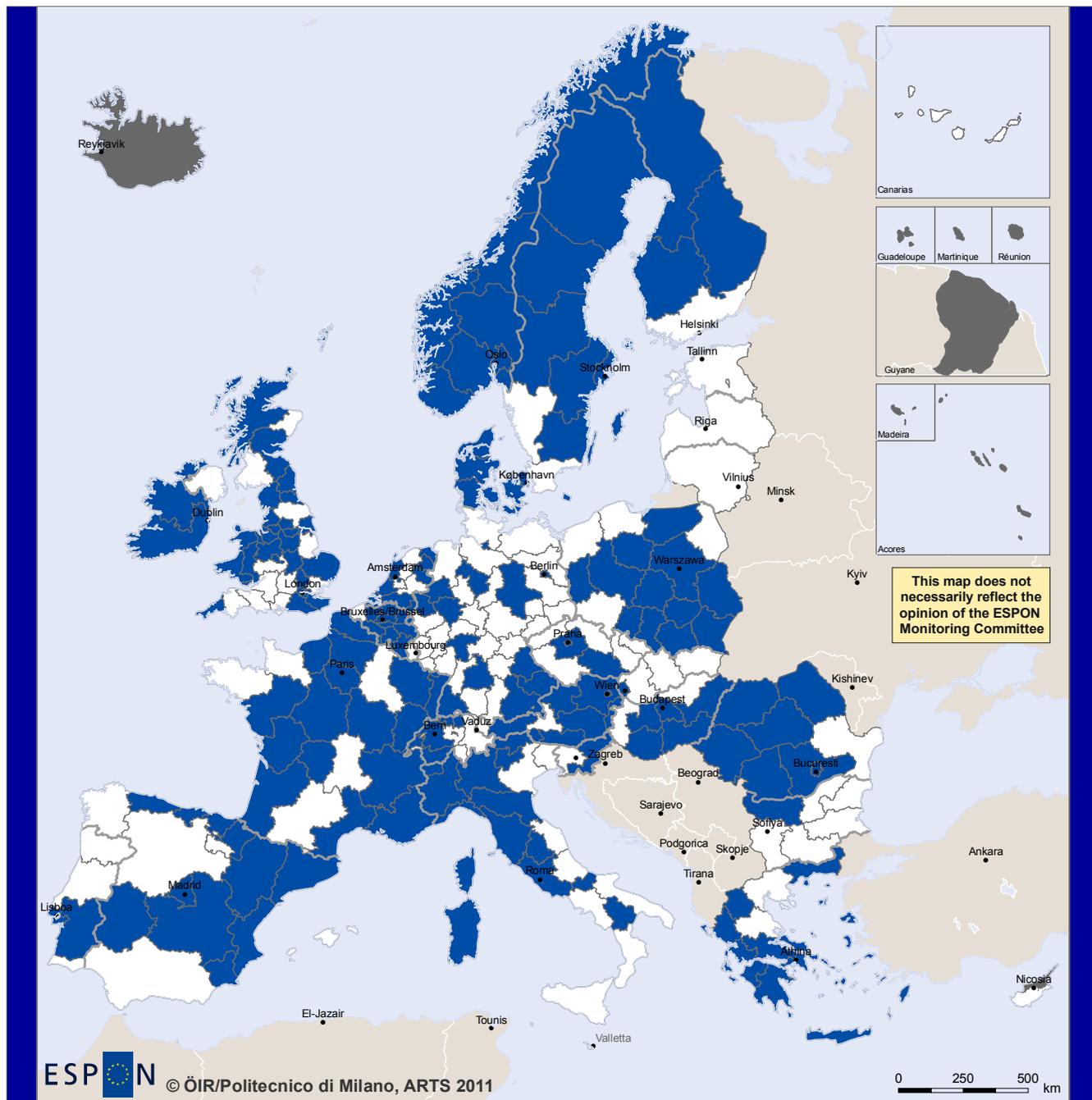
Aggregating both types of regions, 183 European regions are affected in total. However it should be noted that for 8 regions that can be considered rural, no data is available to classify them as regions having a high density of chemical industries.

The following map depicts the regions affected.

**Map C 42: Regions affected by directive on sustainable use of pesticides**

[following page]

# Regions affected by Directive on sustainable use of pesticides



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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: rural, chemical industries

## **The Territorial impact of the directive**

Considering branch a and branch b of this directive simultaneously, the impacts on the environment is limited but positive across all concerned regions. Impacts on air quality (F6) can be considered minor in rural regions and those with chemical plants (the exception is Bucharest, benefitting highly due to the sensitivity adjustment), the directive produces equally moderate positive impacts on the quality of water and soil and minor positive effects on biodiversity (F9) in rural regions.

The positive effects on the environment are mirrored in the strong to very strong (pervasively in eastern European countries) positive impacts on health (F28) and moderate to high positive impacts on environmental and technological risk (F27) in the concerned regions. It should be noted that these impacts are a bit less pronounced in rural regions than in those where chemical plants are situated.

Impacts on the regional economy are quite differentiated across the influenced regions. Economic growth (F12) in rural regions is generally hampered by minor negative impacts, getting stronger the poorer the regions are, reflecting the logic of the sensitivity adjustment. Regions in Hungary (Dél-Dunántúl, Észak-Alföld, Dél-Alföld), Poland (Lubelskie, Podkarpackie, Swietokrzyskie, Warminsko-Mazurskie) and Romania (except Sud-Est and Bucuresti) show moderate impacts, whereas Nord-Est in Romania and Severozapaden in Bulgaria are impacted strongly (see Map C 43). Similar is the impact (minor negative) on economic growth in regions with chemical production, although less differentiated. Only Malopolskie, Opolskie, Kujawsko-Pomorskie in Poland and Észak-Alföld in Hungary are impacted moderately. Impacts of branch a and b on agricultural area (F17) can be compared to those on economic growth although of a greater magnitude, mostly yielding moderately negative impacts. High negative effects are shown in Pays de la Loire in France, East Riding and North Lincolnshire, Leicestershire, Rutland and Northants as well as East Anglia in the UK.

Effects on employment in the primary sector (F16) are minor and positive across all concerned regions, but moderate in city regions that have chemical plants like Hamburg, Stockholm, Groningen, Île-de-France, Brussels, Vienna and strong in Inner London. This last result is certainly a reflection of the workings of the sensitivity indicator, as these regions have virtually no employment in the primary sector, particularly Inner London.

Contrary to the positive effects on employment in the primary sector, effects on employment in the secondary sector (F18) are pervasively strong to very strong and negative in both branches. This is especially true in regions where the industrial sector provides a big share of jobs in the region (see Map C 45).

Impacts on social disparities differ from branch a (mainly positive) to branch b (mainly negative). The effect on income distribution (F22) is negative for both although mainly minor and moderate; only Alentejo in Portugal shows a high impact.

Rural regions profit from the generally minor positive impacts on household disposable income (F21) and employment (F23). Poland (employment) and Bulgaria (disposable income) stick out as being moderately impacted. An exception to this is Severozapaden in Bulgaria and Nord-Est in Romania, both which experience a high impact. A greater magnitude of impacts can be found regarding migration (F24), ranging mainly from moderate to high positive impacts. Itä-Suomi in Finland and Dél-Dunántúl in Hungary, Basilicata in Italy and most regions in Poland and Romania are exceptions, showing only minor impacts.

Limited und undifferentiated negative impacts on household disposable income (F21) and employment (F23) become apparent in regions with chemical plants. The impact is usually minor, but some regions in Poland as well as Sachsen-Anhalt in Germany and Brussels show a moderate impact. Similar to rural regions, the impact on migration (F24) is of a greater magnitude but negative, indicating out-migration. France and the UK are highly differentiated with impacts ranging from minor to high.

Overall, of the 183 regions (summarizing the affected regions of both branches of the directive), 118 show high impact on one indicator only and 44 (scattered throughout Europe) on two indicators. Five regions show high impact on three indicators, namely Molise (IT), Länsi-Suomi (FI) and Syddanmark, Midt- and Nordjylland in Danmark. In contrast, the highest number of highly negatively impacted indicators (three) can be found in the same regions, including East Riding and North Lincolnshire as well as Leicestershire, Rutland and Northamptonshire in the UK. Furthermore high negative impacts can be noticed in all concerned regions on at least one indicator, while 55 regions experienced this on two indicators.

**Map C 43 Territorial Impact of Directive 10 (branch a) on economic growth (GDP/capita)**

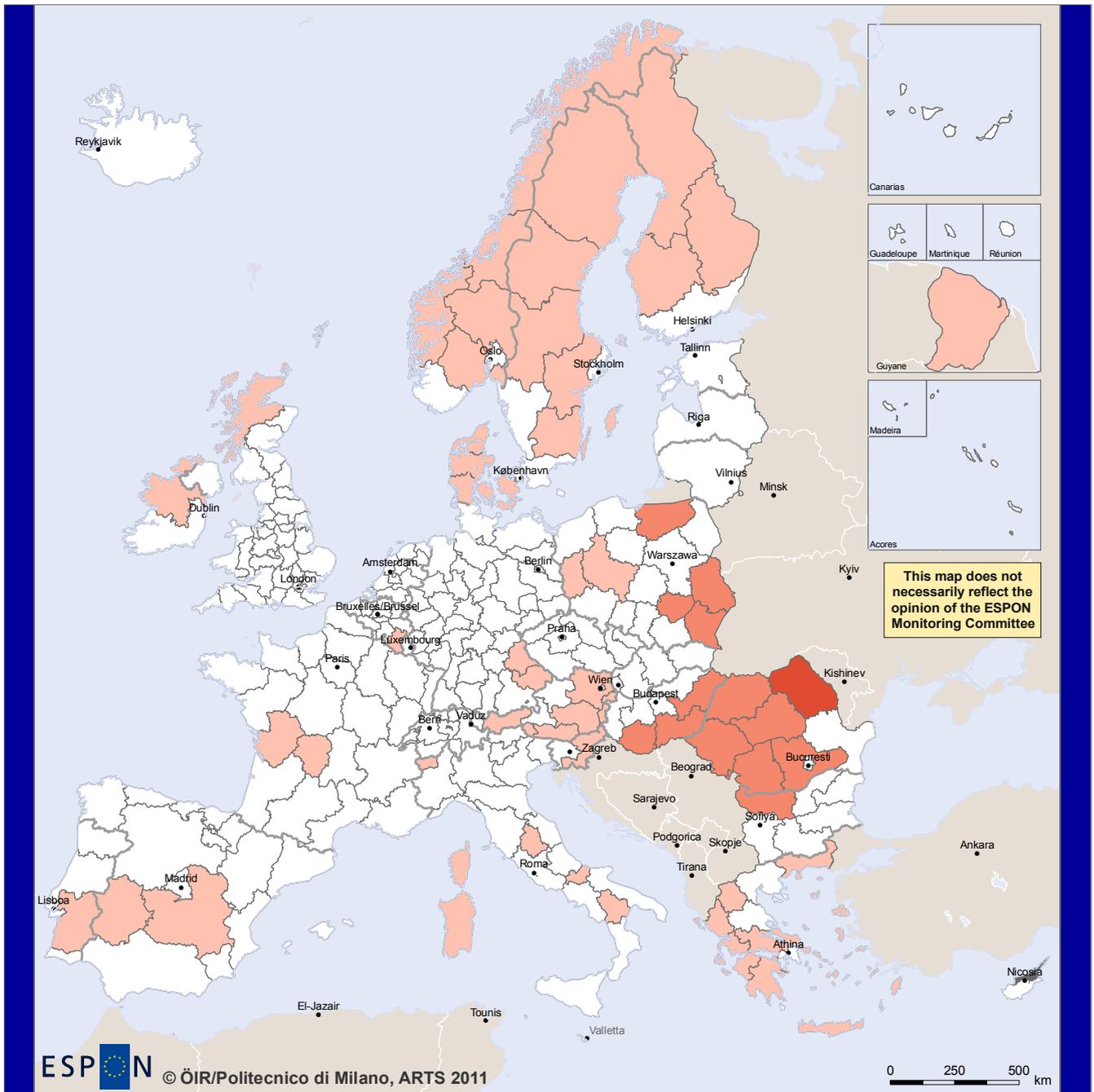
**Map C 44: Territorial Impact of Directive 10 (branch a) on healthy life expectancy at birth**

**Map C 45: Territorial Impact of Directive 10 (branch b) on employment in secondary sector**

**Map C 46: Territorial Impact of Directive 10 (branch b) on healthy life expectancy at birth**

[following pages]

# Regions affected by Directive on sustainable use of pesticides branch a Economic growth (GDP/capita) (F12)



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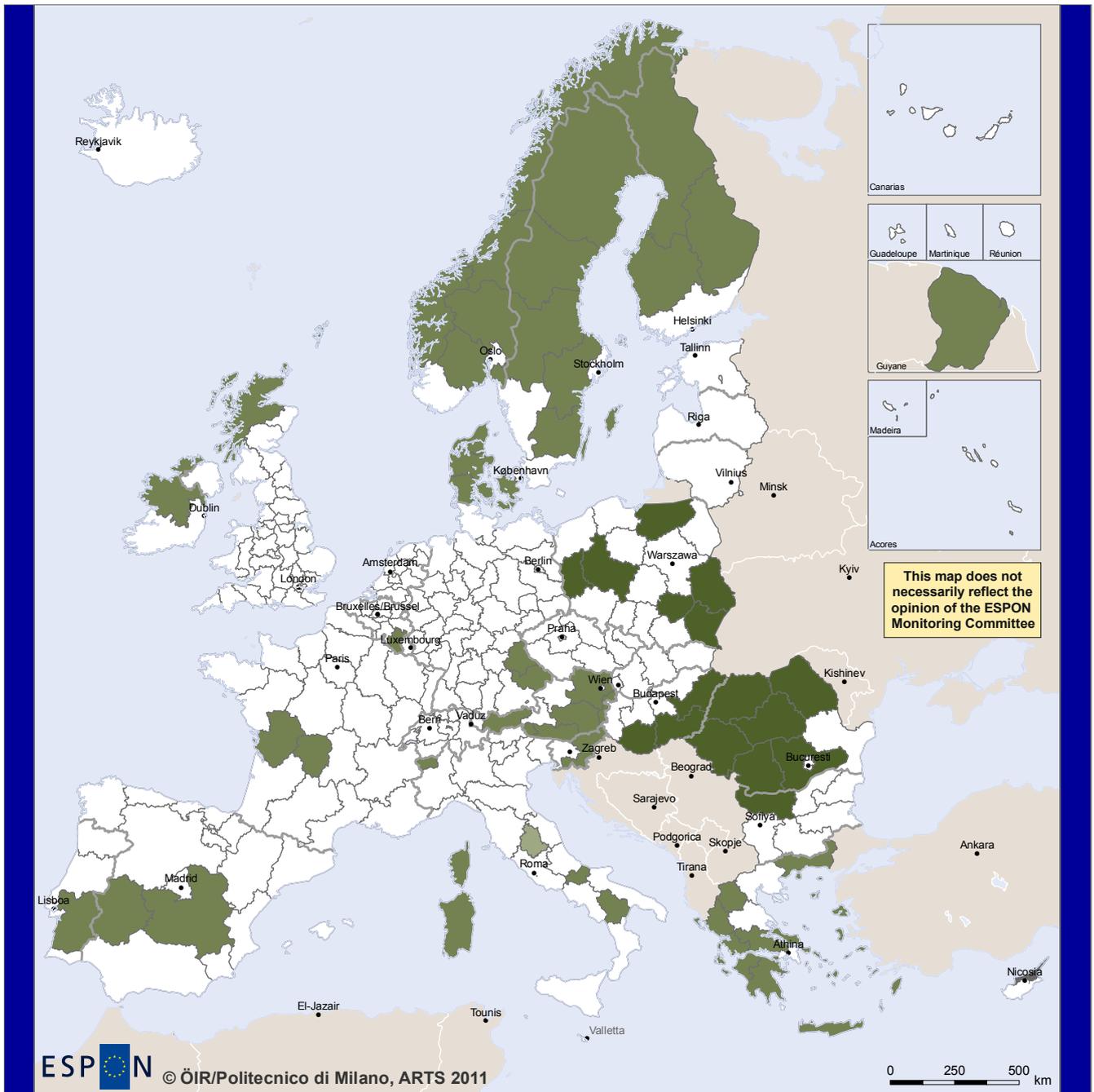
## Negative Impact



Types of regions affected: rural

# Regions affected by Directive on sustainable use of pesticides branch a

## Healthy life expectancy at birth (F28)



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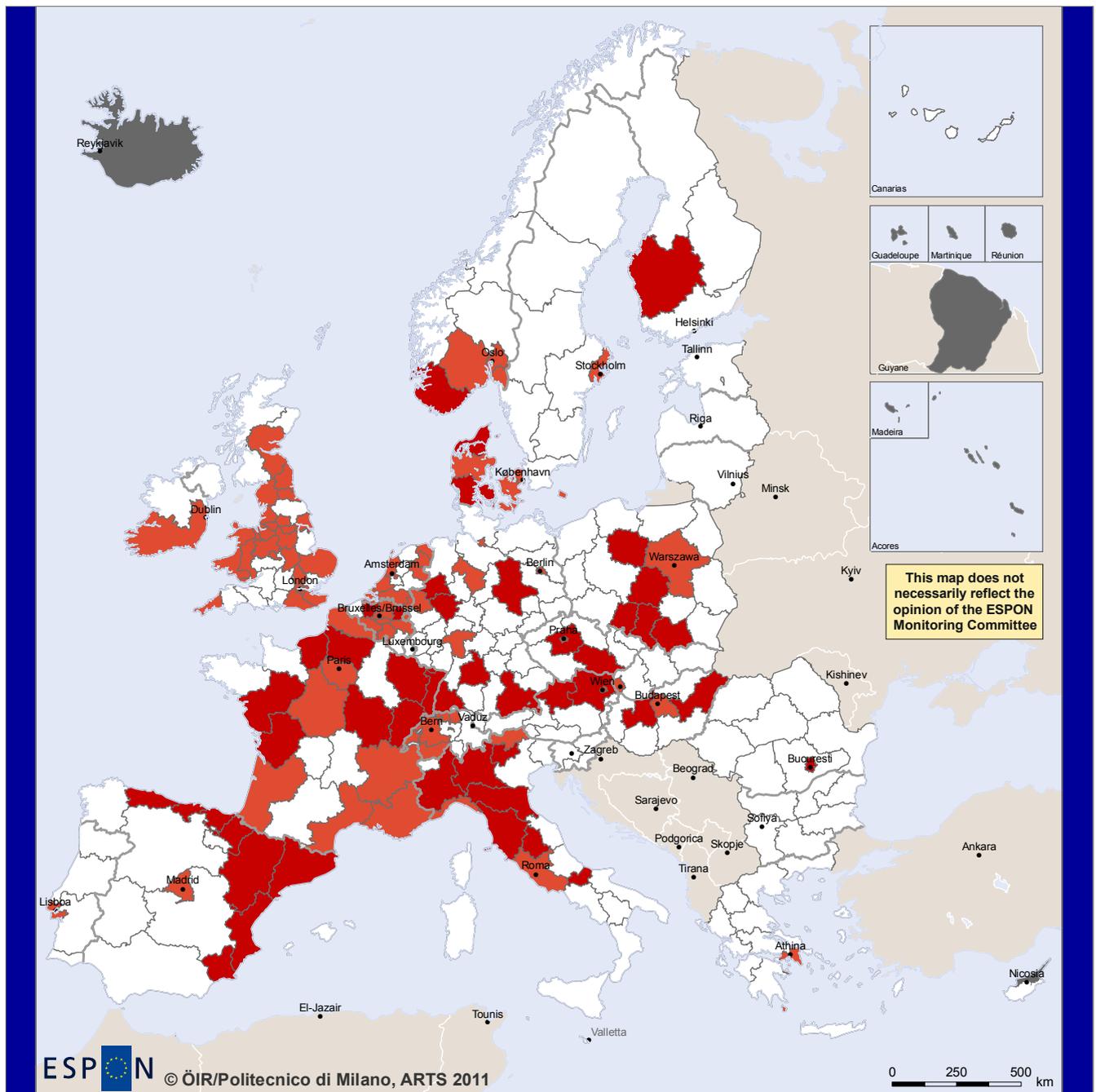
### Positive Impact

- Very high impact
- High impact
- Moderate impact
- Minor impact
- Not affected
- No Data
- Neighbourhood Countries

Types of regions affected: rural

# Regions affected by Directive on sustainable use of pesticides branch b

## Employment in the secondary sector (F18)



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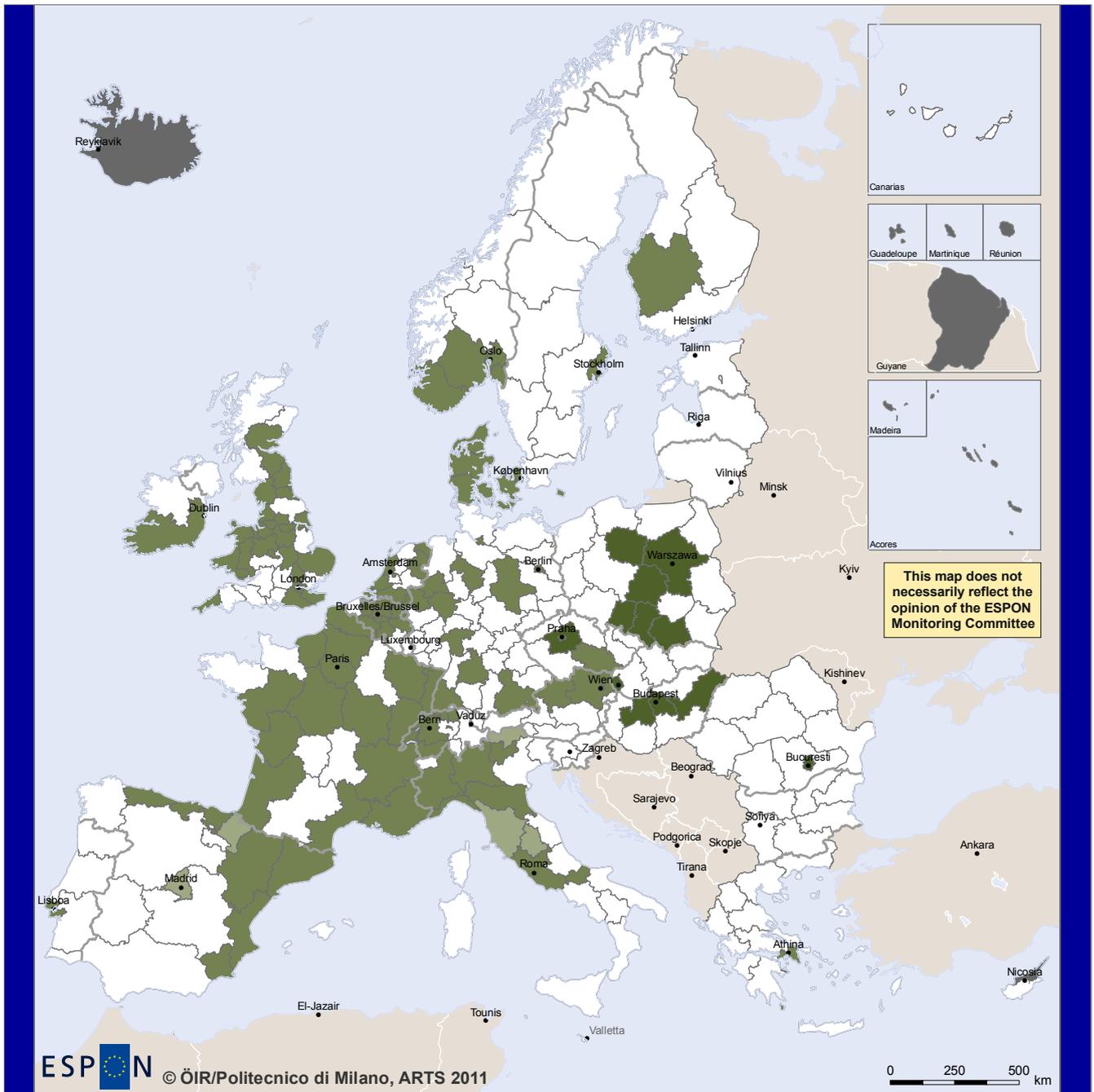
### Negative Impact



Types of regions affected: chemical industries

# Regions affected by Directive on sustainable use of pesticides branch b

## Healthy life expectancy at birth (F28)



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### Positive Impact



Types of regions affected: chemical industries

## 5.9 Directive on the energy performance of buildings

The directive promotes the improvement of the energy performance of buildings within the Union, taking into account outdoor climatic and local conditions, as well as indoor climate requirements and cost-effectiveness. Local planners are directly addressed by the directive, to properly consider the optimal combination of improvements in energy efficiency, use of energy from renewable sources and use of district heating and cooling when planning, designing, building and renovating industrial or residential areas.

### Logical chain and exposure

The four key points of the Directive are:

- a common methodology for calculating the integrated energy performance of buildings;
- minimum standards on the energy performance of new buildings and existing buildings that are subject to major renovation;
- systems for the energy certification of new and existing buildings and, for public buildings, prominent display of this certification and other relevant information. Certificates must be less than five years old;
- regular inspection of boilers and central air-conditioning systems in buildings and in addition an assessment of heating installations in which the boilers are more than 15 years old.

The common calculation methodology should include all the aspects which determine energy efficiency and not just the quality of the building's insulation. This integrated approach should take account of aspects such as heating and cooling installations, lighting installations, the position and orientation of the building, heat recovery, etc.

The Directive concerns the residential sector and the tertiary sector (offices, public buildings, etc.).

Energy performance certificates should be made available when buildings are constructed, sold or rented out. The Directive specifically mentions rented buildings with the aim of ensuring that the owner, who does not normally pay the charges for energy expenditure, should take the necessary action. Furthermore, the Directive states that occupants of buildings should be enabled to regulate their own consumption of heat and hot water, in so far as such measures are cost effective. The Member States are responsible for drawing up the minimum standards. They will also ensure that the certification and inspection of buildings are carried out by qualified and independent personnel.

The Directive forms part of the Community initiatives on climate change (commitments under the Kyoto Protocol) and security of supply (the Green Paper on security of supply). Firstly, the Community is increasingly dependent on external energy sources and, secondly, greenhouse gas emissions are on the increase. The

Community can have little influence on energy supply but can influence energy demand. One possible solution to both the above problems is to reduce energy consumption by improving energy efficiency. Energy consumption for buildings-related services accounts for approximately one third of total EU energy consumption.

This directive operates within the context of some very dynamic markets such as the fossil energy market, the highly innovative sector of renewable energy production, the heat and cold storage and exchange sector, and the construction sector. In particular the prices of (fossil) energy are hard to predict, but may have serious consequences in relation to this directive and its territorial impact. Depending on the development of cheap means (solar, wind, tidal) for renewable energy production the territorial impact of this directive can work out in different directions. The same counts for the developments in the heat and cold storage sector. Because it is not possible to take all contextual parameters into account the outcomes should be understood in terms of relative continuity of the existing situation. In order to factor in various possible developments the same exercise could be repeated, but under different scenario's, with different contextual parameters.

All areas with buildings could be potentially influenced by this directive. It requires member states that all new buildings comply with 'near zero-energy buildings' standards by 31 December 2020 (and 31 December 2018 in case of public buildings). This means that new buildings (or buildings undergoing major renovation) have a very high performance on energy efficiency and that the low amount of energy used comes from renewable sources. This should result in a significantly lower consumption of fossil energy (F34).

Most effects will be on the level of individual new or renovated buildings, which need to be zero-energy buildings by 2018, in the case of public buildings, or 2020 in the case of private buildings. The main impacts will be within the buildings and their installations, with the latter becoming more efficient. From an architectural perspective buildings will be designed in different ways in order to make maximum use of natural climatologically conditions (orientation and angle to the sun, shading etc.), to use different construction materials, to integrate renewable energy production (solar panels, wind turbines, geothermal heat etc.) and may come in adjusted shape, for example with thicker walls.

In terms of physical territorial impact effects are mainly to be expected at the level of a building block or neighborhood in terms of adjusted urban design. In particular in cities where the temperature can be significantly higher due to the dense urban fabric certain urban design provisions can be expected to facilitate the penetration of water and cool air from outside the city. This includes also measures such as lowering the amount of soil sealing, i.e. pavements, roads, at a district level. The overall effect could be a lowering of the amount of buildings per hectare and in effect a more inefficient use of land (F35). On the other hand, it could at the same time lead to a

higher degree of mixed land use (F36) precisely due to the fact that the direct building print will be decreased.

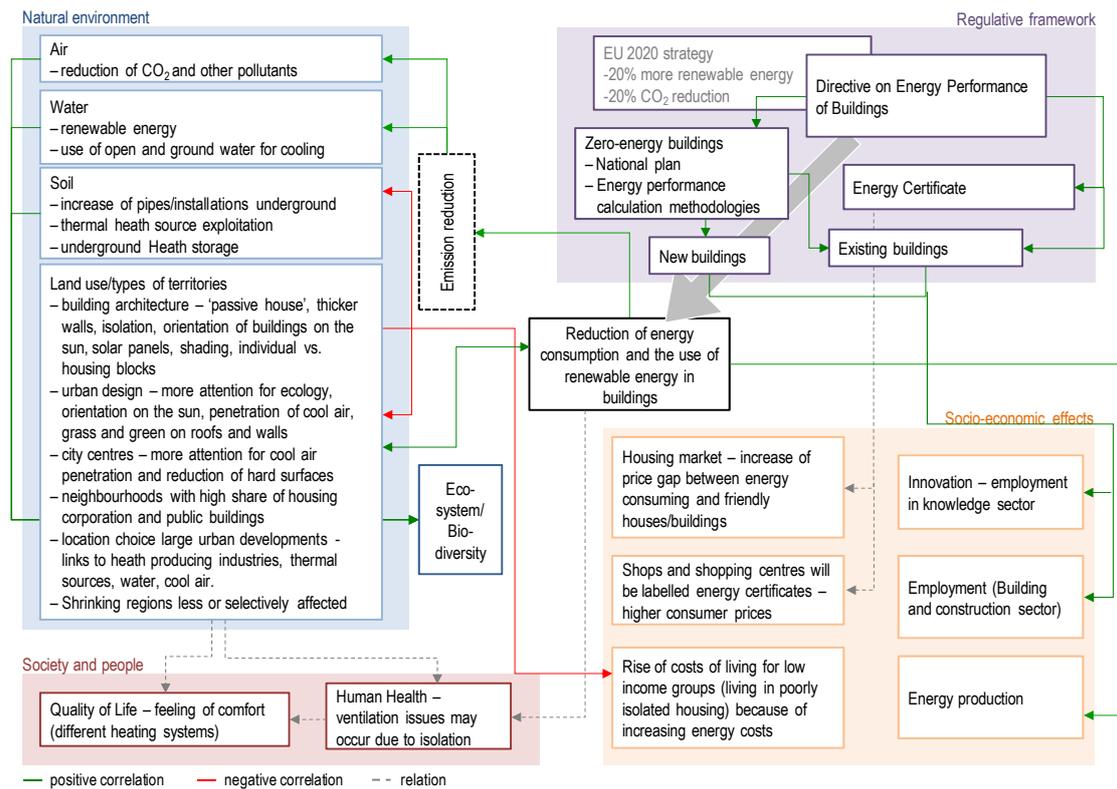
Also there will be increasing attention in urban and neighborhood design for the integration of heat and cold storage and exchange systems, including water as a cooling device (F4). The implementation of such systems involve new underground infrastructure (mainly tubes). Depending on the local situation it can this may also influence decisions on land use and locations for new urban development.

Socially or economically the directive will cause impact too. One field of impact will be the building sector, which needs to become more innovative. In particular in urbanized regions, where there is much building activity, this will lead to more innovation (F13) and new small middle sized consultant and advisory companies in the tertiary sector (F14).

Another social effect, which is more negative, could be further segregation and uneven income distribution in terms of disposable income (F21). Because significant costs involved in making buildings energy neutral it will be difficult for individual owners or landlords to adapt their houses/buildings to the new standards. In particular lower income households will be hesitant to either adapt their own house or move to a new zero energy rent house, which will be more expensive on the short term (but will be compensated on the long term due to lower energy costs). Rather than moving they will stay in poorly isolated and energy inefficient houses. If energy prices raise the effect will multiply and lead to increased income differentiation. In spatial terms it may lead to further segregation within cities.

Indirectly the directive will further stimulate the production of renewable energy (wind, solar, water, biomass etc.) which will have important territorial impact too. The directive foresees in establishing monitoring systems including energy performance certificates for several building categories, national plans to achieve targets, policies and incentives. This will mainly influence the efficiency of government (F37) in terms of additional tasks. The complexity of the planning procedure (F38) may also increase to a limited extent due to an additional national plan which will influence other plans and the certificate system that may play a role in issuing permits.

**Figure C 17: Logical chain of the directive**



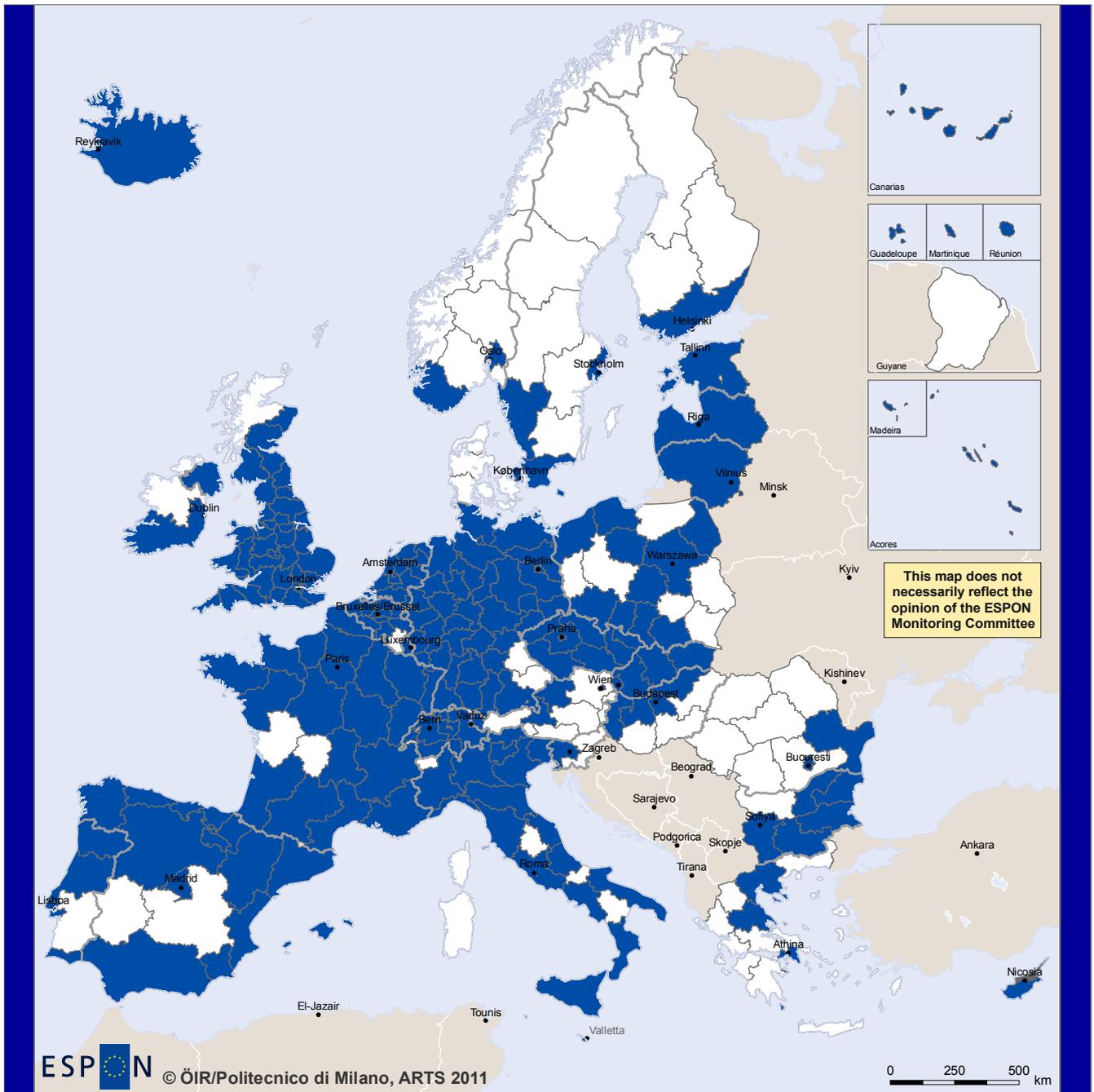
**The regions affected by the directive**

The main type of regions that will be affected concern those regions where many buildings can be found and are being built. This concerns mainly densely populated, urbanized and growth regions. The following map depicts the regions affected.

**Map C 47: Regions affected by directive on energy performance of buildings**

[following page]

# Regions affected by Directive on the energy performance of buildings



This map does not necessarily reflect the opinion of the ESPON Monitoring Committee

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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: urban, agglomerated

## **The Territorial impact of the directive**

The main negative impacts occur in the fields of water consumption and equity in disposable income. Nearly all regions across Europe, except the rural and sparsely populated regions, are evenly impacted in these fields. To lesser extent this is also true for in terms of loss of cultural heritage. Only areas with a disproportionate amount of cultural heritage may be expected to be hit by this directive, in this case in particular Italy.

In terms of positive impact across whole Europe a similar pattern may be observed with an increase of jobs in the innovation sector and a reduction of fossil fuel consumption.

Two more specific types of regions can be identified where effects may be relatively large. This concerns first regions with a high share of cultural heritage (F11) in terms of historic buildings (see Map C 48). This concerns regions such as Prague, Cataluña, Cyprus, but also and in particular many Italian regions. A better indicator would have been 'percentage of old buildings as share total amount of buildings', but the indicator cultural heritage comes close and gives a decent indication. Another type of region that will be more strongly impacted are regions where income distribution (E22) is unbalanced (see Map C 49). This unbalance will be increasing rather than decreasing because of this directive. Regions that are concerned include Andalucia along with a number of other Spanish regions, Thessaly, Malta, almost all Portuguese regions and a number of Italian regions.

A very indirectly influenced type of region, concern regions that are vulnerable to climate change. Because of less **fossil fuel consumption** (F34) (see Map C 50) there will be less **CO<sub>2</sub> emission** (F7) which reduces the speed of climate change.

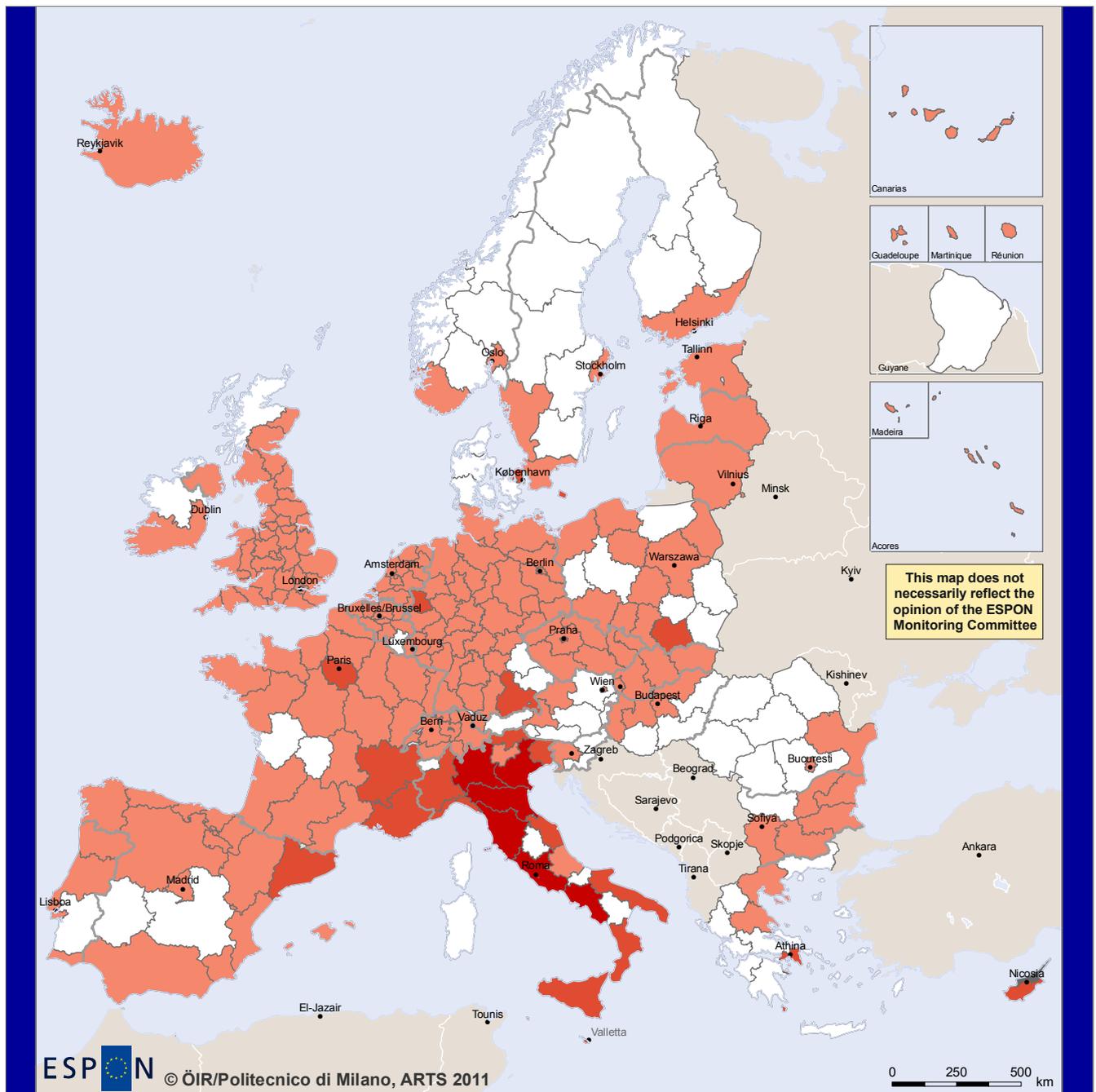
**Map C 48: Territorial Impact of Directive 12 on conservation of cultural heritage**

**Map C 49: Territorial Impact of Directive 12 on equal income distribution**

**Map C 50: Territorial Impact of Directive 12 on fossil fuel consumption**

[following pages]

# Regions affected by Directive on the energy performance of buildings Conservation of cultural heritage (F11)



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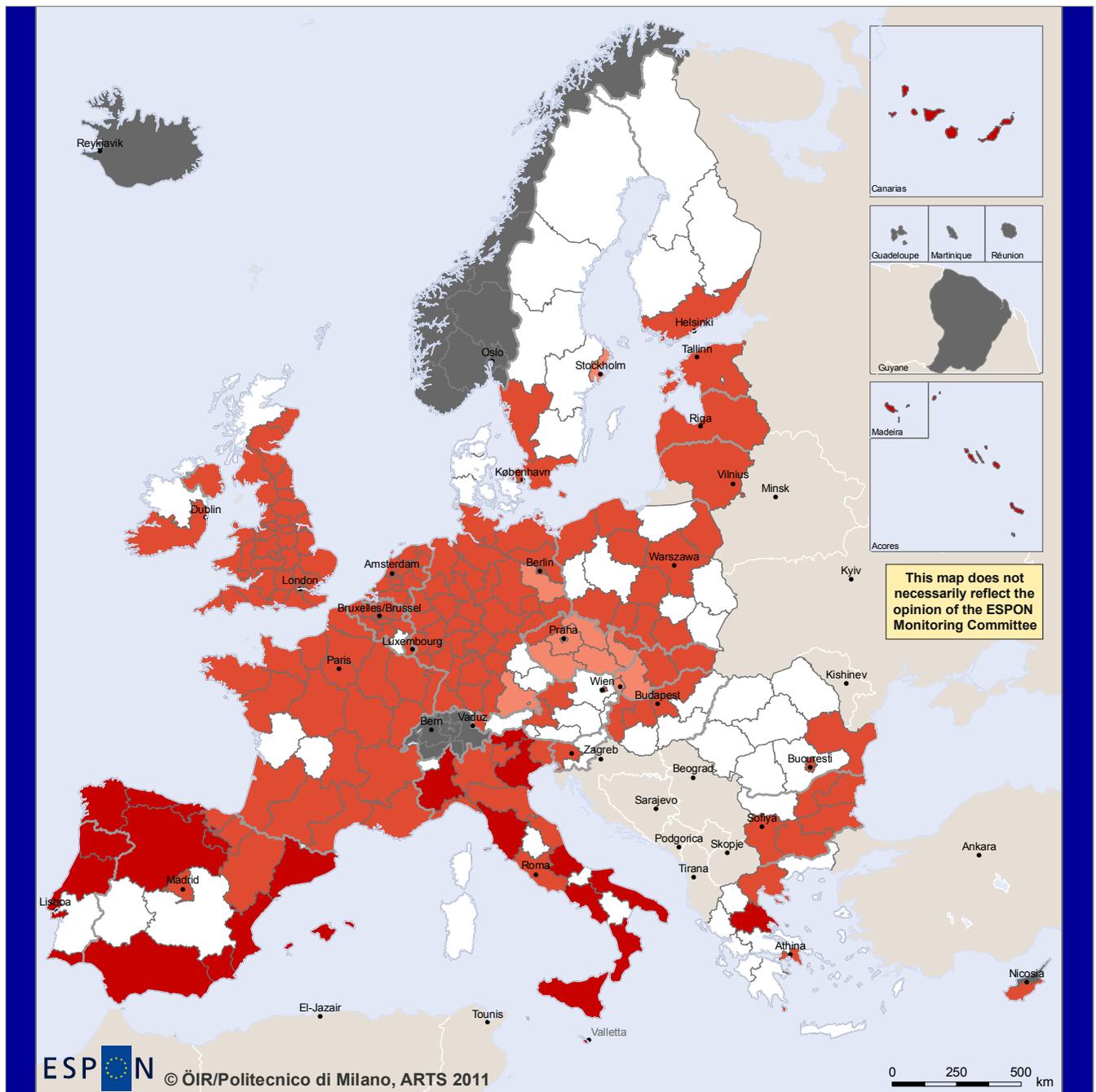
Regional level: NUTS 2  
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## Negative Impact



Types of regions affected: urban, agglomerated

# Regions affected by Directive on the energy performance of buildings Equal income distribution (F22)



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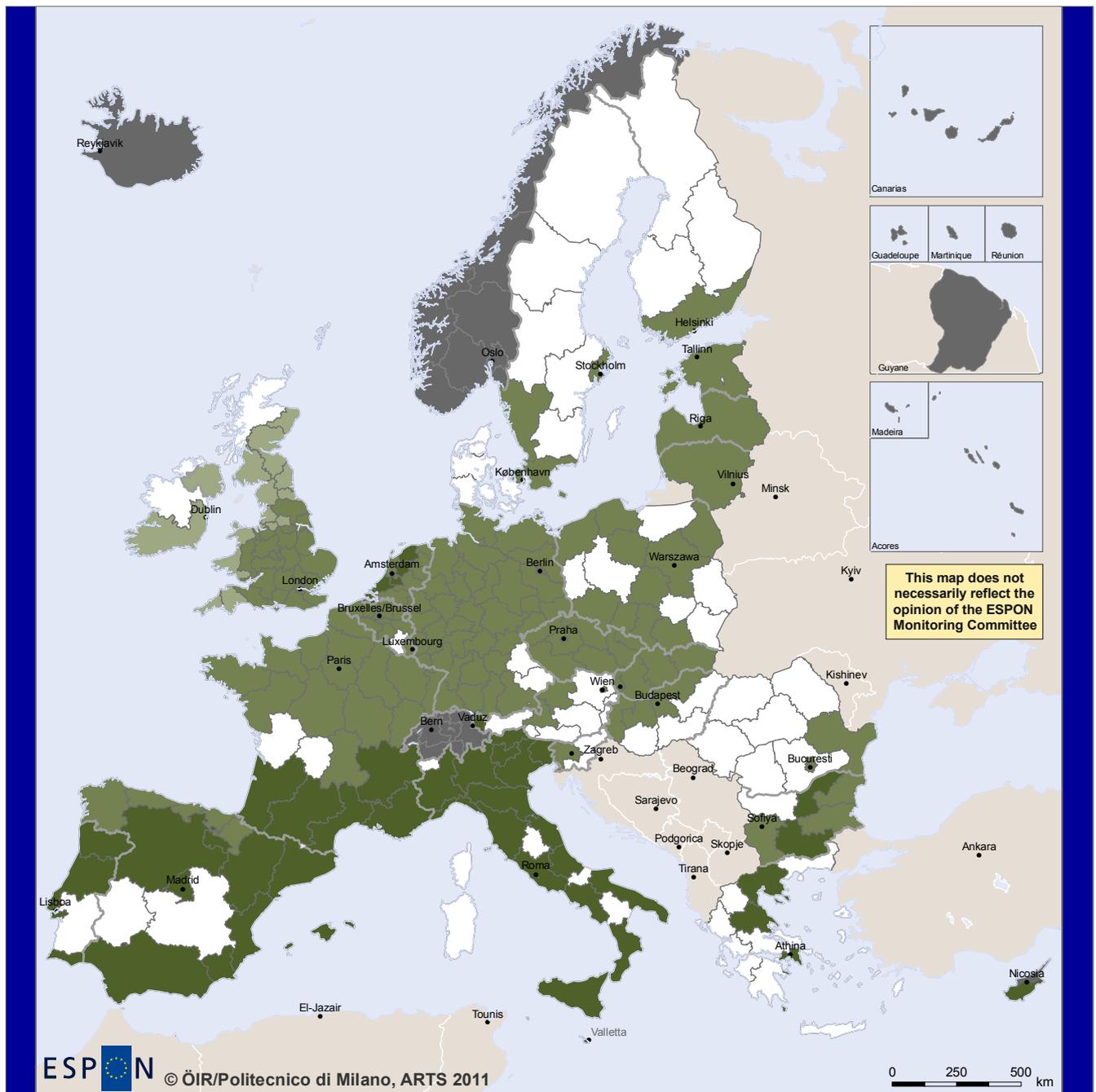
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## Negative Impact



Types of regions affected: urban, agglomerated

# Regions affected by Directive on the energy performance of buildings Fossil fuel consumption (F34)



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## Positive Impact



Types of regions affected: urban, agglomerated

## **6 Governance as a factor for explaining territorial impact**

The main objective of the ESPON ARTS project is to assess the territorial sensitivity of regions to EU directives. A basic assumption underlying the project is that this sensitivity can be explained to a large extent from specific regional territorial characteristics relating to soil, air, water and use of the land. However, it is equally well understood that territorial characteristics alone cannot completely explain the territorial effects of a directive within a region. For example, the air quality directive causes a different impact in similar urban territories in different countries; the explaining element is the factor governance.

One aim of the ESPON ARTS project is to develop a more thorough understanding of the role of governance as an explaining factor for the territorial impact of EU directives. The basic hypothesis underlying is that domestic governance structures can have either an amplifying or a mitigating effect on the potential territorial impact of EU directives.

Governance plays a role in particular in the context of the legislative instrument of directives. In contrast to other legislative instruments of the EU, such as regulations or decisions, directives offer the member states a certain amount of discretion in terms of choosing appropriate means and instruments. In so doing the legal instrument of directive aims to strike a balance between unifying legislation across the EU and paying attention to regional diversity. As such they form a response to the EU's 'unity in diversity' challenge (Haverland et al. 2011).

The key issue is that directives (in contrast to regulations) need to be transposed in domestic legislation, implemented in domestic policies and need to be held up by domestic institutions in domestic administrative and cultural contexts. Transposing directives is a lengthy process in which several follow-up decisions have to be taken, decisions that each member state takes in its own right.

More in general, so not only restricted to directives, it has to be accepted that the implementation of legislation will never be uniform because laws are fundamentally ambiguous and need to be interpreted in specific contexts (Gregg 1999, quoted by Beunen 2006). "The freedom to decide on how to interpret and implement rules and laws is called discretionary freedom or space. Laws gain meaning only after professional and organizational communities have socially constructed this meaning. In practice laws are interpreted and applied and this can either dampen or amplify their impact. These two sets of mechanisms, leading to differences in the implementation of European legislation, are interrelated: the way the legislation is interpreted determines the way it is applied and vice versa." (Beunen 2006: 607-608)

Under the umbrella of 'Europeanization' several authors have discussed and showed that because of these follow up decisions at domestic level EU policies can have

effects that vary considerable across the member states (i.e. Héritier et al. 2001, Börzel 2002, Olsen 2002, 2007, Featherstone 2003, Radaelli 2003, Lenschow 2006).

National contexts differ considerably across the EU and beyond, as has been pointed out by previous ESPON research and other sources (ESPON 2.3.2 2007, Newman & Thornley 1996, CEC 1997, Stead & Nadin 2010). However, it was found that analyzing administrative cultures, spatial planning systems and institutional contexts in general at an EU scale does not provide specific enough information to explain why and in particular how directives will impact.

For a better understanding it is necessary to look in a more detailed way at the processes that eventually shape the domestic application of directives. These processes are largely determined by formal regulatory systems both at EU and member state level.

Now follows an analysis of the various stages, negotiation, transposition, implementation and enforcement (see below) that directives go through and how governance influences these stages. This is done by means of a literature review based on academic articles as well as research reports that are available via the internet or contacts. Articles have been selected mainly by means of Scopus search engine<sup>30</sup>. Search keys used included 'directive', 'impact', 'transposition', 'implementation' as well as key words referring to specific directives such as the habitat and air quality directive. This exercise led to hundreds of articles, some of which could not be accessed<sup>31</sup>, but a sufficient amount could. We were particularly interested in articles in which several member states were being compared. Many of the research reports were already in hand. The pool of research reports are dominated by Dutch written and/or authored reports, which can be explained from the high interest of various government organisations EU directives and their effects. Many of the reports include cross national comparisons.

A limiting factor is the availability of accessible sources, i.e. which are written in English language. Already the TPG researchers have collected a considerable amount of relevant literature. What becomes clear right away is that the literature is unbalanced as regards the geographical distribution across Europe with emphasis on countries that have more experiences with unwanted impact of EU directives and countries of which the academic communities are integrated in the English speaking international academic community. Whereas this means that not all ESPON countries will be covered, there is nevertheless sufficient scope and differentiation to allow for drawing authoritative conclusions that could guide future research.

A further note to the reader would be that the information on the four stages found in the articles and reports differ between each other in terms of tone and detail. In particular information on transposition has a more general character. In contrast, information on implementation draws exclusively on examples and case studies.

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<sup>30</sup> See: [www.scopus.com](http://www.scopus.com)

<sup>31</sup> Due to license contracts of Delft University of Technology.

Probably the reason for this is that most research focuses on the implementation and enforcement stages of directives and much less on the negotiation and transposition stages (Borghetto & Franchino 2010). From the perspective of explaining territorial impact of directives it would be worthwhile to focus future research on the negotiation and transposition stages.

## 6.1 A legal perspective on explaining governance

From legal system's perspective the relation between EU and domestic legislation is perceived as troublesome (Prechal & Van den Brink 2010). EU and domestic legislation do not form a seamless system. This is a result of differences in objectives, structure and substance. EU legislation itself is the product of an amalgamation of 27 legal systems. It does not replace these systems but complements them and is narrowly related to them. As a result European legislation often has a fragmented and vague character. National legislation, in contrast, is the product of one legal system with a long and proved history. Usually it therefore is a more coherent system grounded on clear and consistent norms. The differences in objectives, structure and substance between EU and domestic legal systems and legislation lead to problems for national authorities in carrying out and enforcing European norms (ibid.)

Differences in legislation and legal systems between the EU and member states come to the fore at various moments and are particularly relevant in the case of EU directives. Directives are a particular kind of EU legislation, in a sense that they need to be transposed into domestic legislation. Because this grants member states with more flexibility than in the case of other EU legislative instruments, it becomes more complex to estimate the directives' effects and impacts. The effects differ from member state to member state, depending on several factors (more about which below) but also from directive to directive, depending on the flexibility provided by the directive itself in terms of implementation and thresholds. In all cases, except those in which directives have not been transposed within the given time-limits<sup>32</sup>, directives cause indirect effects, with the domestic legislation as a buffer in-between the EU and concrete cases.

All in all this leads to a complex legal system in which EU and domestic legislation and systems operate in conjunction. The quality of the legislation and its implementation therefore partly depends on the extent to which EU and domestic systems match with each other. With 27 different legislative systems it is no surprise that the legislative quality of directives varies between member states. It is a topic

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<sup>32</sup> The European Court of Justice recognises the direct effect of directives in order to protect the rights of individuals. Therefore, the Court laid down in its case-law that a directive has direct effect when its provisions are unconditional and sufficiently clear and precise (Judgement of 4 December 1974, Van Duyn). However, it can only have direct vertical effect and it is only valid if the Member States have not transposed the directive by the deadline (Judgement of 5 April 1979, Ratti);

that attracts attention, also by the European Commission itself in the context of developing better regulation.

Whether domestic and EU systems match is not only a technical question, but also one that has a substantive component. It makes a difference whether the focus and objectives of EU legislation, or directives, matches to some extent with those underlying domestic legislation and systems. From a legal system perspective a further question could be asked: not only whether EU and domestic legislation adequately match, but also whether the resulting legislative system actually works? (Prechal & Van den Brink 2010)

In order to get a better understanding of how directives work the Better Regulation Task Force of the European Policy Centre that works in close cooperation with EU institutions identifies three different stages within the policy process that directives go through. These concern: transposition, implementation and enforcement of EU directives, shortly referred to as TIE. (Allio & Fandel 2006) In the context of territorial impact and preventing for unwanted effects of directives we consider a fourth relevant policy stage: the development or negotiation stage. As a result we (based on: Allio & Fandel 2006, p. 10-11) discern between four policy stages that directives go through:

- (1) Development of the EU directive: the process whereby EU law is developed through negotiations among member states, the European Commission, the Council and the Parliament.
- (2) Transposition: the process whereby European directives are incorporated into national law in order to make their objectives, requirements and deadlines directly applicable in the EU member states.
- (3) Implementation: the process whereby EU law is applied at national and subnational levels by means of existing and/or new policies.
- (4) Enforcement: the process whereby full compliance with EU law is monitored and secured, and non-compliance is systematically sanctioned by national and supranational courts.

In each of these four policy stages specific domestic government systems and governance related factors play a role and determine the effects and impacts that a directive eventually has in real life. As will become clear the four policy stages cannot be understood in isolation; together they form a so-called policy cycle.

How governance may influence the impact of a directive for each of the policy stages will be discussed in the following chapters. In doing so, the perspective will be alternating between legal, organisational and institutional. For each stage it will be outlined how the conjunction of the EU and 27 different (sub)national contexts leaves room for governance decisions that influence how a directive ultimately works out in a member state.

## 6.2 Development stages of EU directives

Many of the problems with EU directives that occur in later stages (Transposition, Implementation and Enforcement) of the policy process can be traced back to the development stage of a directive. They sometimes can be related to the directive itself. For example, a poorly drafted directive will lead to cases of non-compliance and unwanted impact due to misinterpretation and more general difficulties in the policy process.

EU directives are particularly vulnerable for this kind of misinterpretation because of the different official languages the European Union is working with. In the process of translating directive into domestic languages it can occur that certain terms of the three working languages (French, English and German) cannot be translated one-to-one in another official language. This will result in room for interpretation for the domestic legislator in the transposition phase. Something similar may occur when directives are translated into a language that is used in more than one member state, such as the German language for Germany, Austria and to a lesser extent Luxembourg, the Südtirol region in Italy and a German speaking region in Belgium, the French language for France and the Walloon and Brussels regions in Belgium, the Dutch language for the Netherlands and Flanders and the English language for the UK and Ireland. Although the official language is the same, there are often subtle differences observable between countries' interpretations and use of the language.

Non-compliance or unexpected effects can have other reasons, too, which have more to do with the administrative, institutional and legal contexts in individual member states. As mentioned before, from a legal – institutional perspective the relation between the EU and the member states is perceived as troublesome. This becomes particularly clear when EU directives are based on a different mechanism and system than the traditions, mechanisms and legislative system of a member state. In such cases the transposition, implementation and enforcement become challenging and leave much governance interpretation to domestic legislators and administrators. Whereas such misalignment between EU and domestic systems can theoretically be avoided (by making sure that a directive aligns with domestic situation) in practice such misalignment often is hard to recognize or is the outcome of a political process among 27 member states, the Commission and the Parliament.

A large opportunity for member states to avoid unwanted and unexpected (territorial) impacts from EU directives is related to their organisational capacity. Member states with larger organising capacity can be expected to have greater influence on the contents of a directive and, arguably, will suffer less from unwanted or side impacts. The latter is not always the case, however, as for example is shown by the difficult implementation of Natura 2000 in the Netherlands, a country that has been one of the founding fathers of this policy (Buunk 2003).

In general, however, it can be argued that member states that are able to mobilize as much as possible knowledge by involving various stakeholders and investing in

research can influence the contents of directives and will experience less surprises later on in the process. This capacity varies from member state to member state, but also from policy field to policy field, depending on the political importance that is attached to it. Obviously, it is in this process that an European TIA instrument could play a valuable role and equalise the knowledge base between member states. A condition for avoiding unexpected impact is that the stakeholders that have been involved in the development process also play a role in subsequent policy stages.

### 6.3 Transposition

Transposing a directive into domestic legislation can be done in many different ways depending on how a member state interprets the directive in the context of its own legislative system. Some member states act pragmatically and, if possible, copy-paste directives in their domestic legislation, while others (not many though) incidentally add additional objectives (gold plating) or relate the directive to specific legislation in other policy fields. Both methods have their virtues and problems. These are just some of the possible options.

More in general it can be noted that there has not been much interest in the transposition process from the perspective of territorial impact of directives. Territorial impact usually is stronger related to the implementation and enforcement stages. Whether this is correct remains to be seen. Both the implementation and enforcement of EU directives are based on legislation that is the result of the transposition stage. As a result this section is largely based on literature and research by jurists and law students, rather than by scholars of territorial issues. For this reason there is little if any reference to cases of transposition and its impact on territory. A case that can be linked closely to transposition is that of the air quality directive in the Netherlands, which will be briefly described at the end of this section. There are probably many other cases as well in which territorial impact can be traced back to the transposition of a directive, but this requires further analysis that goes beyond the scope of this report.

#### *Methods of transposition*

As regards the *method* of transposing the domestic legislator can choose between a large variety of possibilities with *segregation* on one end of a continuum and *integration* on the other. Segregation means that EU directives are separated from domestic legislation. EU directives are being transposed in a separate law or, in a less extreme form, in a separate chapter or section of a relevant existing act. The option of integration means that EU directives are fully integrated in domestic legislation. Which decision is finally made largely depends on the extent to which the domestic legislative system aligns with that of the European Union.

In any case the result is new legislation at the domestic level which function differs from 'normal' national legislation, just as the function of EU legislation differs from the

function of national legislation. The main difference is that in the case of 'transposition legislation' an important part of the decision making has taken part at the European level. The exact function of transposition legislation depends on the obligations and requirements of the EU directive and the decision or governance room (in proper terminology: discretion), that is left for the member state. In some cases the domestic legislator is granted significant flexibility regarding the setting of norms and method of enforcement. In other cases little more can be done than indicating the organisations that will implement and apply the EU directives. (Council of State 2010)

The legislator roughly has three possibilities:

- (a) Integration of European directive in the national legislative system – where possible European terms, concepts and norms are systematically ranked under existing domestic terms, concepts and norms. The advantage of this strategy is that a body of legislation (related to a particular policy domain) changes only gradually. This means that existing norms and uses relating to application and enforcement remain in use. A disadvantage is that as a result of evolving EU legislation it becomes increasingly difficult to sustain the national system. It can negatively impact on the transparency, consistence, applicability and enforcement of national legislation.
- (b) Separation of EU directives – When EU concepts, rules or procedures do not easily fit with the domestic legislative system, for example because of different underlying rationales, it is possible to opt for a separate chapter of legislation that functions in parallel to domestic legislation in the same field and bring EU regulation together there. The advantage of this strategy is that the transposition and implementation can become easier. The disadvantage is that it may affect the consistency and transparency of domestic legislation.
- (c) Integration of EU system in domestic legislative system – When EU legislation has significant effects on the contents of a domestic body of legislation it can be strategic to depart from domestic concepts, frameworks and instruments. In such a case the national legislation will be remodelled after the European system. The advantage is that new EU legislation can be easily accommodated in the domestic system. Also jurisprudence of the European Court can be incorporated in the system. A possible disadvantage can be that the EU system does not fit well within the wider national system and results in a misunderstanding and application of European concepts and rules.

The strategy of separation is particularly useful in cases when European and domestic legislation are easily to separate from a substantive perspective. In the case that European and domestic legislation intertwine a decision needs to be taken whether to integrate or European in domestic legislation or remodel domestic legislation to the EU system. The decision will depend on the one hand on the degree of flexibility that EU legislation grants and on the other hand, on national characteristics and possibilities as well as willingness to adapt.

### *EU legislative aspects and domestic governance flexibility*

The degree of flexibility that a member state has is related to a number of legislative aspects. One of them concerns EU treaties and the type of competence in a certain policy field. Where the EU has exclusive competence, like for example competition, European Union customs union and monetary union, there is no flexibility for member states. In the case of a shared competence, such as in the fields of internal market, social and environmental policies<sup>33</sup>, or in the case of coordination and supplementary competencies, like public health and industry, a member state has more flexibility.

A second aspect concerns the type of legislative instrument. Directives are predominantly used in the case of a shared competence. In contrast to the legislative instruments decisions and regulations, directives offer quite some flexibility to a member states. Directives provide member states with the opportunity to take into account domestic circumstances as well as the legislative culture and system.

Third and fourth aspects concern the degree of harmonisation and the quantity and coherence of EU legislation respectively. In particular where the EU legislator acts frequently and coherently it may pay off to adopt the European legislative system.

A fifth aspect concerns the level of detail. Regulations often have a high level of detail, but also directives can forward very concrete and detailed objectives and rules, which reduce governance space and harmonize domestic legislation. Framework directives require particular attention. It may first appear that there is flexibility to factor in domestic governance characteristics. However, this governance room may fade when the framework is subsequently filled in by means of 'daughter directives', which can reach high levels of detail.

A sixth aspect concerns the contents of a directive. EU directives use to contain predominantly substantive issues relating to objectives and thresholds to meet. This allows member states to choose the best way of enforcement within domestic contexts. However, directives now increasingly also include guidelines regarding policy measures and sanctions. An example is the Water Framework directive which imposes on member states an administrative system. In such a case there may perhaps not be direct impact on territory, but in any case there is direct impact on domestic territorial governance systems. The result is less freedom for member states.

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<sup>33</sup> Shared competences apply to the following policy fields: (a) internal market; (b) social policy, for the aspects defined in this Treaty; (c) economic, social and territorial cohesion; (d) agriculture and fisheries, excluding the conservation of marine biological resources; (e) environment; (f) consumer protection; (g) transport; (h) trans-European networks; (i) energy; (j) area of freedom, security and justice; (k) common safety concerns in public health matters, for the aspects defined in this Treaty.

### *National aspects influencing the transposition and implementation strategy*

The choice to integrate EU legislation into the domestic system or not depends on national factors too. At least four of such factors can be identified: a) the degree of harmonisation at national level, b) the scope of the national legislation, c) the degree of detail and d) cultural factors.

As at the domestic level a certain degree of codification or harmonisation has taken place, for example in the field of environmental law, there will be less willingness to change the national system in favour of adapting to EU system. Conflicts of loyalty can arise from the obligation to adequately incorporate EU legislation on the one hand and to hold on to the national system on the other.

The scope of legislation can pose challenges in particular when the scope of EU legislation is wider than, or touches several sub-fields of a domestic legislative system. In such cases it can be extremely complex to incorporate the EU legislation in the domestic system. For example, in the Netherlands, the Birds Directive was transposed in no less than 23 different regulations and decisions, which complicated its enforcement. When the scope of EU legislation, however, is limited and touches just an aspect of a national regulation, then the domestic system will prevail.

As regards detail the logic works in a similar way. The more detail as regards norms, terminology and rules national regulations contain, the more complex it will be to incorporate EU legislation.

Cultural aspects, finally, determine what type of regulations, implementation and enforcement methods are preferred. Many countries have formulated a number of key principles when it comes to developing legislation. For each policy field, or legislative family, additional characteristics and patterns have emerged. Examples concern the way legislation is structured around specific concepts and types of instruments, but also the type of enforcement system (civil law or administrative law), the use of self-regulation instruments (for example covenants), or specific implementation organisations. Wherever such characteristics have developed, it will be tried to let prevail the domestic legislative logic.

### *Quality and quantity indicators*

While the legislative system of a member state poses several challenges to transposing directives that, as a consequence of the decision made, may lead to different outcomes in different member states, this is not the whole story. Widely known are the Commission's infamous reports, tables and records indicating member states' progress as regards implementing directives within the given deadlines.<sup>34</sup> The reports are meant to stimulate member states, by means of the soft instrument naming and shaming, to implement directives into their legislation within the time limits as pointed out by the directive itself.

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<sup>34</sup> For example, see the 26<sup>th</sup> annual report on monitoring the application of EU law (CEC 2009): [http://ec.europa.eu/eu\\_law/infringements/infringements\\_annual\\_report\\_26\\_en.htm](http://ec.europa.eu/eu_law/infringements/infringements_annual_report_26_en.htm)

However, implementing directives on-time is only half of the story: the other half is the quality of the implementation. This is also measured by means of registering the number of judicial demands, advice reports and, ultimately, lawsuits that have been filed against a member state because of wrong implementation of directives (Steunenberg & Voermans 2005).

In terms of indicators one can look at the number of Court cases as well as at the number of cases in which the Commission considers the transposition of a directive wrong. Whereas for both indicators data are available their usability in terms of developing a reliable governance indicator within the ARTS model are limited. In both cases the data are collected at the level of the member state as a whole and therefore sketch a picture referring to the transposition of all directives.

In terms of complexity of the transposition process, however, considerable differences exist between types of directives and the policy fields to which they belong. An analysis of over thousand directives performed by Haverland (et al. 2011) for example reveals significant cross-sectoral differences which complicate generalization from studies of one sector. One explaining factor is the systematic cross-sectoral difference in transposition deadlines. Directives in the health and social policy sectors, for example, tend to use three year deadlines, whereas telecommunication directives need to be transposed in much shorter time periods. Other explaining factors refer to the type of legal measures used and whether a Commission directive or Council and Parliament directive is concerned, with the latter generally being more complex to transpose. According to these authors no single sector can be considered representative for transposition of directives in general. As regards differentiation between time dependent patterns of various member states it was found that the UK is relatively faster than, for example, the Netherlands in the first part of the transposition process (up to 500 days). However, after 500 days this effect disappears. Something similar occurs for Germany, Spain and Greece.

#### *Transposition techniques and instruments*

As regards transposing directives member states can make use of several instruments and techniques, which may have an effect on the directive's impact too. Although Member states can choose the technique and instruments that they seem to fit best, certain conditions apply. One condition is that member states analyse the best possible way to incorporate directive in domestic legislation and explain why. Doing nothing and, as a consequence, force direct application of the directive is therefore not considered an option. 'Transposition through reference', however, is possible in a selection of cases, but depends on the contents of a directive. This method is sometimes applied amongst others in Italy, Germany and Denmark, but does not seem to be used in most other countries. (Steunenberg & Voermans 2005)

There is no evidence that member states have introduced new instruments in order to transpose directives. This is done by using already existing instruments. In general, member states prefer to transpose directives to the lowest possible level of

regulation, for example by means of a ministerial order, regulation or decree, rather than through integrating it into an existing law. The latter would require a longer and more complex procedure, involving a role for domestic Parliaments. For a selection of analysed member states, including the UK, France, Spain, Italy, Germany, Denmark, The Netherlands, 60% (France) to 80 to 90% (UK, Spain, Netherlands) of the directives are implemented by means of delegated regulation.

In some cases the parliament has a say in these delegated forms of regulation. For example in the UK the parliament can say 'yes' or 'no' by means of silent (negative procedure) or explicit approval (affirmative procedure). In France use is made of so-called authorization laws, called *lois d'habilitation*, which provide the government with the opportunity to implement directives by decree. An interesting aspect of the French system is that these regulations only apply for a specified period and that the *ordonnances* need to be approved by parliament (but without the possibility of amendment). In Spain a similar system applies, but here authorization laws expire with the approval of ministerial decrees: *real decreto-legislativo*. In Germany, Denmark and the Netherlands the instrument of special delegation is often applied, which is also used in several other countries. This means that for each case (for example per subject, specific competence of directive) the parliamentary law foresees in the transfer of specific decision competences to the government or minister. (Steunenberg & Voermans 2005)

In the case that a member state opts for implementing a directive by means of a formal law the procedure becomes more complex and time consuming. This happened amongst others in the Netherlands in the process of transposing and implementing the air quality directive. Whereas the 1996 air quality directive was transposed in the Environment Act of 1998 without major amendment by the Dutch Parliament, the subsequent daughter directive was transposed, on the basis of the Environment Act, by means of an Order in Council. This time the Parliament wanted to execute its influence and asked the government by means of a letter (dated 27 July 2001) not to transpose the directive by means of an Order but, instead, by incorporating it in the previous mentioned act. The reason was that the Parliament was of the opinion that the 1996 directive had been implemented in a too strict sense. At that moment the Parliament had been sleeping, and now it wanted to restore its fault. However, it was too late as the Royal Decree that transposed the directive was signed on the 9<sup>th</sup> of July and would turn into force on the 19<sup>th</sup> of the same month. Had it been on time this would perhaps have led to a different way of implementation and prevented the building stop in January 2005. A second Royal Decree issued in 2005 as a reaction on the building stop served the purpose of offering temporal relief. It could, however, not adapt the 1998 act. Only in 2007 a revised Environment Act could be adopted, which much closer followed the EU air quality legislation. (Rood et al. 2005)

In terms of techniques the leading question is which legislative system prevails: that of the EU or the domestic system? In France, Denmark and Germany the national

system is taken as point of departure and directive are incorporated in it. Usually this means that the terminology of the directive needs to be adapted. In the UK, Spain, Italy and the Netherlands there is a preference to stay as close as possible to the terminology and system of the directive. In doing so, there can be a difference between minimalistic transposition and adding additional national objectives to the directive, so-called gold-plating, something that member states increasingly tend to avoid.

Some countries indeed do have some sort of history of gold plating. Sweden for example has added a number of additional national objectives to those of the Air Quality directive, which results in a much stricter act when compared to other countries. (Backes 2006) However, in the Swedish case the practical effects of this gold plating have been rather modest. Not only is the air quality generally very good in Sweden, even at those locations where this is not the case the Swedish law accepts mitigating measures which means that projects can continue. Interesting also is that for some projects, like for example the construction of a tunnel in Stockholm, there is large consensus, also among environmental pressure groups, that the project is vital to society. Hence, nobody appeals to court, even if technically speaking the air quality rules are being violated.

#### **6.4 Implementation and enforcement**

After transposing the directive the process of implementing starts. In this stage the directive and the domestic legislation that results from it is being translated into concrete policies and measures. In this stage there can be observed much variation between member states. Such differences become even further emphasised if the enforcement stage of a directive is also taken into account. Whereas we theoretically distinguish between implementation and enforcement this is difficult to do in reality as the two are narrowly interrelated. So, in this section we deal with them together.

The two cases where the differentiation in terms of implementation and enforcement show clearly concern the air quality and the habitat directives. Beyond these directives there is much literature available on Strategic Environmental Assessment, Environmental Impact Assessment, Procurement and State Aid regulation as well as on the Water Framework, the Pesticides and Nitrate directives. However, for the sake of readability we will here only deal with the air quality and habitat directives.

Air quality has been analysed in many countries and a large number of varieties have been identified. As Backes et al. (2005) show this variety can be largely traced back to the way in which member states have implemented the first Daughter Directive on air quality. One of the most striking differences is that in some countries (Netherlands and Germany) limit values are understood as absolute limit values, whereas in other countries (Belgium, France, UK) the need to meet a limit value is weighted with other interests when deciding on granting permits. It is clear to these authors, while most countries have exceedances of limit values, and all countries base their policies on

the same EU air quality directives, still large differences exist between member states with respect to the role limit values play in granting permits for new spatial developments.

Some member states use modelling systems and others measure systems. There is a large variety among member states as regards the identification of locations where air quality should not exceed thresholds. In this respect Sweden and the Netherlands follow a more strict and, from a spatial perspective, comprehensive policy than for example Germany. In Germany the air quality directive is transposed and implemented in such a way that air quality should meet the threshold only in those locations where people regularly stay for a short period, but repeatedly. The result is that, because of the chosen system, the air quality directive impacts on different territorial types in different member states. In case of modelling the air quality situation can be determined at the very detailed scale of a single plot, which, ironically perhaps, results in an overall picture in which the air quality is below threshold in vast areas. (Backes 2006)

Add to this the variety in 'natural' air quality situation between countries and a picture emerges in which air quality issues play a role in more than half the country, or in contrast, only on a few selected hotspots in large cities. Whereas the ARTS model is able to identify the general territorial scope of the problem as well as, by applying branches, the impact of using modelling or measuring techniques, it is not possible (at least not in this version of the model) to factor in specific legislative characteristics and choices that have been made during transposition and implementation stages.

#### *Administrative capacity and legal system*

The actual use of a policy depends amongst others on the organization and functioning of the public administration, available governance capacity and resources and on the legal system within a member state or region and whether the decision made in the transposition and implementation phases allow certain degrees of flexibility. Here we find amongst others:

- A large variety across member states on the applying thresholds when issuing of building permits
- That access to the legal system in order to file a case differs greatly across member states

For example there is a large variety in jurisprudence. Whereas in a five year period 110 cases have been dealt with by the Federal Court in Germany, in the same period roughly 3000 cases have been filed to the Dutch Court, and surprisingly, none (!) to the Belgium Court. And not only is there a difference in terms of quantity. Also as regards the rate of success of appeal there appears to be a large variety. For example only 20 percent of the German cases were won by the opposing party, whereas in the Netherlands this amounted to well over 50 percent. Moreover, in some countries the applicant has to prove that new proposals comply with

thresholds, in other countries those who object need to prove that thresholds are being violated.

The implementation of a directive depends on a variety of decisions regarding the question how the objectives of the directive can be best met given the existing domestic policy system and mechanisms. In one case existing policies already cater for meeting the directive's objectives, in other cases existing policies need to be revised or complemented by new policies and instruments. A variety of different decisions can be made as regards instruments and measures and resources to be used.

This also transpires in terms of for example, resources allocated to policies. There is a large variety as regards the resources that member states allocate to preserving Natura 2000 areas (Backes 2006). Also in terms of personnel this counts and has effects on the impact (Neven & Kistenkas 2005). The existence and role of NGO's and other stakeholders is in particular in the environmental sector influential. But also if a transnational agreement has been made regarding the management of a transnational Natura 2000 area, there appear to be large differences in terms of implementation and enforcement (Weston 2007).

So a picture emerges that shows a wide variety of implementing directives and ways of doing things. Differences can be explained from incidents, but also from structural elements of the institutional system of a country, such as the legal system. In countries where there are high barriers to file a case to court there is significantly less jurisprudence to be found, if at all. This then results in entirely different dynamics across member states in planning and project development processes. Whereas in one country this needs to be done very carefully in order to avoid the risk of a legal case (and losing it), in other countries this risk is much lower and puts less pressure on the procedure and contents of a plan. The effect is a different territorial outcome.

## **7 Roadmap for policy implementation and on the further research avenue to follow**

### **7.1 Options for policy implementation**

#### **Implementation of the TIA procedure in the IA of the Commission**

The impact assessment (IA) procedure on the Commission level was introduced in 2002 and further developed by means of a gradual process that allowed Commission officials and organization to grow with it. The basic idea of the IA procedure is that ex ante impact evaluation, parallel to the policy making process, will improve the original ideas and result in robust, effective, efficient and widely supported policies.

An IA usually takes about a year to one and a half year and is intended as a bottom-up process. In principle each and every stakeholder is invited to be part of the IA process.

IA procedures always make use of existing knowledge and never develop data themselves. In terms of addressing territorial impact this may have consequences as (apart from ESPON) there is little territorial data available.

Therefore, the Commission's Impact Assessment practice qualifies as one of the best opportunities to get TIA implemented at the EU level (Zonneveld & Waterhout 2009). The TIA as developed in ESPON ARTS could serve as a first pre-check on the expert level of the Commission and add the territorial dimension to the IA procedure. It enables to identify those regions with would benefit intensely and those regions with likely high negative impacts. The result of TIA could feed in into the further stakeholder driven process of the Commission's Impact Assessment.

Another option would be to use the TIA procedure as part of the strategic environmental assessment (SEA). This would put the focus on the impacts of a directive on the environment, whereas the TIA approach developed analysis also economic and societal consequences.

#### **Taking the EU neighbourhood on board**

The analysis concentrates on the direct and indirect effects within a region of the EU27 where the directive is directly implemented. However, each directive will also produce spill over effects towards the neighbouring countries. These effects are not covered by the TIA procedure up to now. Analysing the impacts of EU legislation on the EU neighbourhood could be a new part of the EU neighbourhood policy in order to support the neighbouring to be better prepared.

## **7.2 Further data requirements and ideas of territorial indicators, concepts and typologies as well as on further developments linked to the database and mapping facilities.**

### **Additional indicators needed to get a more complete picture about the sensitivity of regions**

The analysis of the impact of the directives should cover all relevant fields of territorial development: covering natural environment, regional economy as well as society and people. 41 indicators were defined in order to cover that wide range. However, only 35 indicators values were found allowing to picture sensitivity of regions in a quantitative way. Missing information concerned mostly governance indicators (efficiency of government/governance mechanisms, duration or complexity of planning procedures, participation rate and societal transfers).

Additional indicators would be needed in order to provide the full range of possible impacts of directives.

### **Additional and more specified types of regions**

When setting up the conceptual model for the selected directives, it became clear that their territorial effects would be very different and particularly strong in very special types of regions (eg. regions with chemical plants, intense agriculture, specific infrastructure etc.) The existing regional typologies, defined on existing statistical information, do not cover the types that would be necessary in some cases. So it would be very useful to extend the list of pre-selected types of regions of the regional exposure matrix. Only if it were possible to provide a suitable type of region for the analysis, the running of a TIA procedure in the format of an interactive workshop would be possible.

As it will be expensive and probably limitless to build a comprehensive data base on fine regional typologies, in the application of the present methodology to new Directives a direct attention should be paid to:

- availability of regionalised data on explicit target issues,
- openness to collect the new required data by statistical offices and Eurostat in particular,
- cooperation of the offices and officials of DG Regio in the supply of these punctual information (that, in most cases, do in fact exist for policy decisions and management);
- need for sufficient time in order to collect the required information.

Of course, these requirements should not be considered as limitations of the methodology: they refer to a necessary but feasible precondition for any assessment procedure (even more qualitative in nature than the one proposed here).

## 8 Points for further consideration providing the thoughts of the TPG

The results reached in this project confirm that:

- a quali-quantitative methodology is absolutely necessary when dealing with all European regions, a wide array of impact dimensions and a widely diversified policy field;
- it is possible to devise and design a simple methodology even in a complex and wide field like the one at stake. The present methodology may fit any Directive or EU policy and provides a first but consistent and complete list of potential impact fields;
- the operational application to 12 different and diversified Directives confirms this flexibility of the tool;
- the methodology proposed builds on the previous experience of Tequila 1 and Tequila 2 TIA models provided to the ESPON Programme, simplifying their logics and operations where possible and enlarging the scope of the assessment well beyond the previous attempts.

Nevertheless, the results of the TIA on the selected Directives show clearly what kind of additional analytical work is still needed:

### **A better definition of regional exposure.**

In this project, regional exposure was treated in a Yes/No, dichotomic way. A relevant improvement could be achieved allowing the definition of different intensities of exposure, taking into consideration the size and relevance of the targeted fields, the strength and the binding nature of the directive for specific regional typologies, the intensity of potential indirect counter-effects. This intensity would be revealed by a coefficient ranging from 0 to 1.

### **Indicators at NUTS 3 level**

Due to availability of necessary indicators, the TIA was carried out at NUTS2 level. NUTS 2 is quite a large scale for the distinction of effects of some directives e.g. when directives aim at urban areas etc. Therefore, a relevant priority in the research field would be to build statistical information on the list of indicators as well as on regional typologies at NUTS 3 level, in order to get more precise and meaningful results. It is worth recalling that the previous experiments with the Tequila models were run at NUTS 3 level.

### **A better solution for describing cumulative effects easy and reliable**

At the moment the TIA delivers usable results for each impact field. For policy makers it would be interesting to get also an overview about “cumulative” impacts of

a directive on each region, considering together all impacts on the different fields. At the moment, in this project the simplest solution was chosen: counting all fields in which the impact on the region was considered “high”. This led to very simple, credible but first approximation results.

Additional research would be interesting on how to picture this “cumulative” effects better. One approach would be computing a weighted multi-criteria impact index, in the same way as it was done in the ESPON Tequila Models. This solution implies the definition of a shared system of weights for the single impacts (through experts judgement, policy maker’s priorities, etc.) and of some thresholds beyond which compensation among impacts is excluded (the FLAG methodology in the Tequila 2 model). Another option would be a cluster analysis. Then a system of weights would not be needed, but a cluster analysis cannot be standardised for applying it directly during an interactive workshop.

### **Depicting spillover effects**

The analysis focuses and depicts the impact of the EU legislation within single region. Additionally also spillover effects and cross border effects could be analysed.

### **Alternative approach for the TIA analysis on governance issues**

Instead of trying to model governance in order to predict where problems might occur, a different approach is to help stakeholders identifying potential issues in the process of developing, transposing, implementing and using the directive. This could be done by developing a guidance and check-list which provides general and stage specific guidance. Such a check-list should inform policy makers about how to act in specific situations and what the possible options and their likely effects are. A general guidance, applying to all possible directives, could act as a framework and tool for policy makers.

Going one step further the challenge becomes to adapt the general guidance in such a way that it becomes attuned to a specific directive. Here the ARTS model comes back in. With the outcomes of the ARTS model and the elaborations by means of the logical chains and reports the guidance could become further specified in a qualitative way by taking account of specific territorial characteristics of the directive under consideration.

## **9 Dissemination activities**

### **9.1 Activities conducted till May 31<sup>st</sup> 2011**

As up till now, the focus of the work was lying at the development of the methodology the dissemination was not the focus of our work. The methodology was presented at the ESPON Seminar in Liege.

In order to stimulate the debate amongst policymakers, the TPG organized in cooperation with the ESPON CU a workshop at DG region in Brussels. During this workshop, policymakers about the implementation of IA approach from DG Regio and DG Environment simulated the standardised TIA quick check and discussed the results of the project. This contributed to fine tune the standardised TIA quick check and to develop the advanced TIA quick check.

### **9.2 Further activities planned**

#### **9.2.1 The dissemination in the scientific community**

The following activities in participating to scientific conferences presenting papers related to this project are planned

- presentation of methodological aspects at the Annual Conference of the European Regional Science Association (ERSA), to be held at the end of August 2011;
- presentation of empirical results and achievements at the ERSA Conference in 2012
- presentation at other conferences as, e.g the AESOP (the Association of European Schools of Planning, deeply interested in the impact of European initiatives), meetings of the European Council of Spatial Planners and the biennial Conference of the European Evaluation Society
- Submitting scientific articles to international journals in the fields of Regional Science, Planning, Geography and Public Policy Evaluation as well as other journals

Single partners could also make presentations of results at national meetings. Since the results are particularly interesting when placed in an interregional comparative setting, comparing both international and intra-national contexts will stimulate discussion and enhance learning and understanding. Finally, the partners will consider the possibility of publishing insights gained in these meetings in national journals.

### **9.2.2 The dissemination in the policy makers' community**

Additionally to the workshop at DG Regio a workshop for the Committee of Regions is discussed with the relevant people.

Single partners could also make presentations of results at national meetings with a comparative goal (results are particularly relevant in an interregional comparative setting), and publish in national scientific or professional journals.



## Annexes to the Scientific report

### A1 List of indicators developed and datasets provided to the ESPON Database

According to the fields of exposure the following sensitivity indicators were developed.

Exposure Field	Sensitivity Field	Source
erosion	% areas at risk of soil erosion	CLC
pollutants in soil	(pop+empl)/usable land	ESPON
share of artificial areas/soil sealing	% artificial area	CLC
water consumption	% inland water	ESPON on CLC
pollutants in ground/surface water	(pop+empl)/usable land	ESPON
pollutants in air	concentration of PM <sub>10</sub>	5 <sup>th</sup> Cohesion Report
emissions of CO <sub>2</sub>	((vehicles per 1000 inhab)+(dens pop))/2	EUROSTAT+ESPON
heavy rain/flood hazard/occurrence of landslides	risk of flood hazard	ESPON
biodiversity	areas in Natura2000	University of Natural Resources and Life Sciences, Vienna
conservation of natural heritage (landscape diversity)	% natural areas	DG Agriculture – Rural Development Report
conservation of cultural heritage	number of 3-star TCI	ESPON ATTREG Project
economic growth (GDP/capita)	GDP per capita	ESPON
innovation	Share of product &/or process innovation	ESPON
entrepreneurship	% self employment	EUROSTAT
employment in primary sector	GDP per capita	ESPON
% of arable area, permanent grass area, permanent crops area	% agricultural areas	ESPON on CLC
employment in secondary sector	employees in secondary sector as percentage of all employees	EUROSTAT
employment in tertiary sector	employees in tertiary sector as percentage of all employees	EUROSTAT
overnight stays	nights on population	EUROSTAT+ESPON
disposable income in PPS per capita	disposable income per capita	ESPON
equal income distribution	poverty index	5 <sup>th</sup> Cohesion Report
employment rate	unemployment rate	5 <sup>th</sup> Cohesion Report
out-migration/brain drain/"shrinking regions"	net migration balance	5 <sup>th</sup> Cohesion Report
number of people exposed to noise	% population in urban areas	CLC
accident rate in transport	road fatalities	5 <sup>th</sup> Cohesion Report
accident risk: industry/energy supply	technological &/or environmental risk	ESPON
healthy life expectancy at birth	life expectancy at birth	EUROSTAT
daily accessibility by air	potential accessibility by air	ESPON Data Base
daily accessibility by road	potential accessibility by road	ESPON Data Base

<b>Exposure Field</b>	<b>Sensitivity Field</b>	<b>Source</b>
daily accessibility by rail	potential accessibility by rail	ESPON Data Base
renewable energy	vulnerability to climate change	5 <sup>th</sup> Cohesion Report
fossil fuel consumption	vulnerability to climate change	5 <sup>th</sup> Cohesion Report
increase of urbanization relative to population growth	% discontinuous urban fabric	ESPON on CLC
transnational cooperation	INTERREG IIIa expenditures/cap	EUROSTAT

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### A3 List of missing indicators and data

The following tables list the data missing for indicators in the respective regions.

Fields	Subject or Topic	Data missing for
F1	% areas at risk of soil erosion	BE10, CH, CY, ES (30, 53-70), FR (91-94), GR (30-41), IS, LI, MT, NO, PT (20-30), SE, SK01, UKI1,
F3, F4,	Corine Land Cover	CH, NO, LI, IS, FR (91-94), PT (20-30)
F6	PM <sub>10</sub> concentration	CH, ES70, FR (91-94), IS, LI, NO,
F7	Vehicles per 1000 inhabitants	Fr (91-94), IS, PT (20-30),
F9	% Natura 2000 areas	CH, FR (91-94), IS, LI, NO, UK
F10	% natural areas	CH, FR (91-94), IS, LI, NO, PT (20-30)
F12	GDP per capita	LI
F13	% product and/or process innovation	Fr (91-94), LI
F14	% self-empl on employment	LI
F15	Market barriers	all regions
F16	Empl primary sector – GDP per cap	LI
F17	Corine Land Cover	CH, NO, LI, IS, FR (91-94), PT (20-30),
F18	Empl secondary sector – GDP per cap	Fr (91-94), LI
F19	Empl tertiary sector – GDP per cap	Fr (91-94), LI
F20	Total overnight stay per total population	ES(63-63), FR (91-94)
F21	Disposable income per capita	CH, IS, LI, NO
F22	Income distribution (Poverty index)	CH, FR (91-94), IS, LI, NO
F24	Net migration balance	CH, IS, LI, NO, UKM5,
F25	% Population in urban areas	CH, IS, LI, NO
F26	Road fatalities	CH, IS, LI, NO, PT(20-30)
F27	Env/tech risk	IS, LI,
F29	Accessibility by air	FR (91-94), PT(20-30)
F30	Accessibility by water	all regions
F31	Accessibility by road	FR (91-94), PT(20-30)
F32	Accessibility by rail	FR (91-94), PT(20-30)
F33, F34	Vulnerability to climate change	CH, ES70, FR (91-94), IS, LI, NO, PT(20-30)
F35	% of discontinuous urban fabric	CH, FR (91-94), PT(20-30)
F36	Mixed land use	all regions
F37	Efficiency of government/governance mechanisms	all regions
F38	Duration or complexity of planning procedures	all regions
F39	Participation rate	all regions
F40	Societal transfers (e.g. tax added)	all regions
F41	Funding pc in INTERREG	BG, CH, DK, IS, LI, NO, RO, SI, UKM5, UKM6

<b>Directive</b>	<b>Type of Region</b>	<b>Data missing for</b>
11a	Agglomerated	IS, LI
3,9,	Areas at highest tech/env risk	none
10b	Chemical industries	none
4a, 4b, 4c	Densely populated	CH07, ES70, FR (91-94), IS, LI, MT, PL52, PT (20-30)
5a	Forest	CH07, CY, ES70, FR (91-94), GR30, IS, LI, MT, PL52, PT (20-30), SI
5b	Harbour regions	CH07, ES70, FR (91-94), IS, LI, MT, PL52, PT (20-30)
4a, 4b, 4c	High density of rail	CH, IS, LI
7, 9	High density of rail/road	CH07, ES70, FR (91-94), IS, LI, MT, PL52, PT (20-30)
4a, 4b, 4c	High density of road	none
11b	High employment in automotive	FR (91-94), IS, LI, PT (20-30)
1b, 6	Industrial regions	none
4a, 4b, 4c	Major airport location	DE(50-60; 91-91; B2-3), DK, EE, ES (22,23,43,52,53,64), GR (21,41,42), LI, LT, LU, LV, MT, NL13, PL31, SI, UKD1
5a	Natural areas	none
4a, 4b, 4c, 8a, 12	Agglomerated and Urban	CH, ES70, FR (91-94), IS, LI, NO
1a	PM10 – TOP20P	CH, IS, LI, NO
5a, 10a	Rural	CH, FR (91-94), IS, LI, NO, PT(20-30)
8b	Shrinking regions	CH, FR (91-94), IS, LI, NO, PT(20-30)
5a	Unprofitable farming	none
8a	Wealthy regions	LI

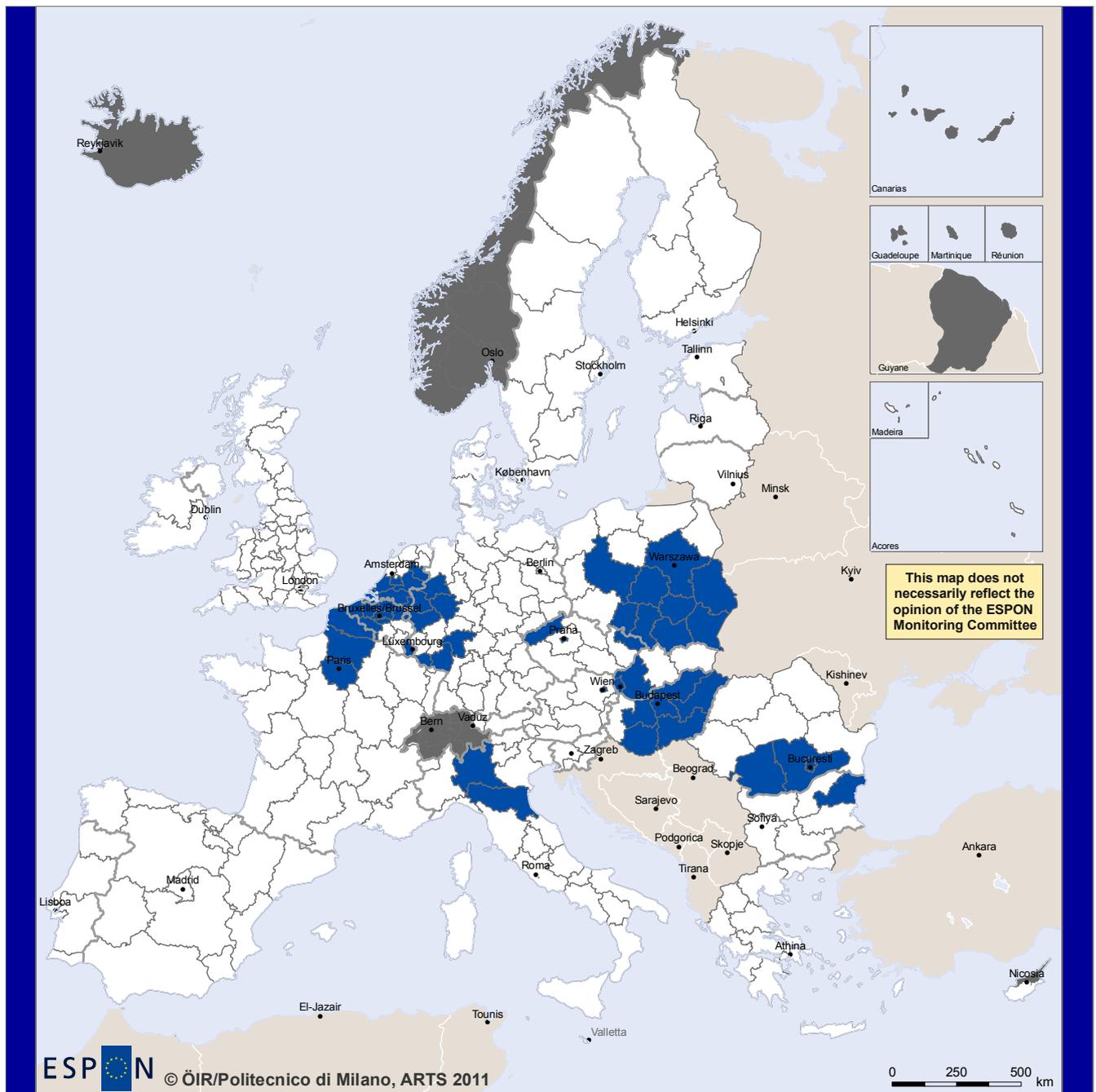
#### **A4 List of abbreviations and glossary**

ARTS	Assessment of Regional and Territorial Sensitivity
CAP	Capita
CO <sub>2</sub>	Carbon Dioxide
DB	Database
DEM	Directive Exposure Matrix
EC/CE	European Commission
EU	European Union
EXP	Exposure
GDP	Gross Domestic Product
GVA	Gross Value Added
HNI	High negative impact
HPI	High positive impact
IA	Impact Assessment
IPPC	Intergovernmental Panel on Climate Change
KIS	Keep It Simple
LPD	Legislation, Policies and Directives
NUTS	Nomenclature of Statistical Territorial Units
PIM	Potential Impact
PPS	Purchasing Power Standard
REM	Regional Exposure Matrix
REX	Regional Exposure
RSM	Regional Sensitivity Matrix
S	Sensitivity
TIA	Territorial Impact Assessment
TIM	Territorial Impact Matrix
ToR	Terms of Reference
WFD	Water Framework Directive

## **A5 Additional maps not included in the core text of the report**

- Map A5 1: Regions affected by Directive on air quality (branch a)
- Map A5 2: Regions affected by Directive on air quality (branch b)
- Map A5 3: Regions affected by the Waterframework Directive
- Map A5 4: Regions affected by the Seveso Directive
- Map A5 5: Regions affected by Directive on managing environmental noise (branch a)
- Map A5 6: Regions affected by Directive on managing environmental noise (branch b)
- Map A5 7: Regions affected by Directive on managing environmental noise (branch b)
- Map A5 8: Regions affected by Directive on promotion of use of biofuels
- Map A5 9: Regions affected by Directive on recognition of qualifications
- Map A5 10: Regions affected by Directive on critical infrastructure
- Map A5 11: Regions affected by Directive on sustainable use of pesticides
- Map A5 12: Regions affected by Directive on clean and energy-efficient road transport vehicles (branch a)
- Map A5 13: Regions affected by Directive on clean and energy-efficient road transport vehicles (branch b)
- Map A5 14: Regions affected by Directive on the energy performance of buildings

# Regions affected by Directive on air quality branch a



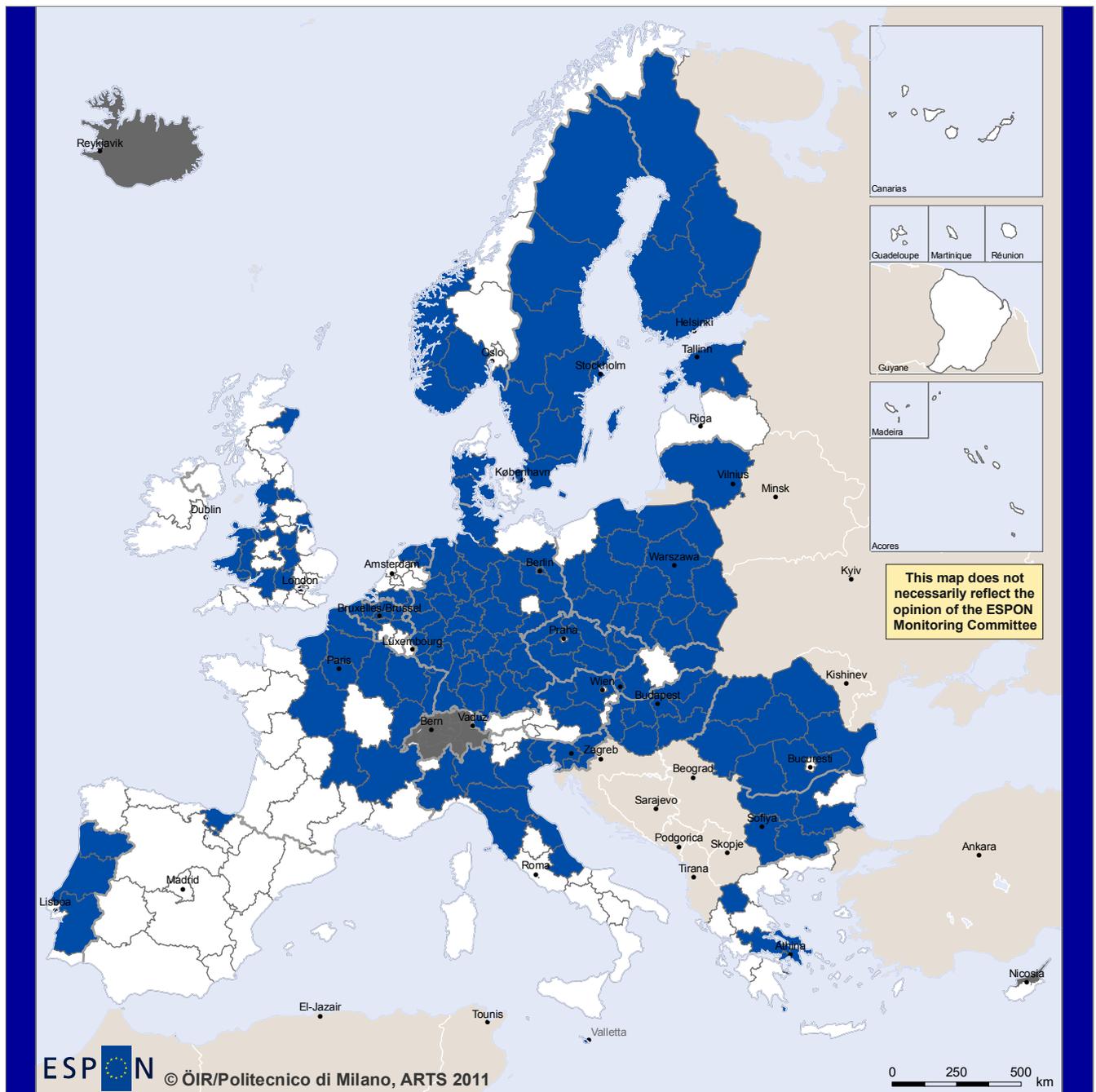

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-  Affected
-  Not Affected
-  Neighbourhood Countries
-  No Data

Types of regions affected: high particulate air pollution

# Regions affected by Directive on air quality branch b



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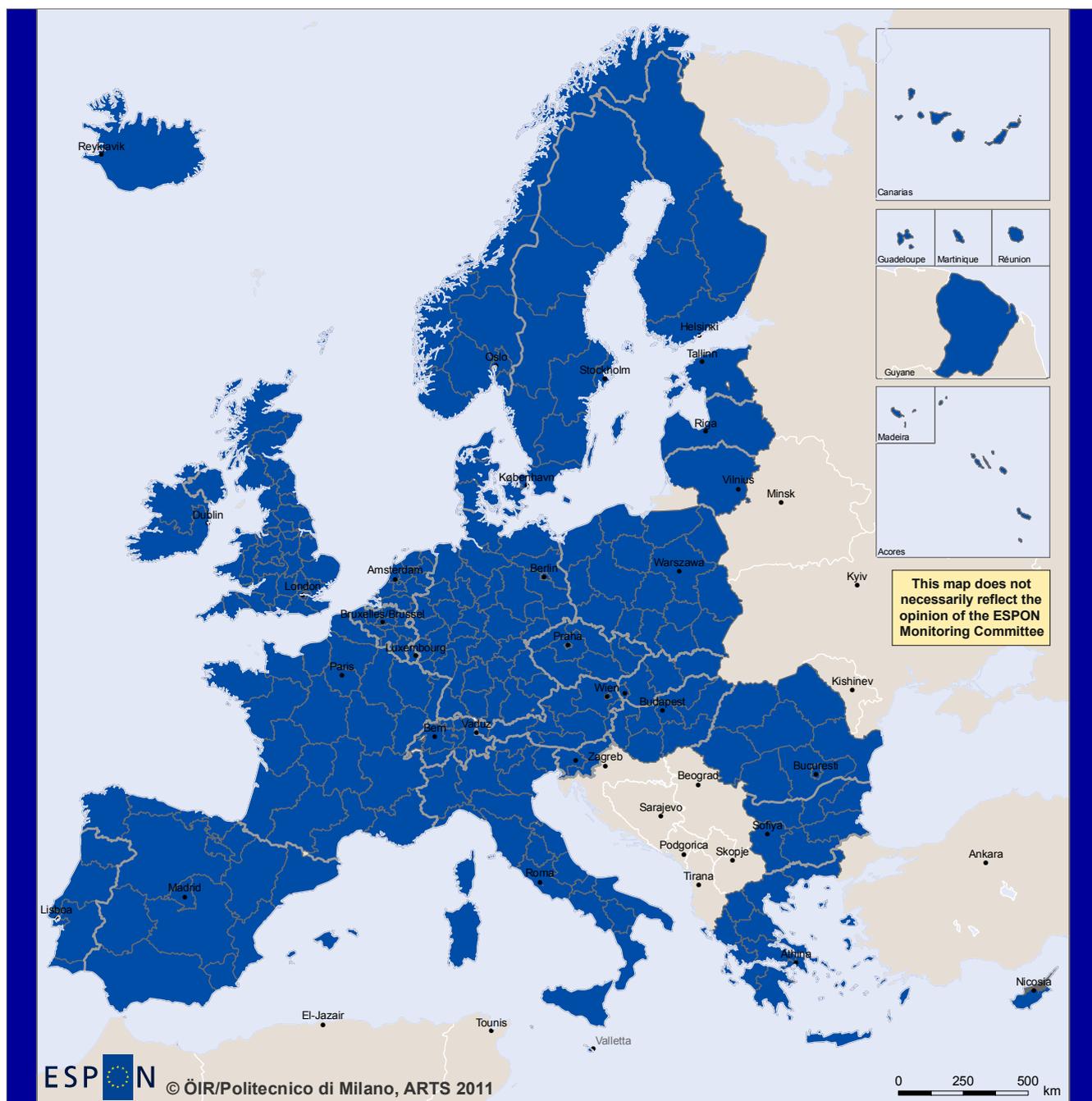
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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: industrial regions

# Regions affected by Waterframe Directive



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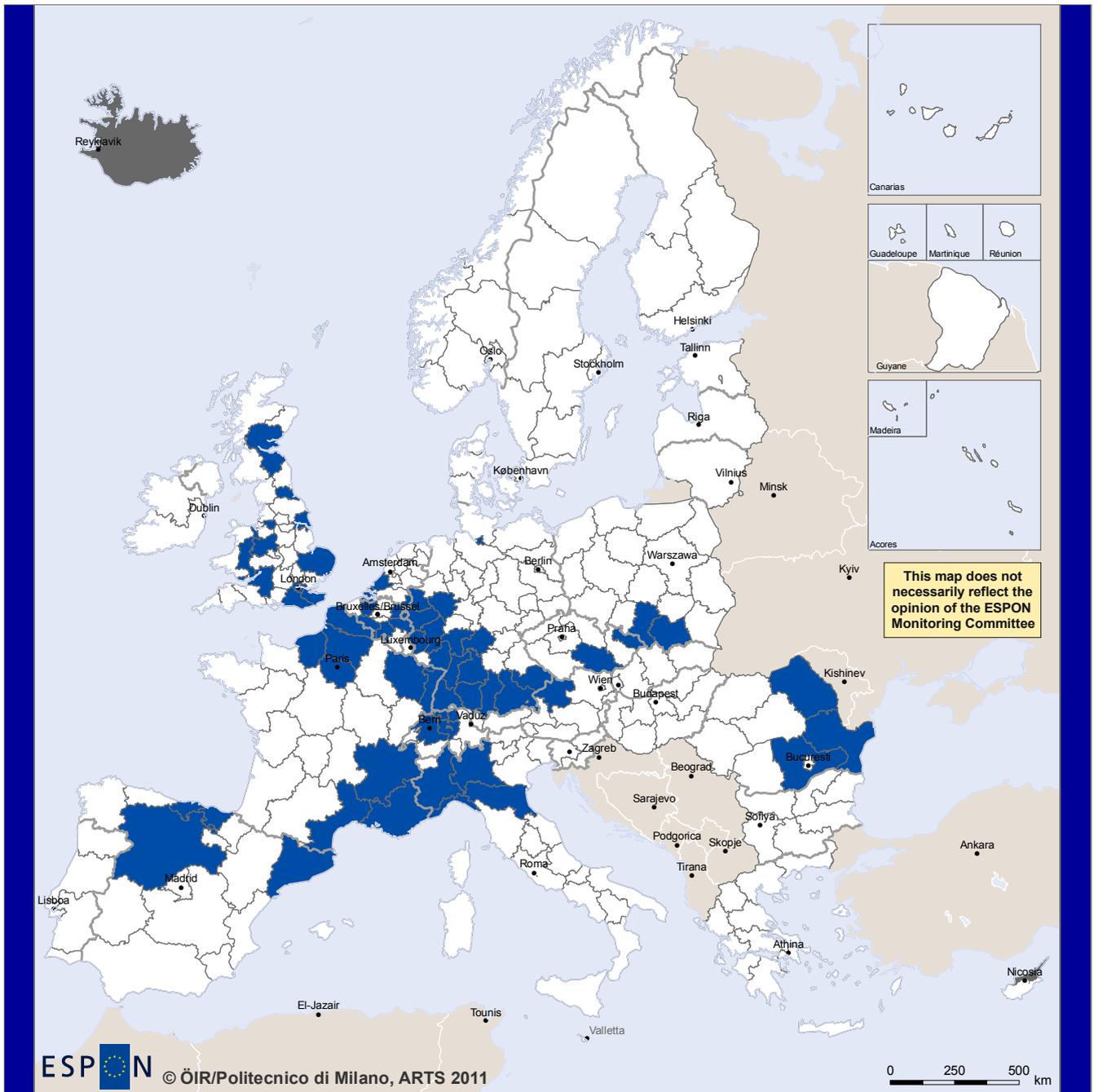
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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: all regions

# Regions affected by Seweso Directive



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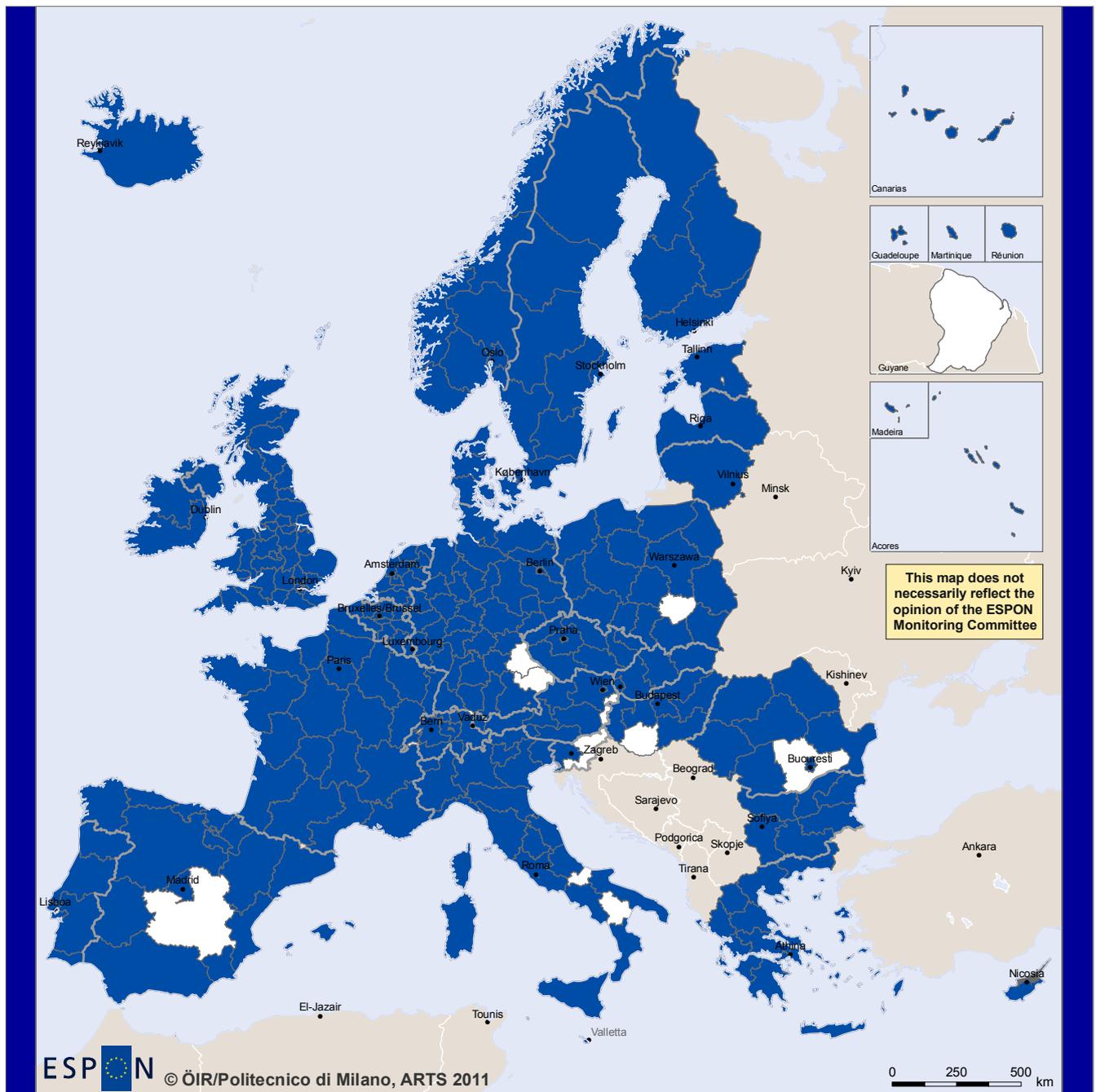
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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: areas at highest technological/environmental risk

# Regions affected by Directive on managing environmental noise branch a



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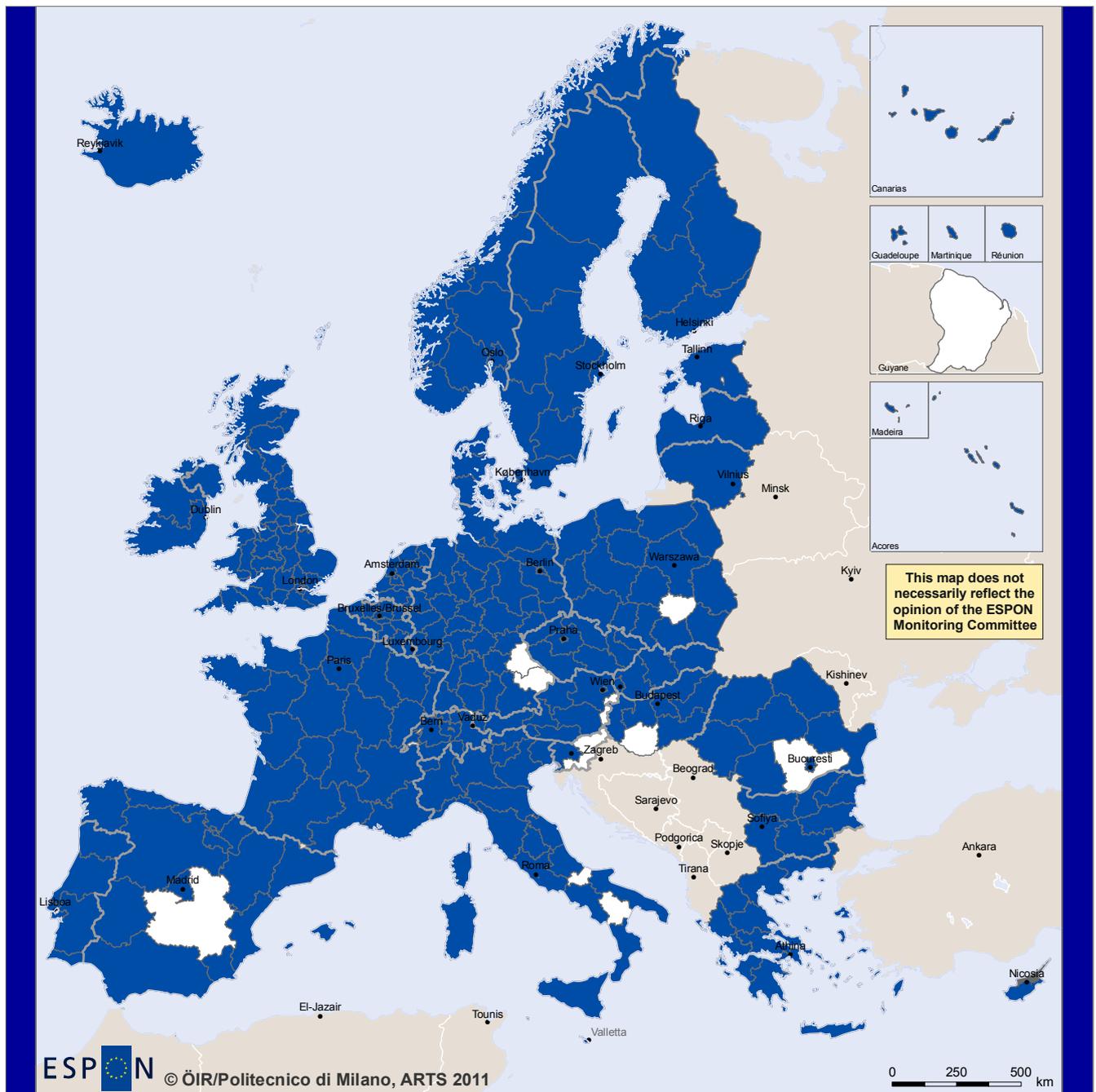
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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: urban, agglomerated, densely populated, high density of roads, high density of rail, major airport location

# Regions affected by Directive on managing environmental noise branch b



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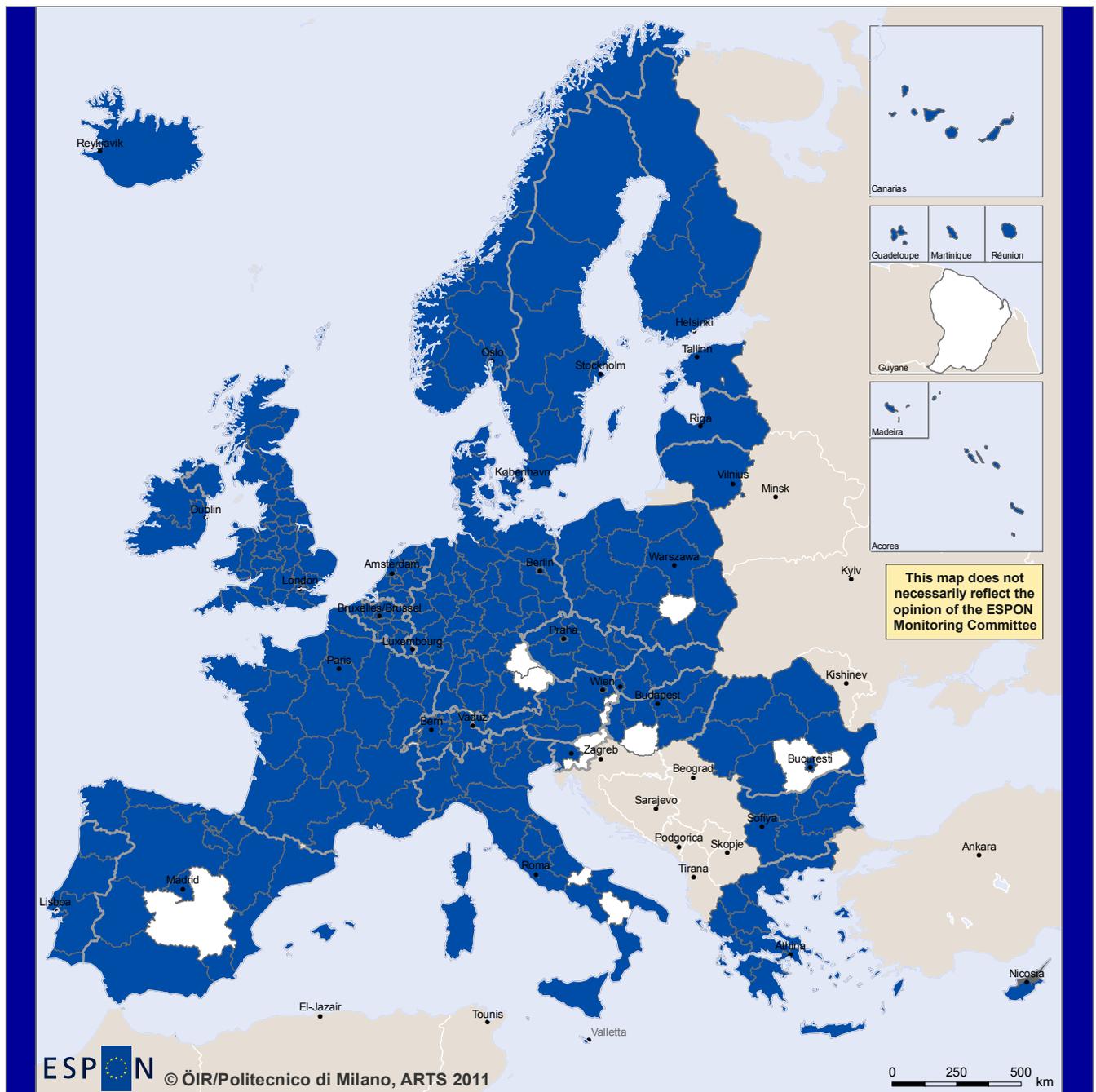
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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: urban, agglomerated, densely populated, high density of roads, high density of rail, major airport location

# Regions affected by Directive on managing environmental noise branch c



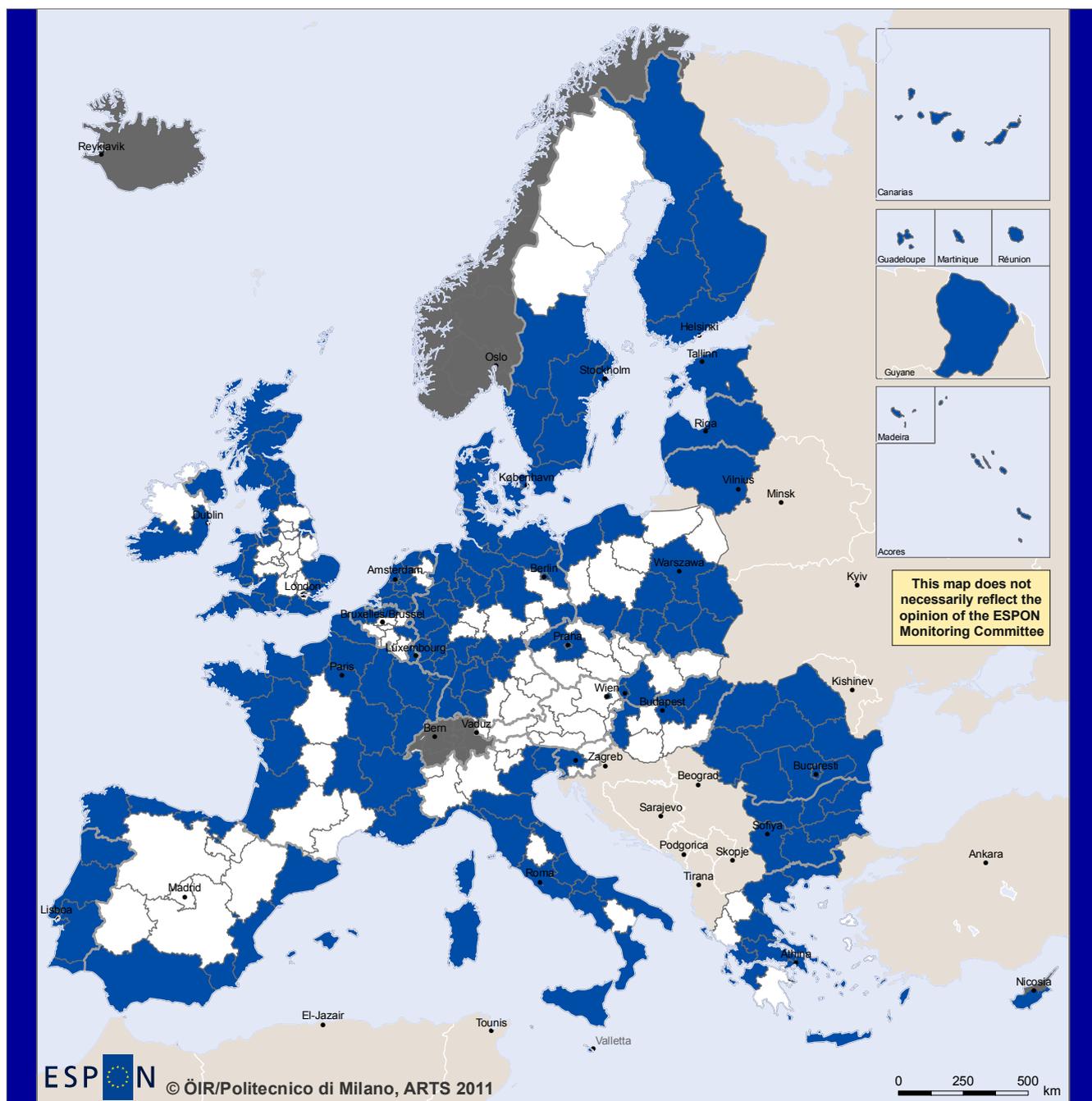

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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: urban, agglomerated, densely populated, high density of roads, high density of rail, major airport location

# Regions affected by Directive on promotion of use of biofuels



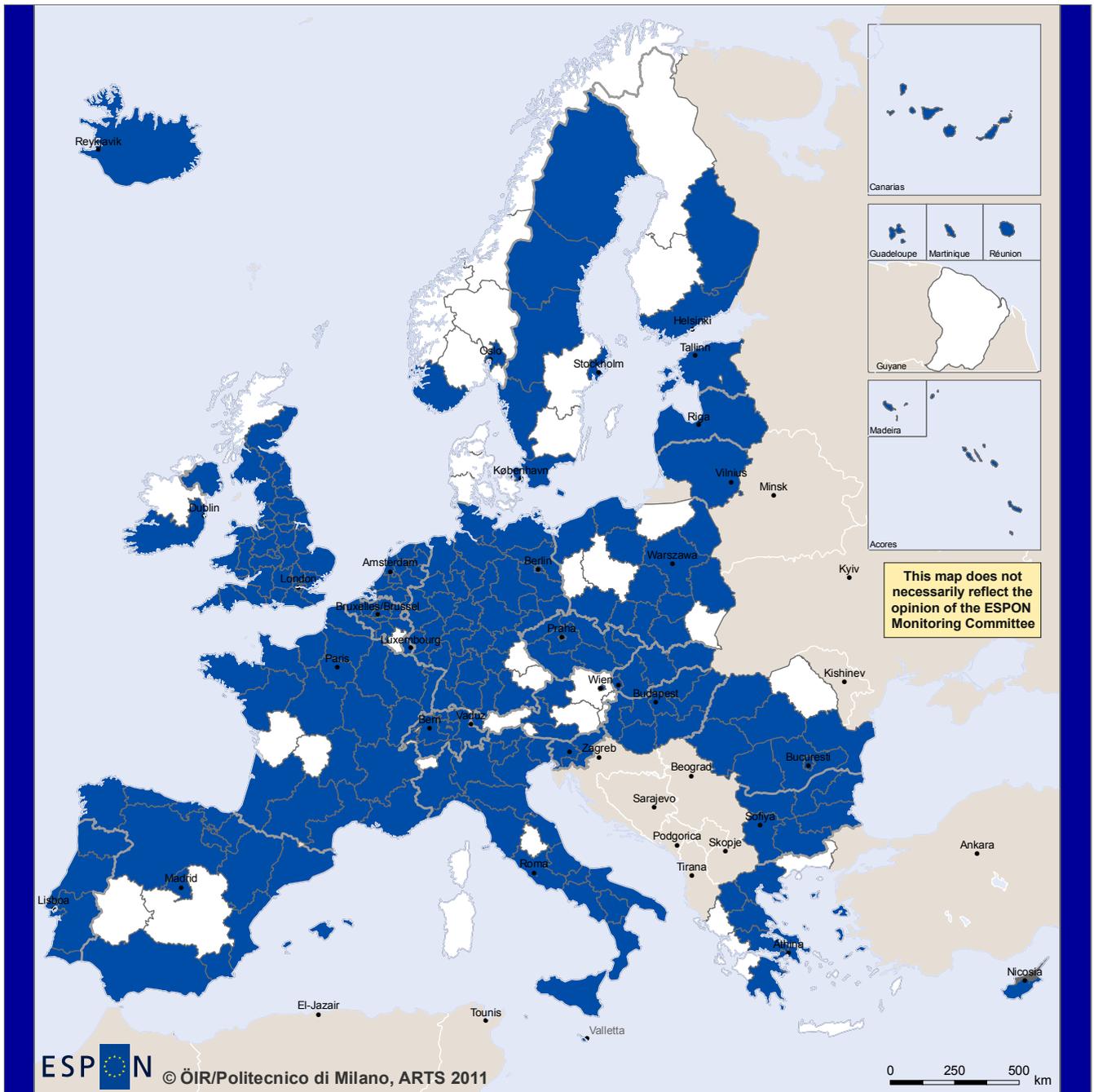

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-  Affected
-  Not Affected
-  Neighbourhood Countries
-  No Data

Types of regions affected: rural, unprofitable farming, natural areas, forest, harbour regions

# Regions affected by Directive on recognition of qualifications



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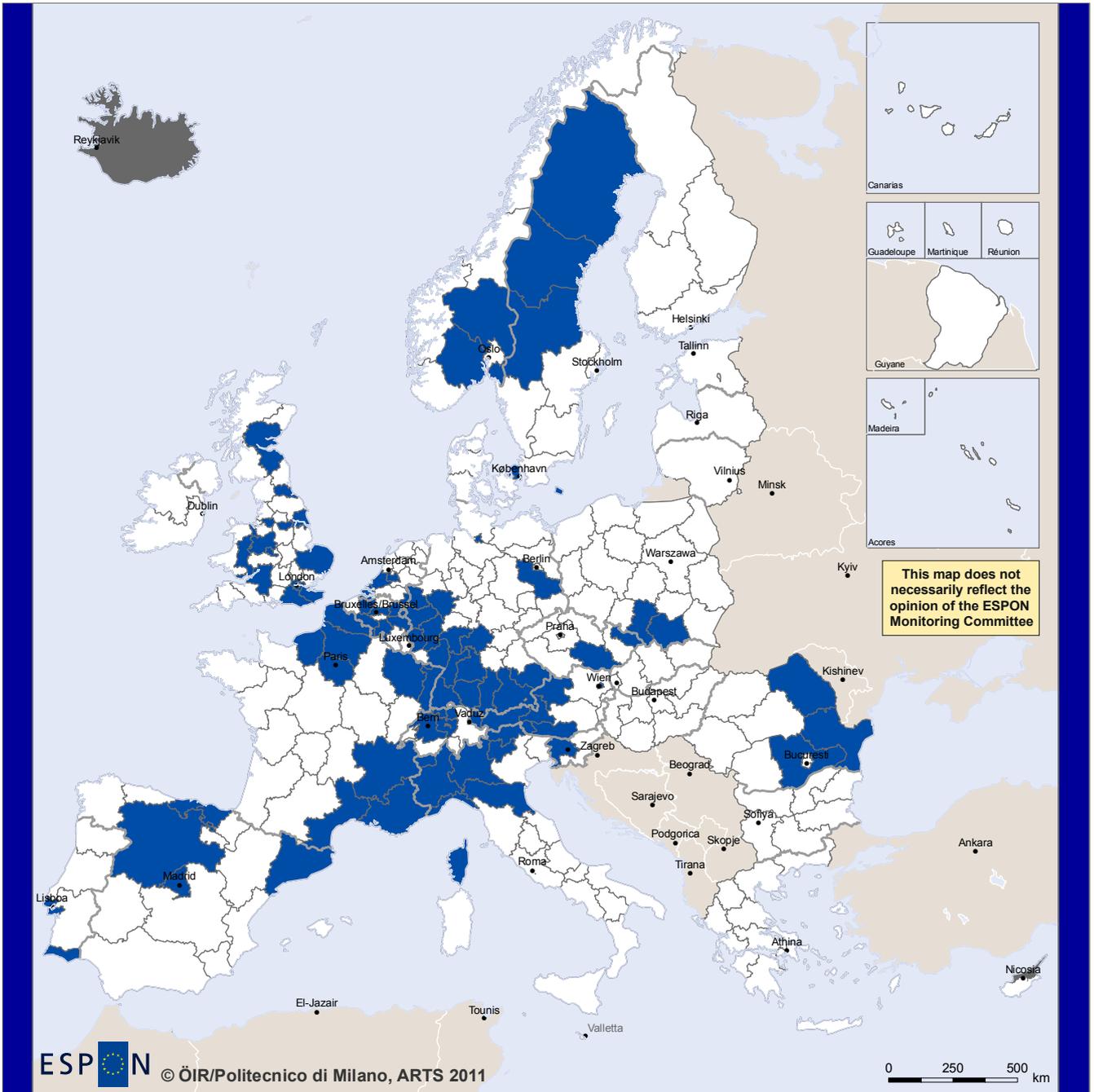
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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: wealthy regions, urban, agglomerated, shrinking regions

# Regions affected by Directive on critical infrastructure



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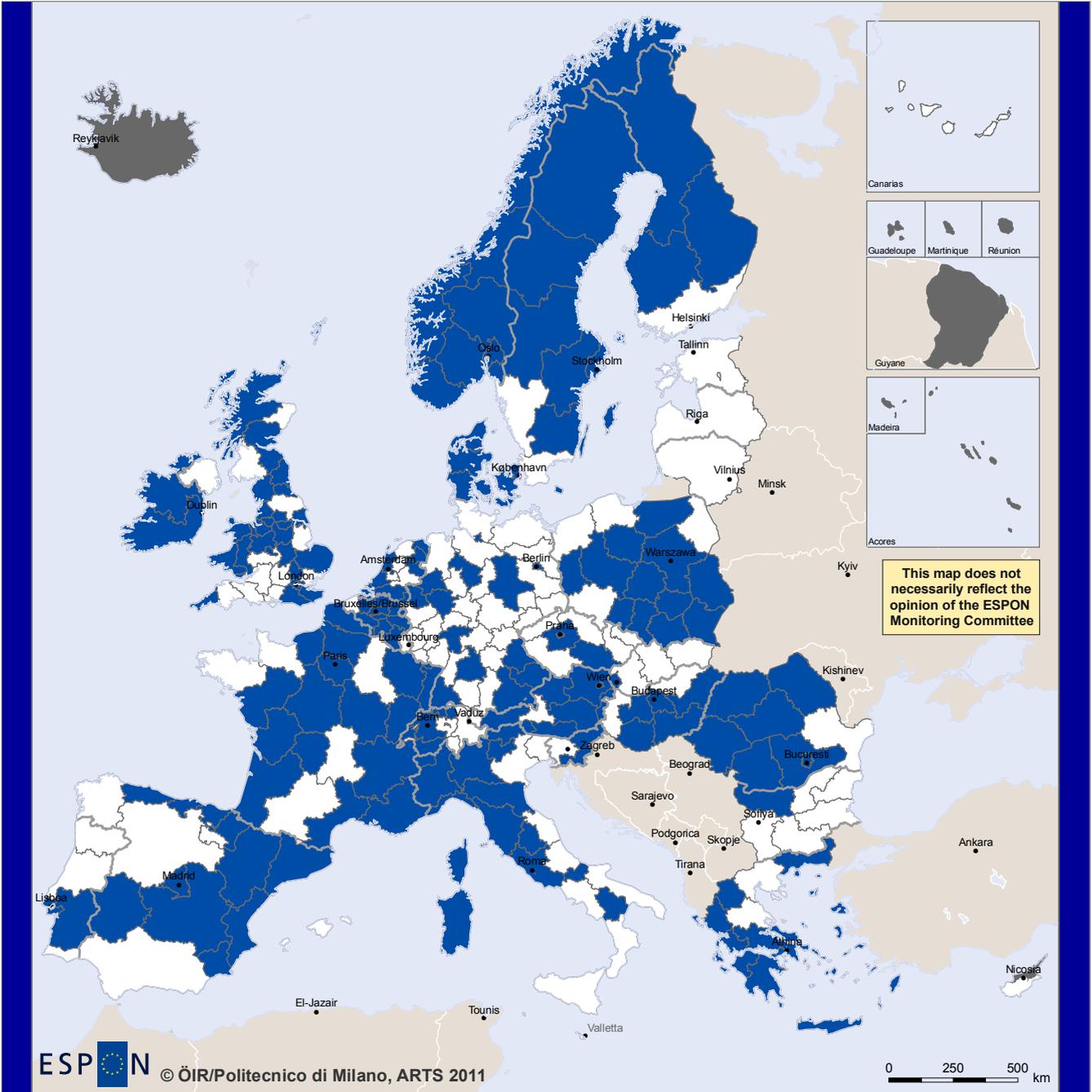
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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: highest density of rail and road network, areas at highest technological/environmental risk

# Regions affected by Directive on sustainable use of pesticides



ESPON © ÖIR/Politecnico di Milano, ARTS 2011

0 250 500 km

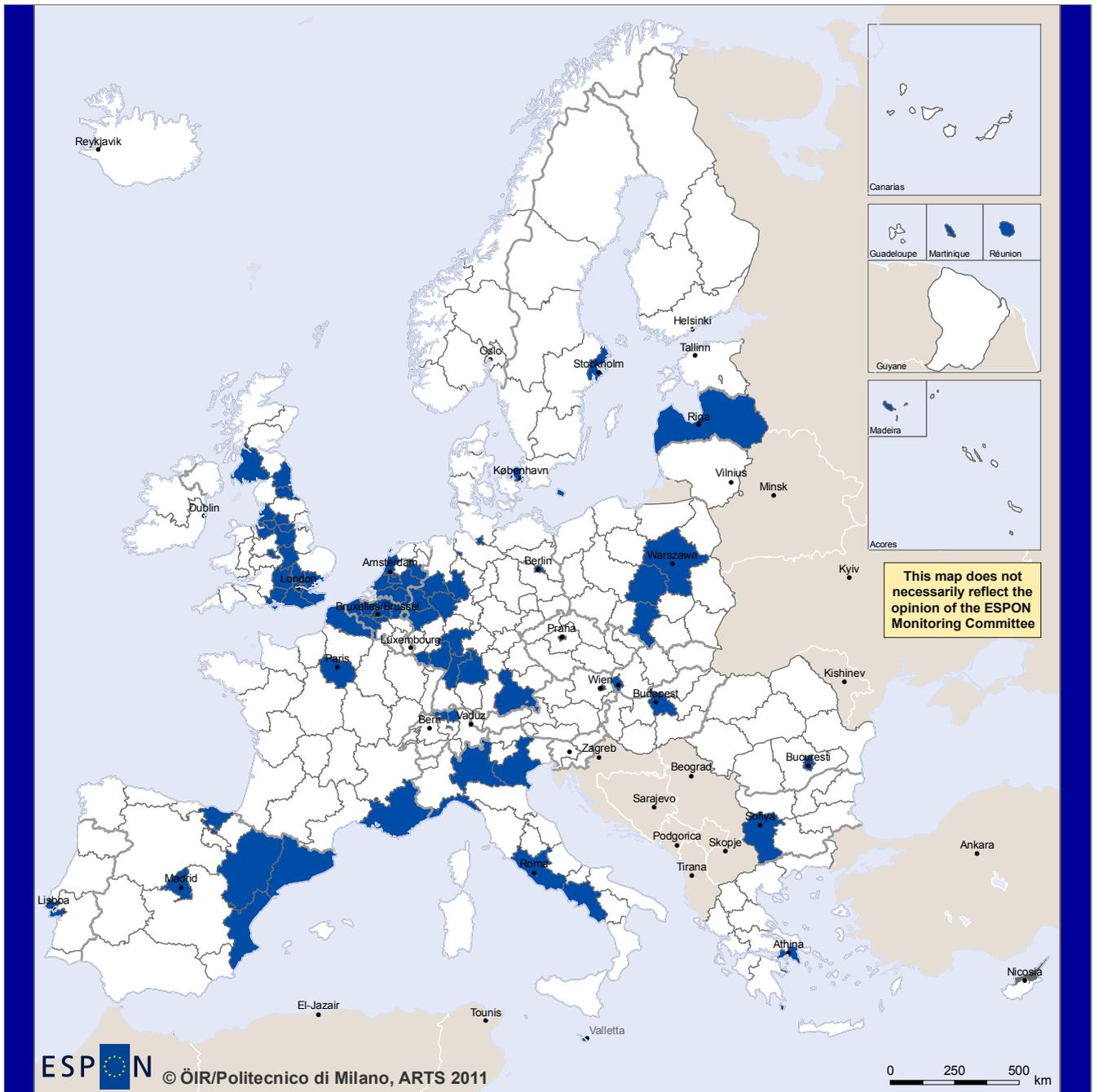
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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: rural, chemical industries

# Regions affected by Directive on clean and energy-efficient road transport vehicles branch a



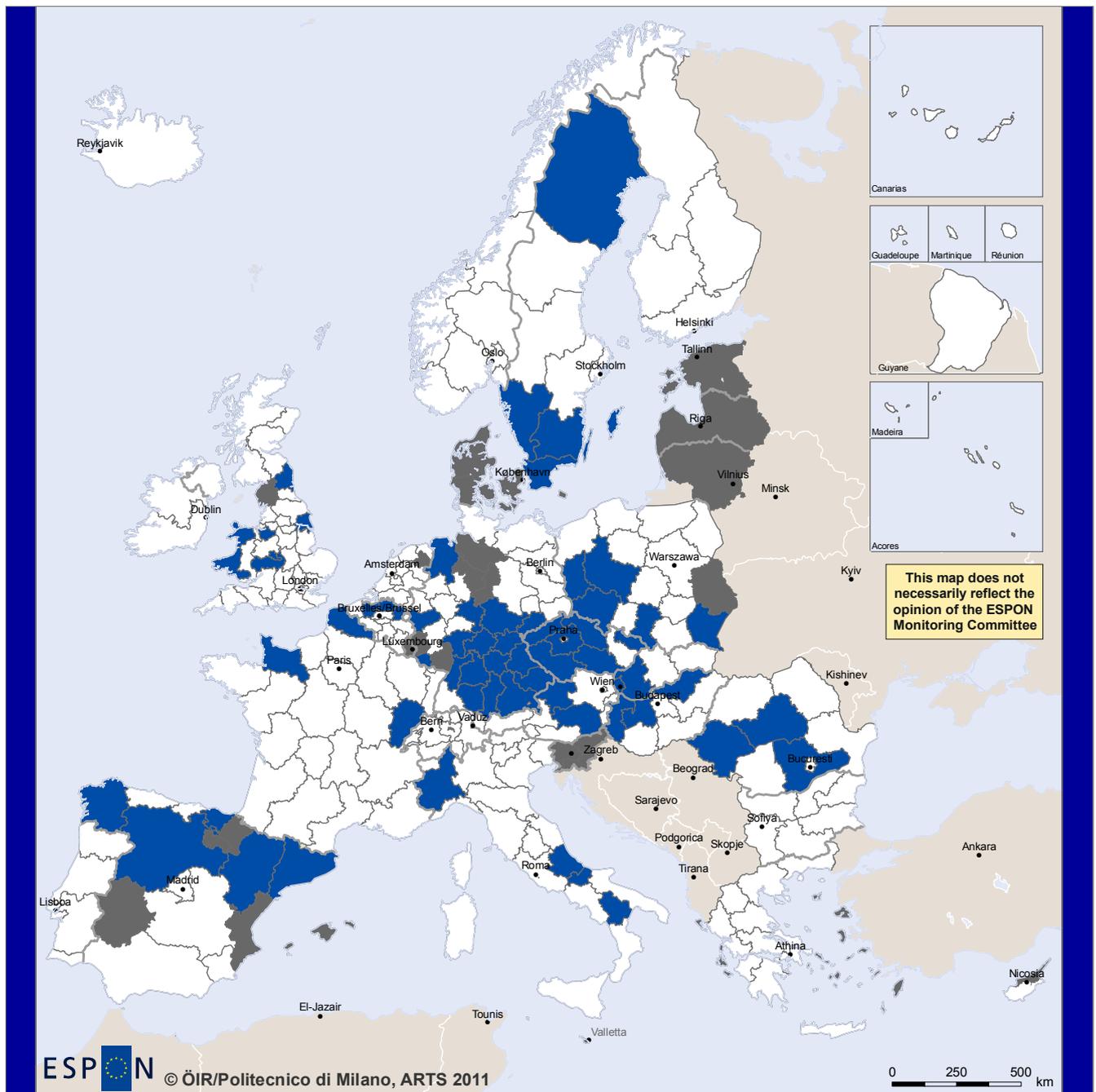

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-  Affected
-  Not Affected
-  Neighbourhood Countries
-  No Data

Types of regions affected: agglomerated

# Regions affected by Directive on clean and energy-efficient road transport vehicles branch b



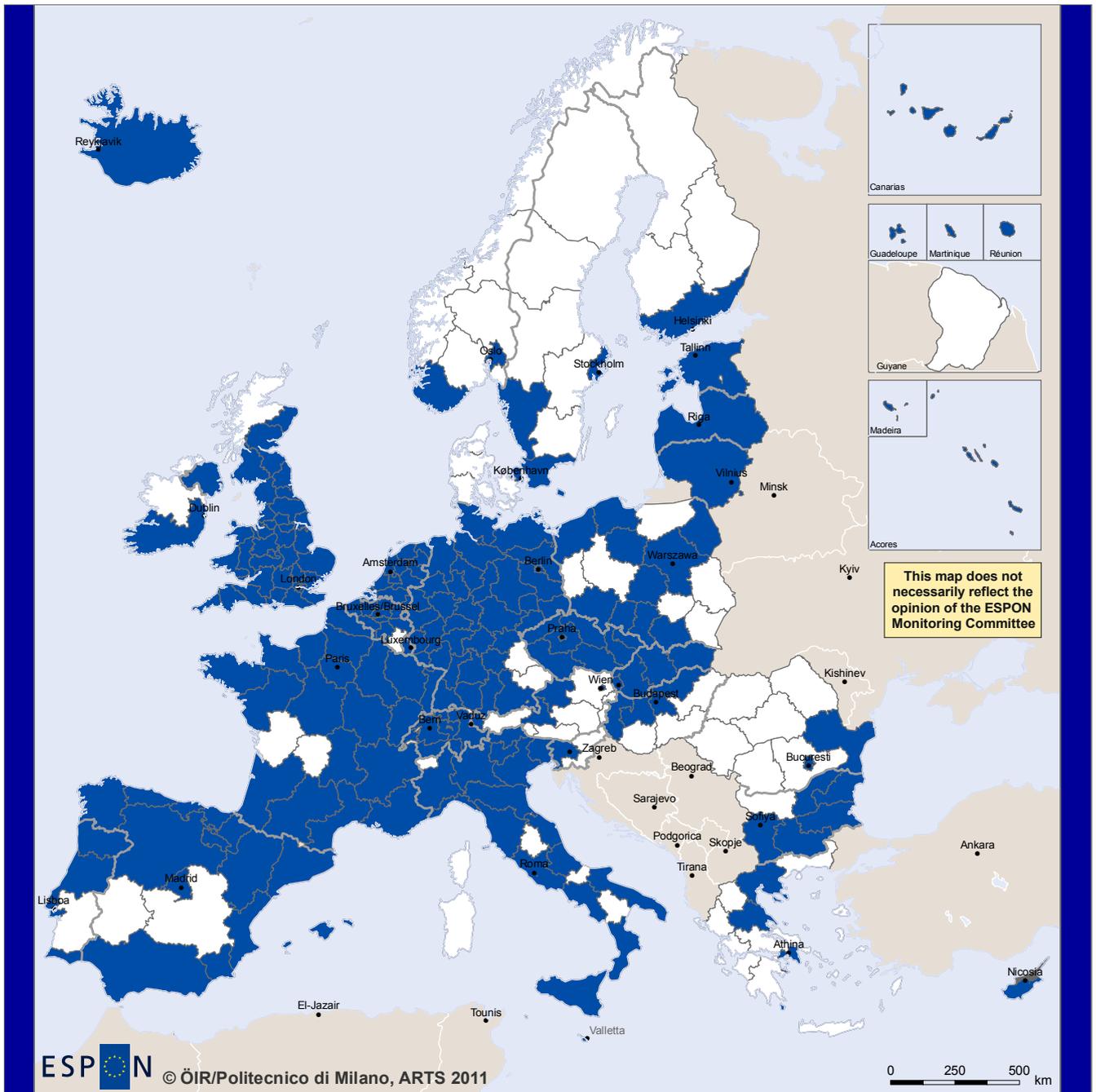

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- Affected
- Not Affected
- Neighbourhood Countries
- No Data

Types of regions affected: highest share of employment in automotive

# Regions affected by Directive on the energy performance of buildings



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-  Affected
-  Not Affected
-  Neighbourhood Countries
-  No Data

Types of regions affected: urban, agglomerated

## A6 Governance questionnaire

### ESPON ARTS Questionnaire

#### The governance aspect of the territorial impact of EU directives

(Disseminated at the ESPON Contact Point meeting 19 November 2010, Liège)

##### *Introduction, aims and objectives*

The main objective of the ESPON ARTS project is to assess the *territorial sensitivity* of regions to EU directives. A basic assumption underlying the project is that this sensitivity can be explained to a large extent from specific regional territorial characteristics relating to soil, air and water.

However, it is understood that territorial characteristics alone cannot completely explain the territorial effects of a directive within a region; an important additional element is the factor *governance*. So, a part of the ESPON ARTS project is about developing a more thorough understanding of the role of governance as an explaining factor for the territorial impact of EU directives. The basic hypothesis underlying this focus is that domestic governance structures can have either an *amplifying* or a *mitigating* effect on the potential territorial impact of EU directives.

This leads to the following question: how does the factor governance amplify or mitigate the potential territorial impact of EU directives? The answer can be found in the four policy stages that directives go to:

- (1) Development of the EU directive
- (2) Transposition/translation in national legislation
- (3) Implementation into existing policies or by issuing new policies
- (4) Actual use and jurisprudence (if any) in relation to this actual use.

In each of these four policy stages government and governance decisions play a role and can lead to unexpected territorial impact. For example:

Ad1. During the *development* of an EU directive member state delegations have to be sensitive for its possible effects on territory and existing domestic legislation and will very likely use knowledge about this to define negotiation boundaries.

Ad 2. *Transposing* a directive into domestic legislation can be done in many different ways depending on how a member state interprets the directive in the context of its own legislative system. Some member states act pragmatically and, if possible, copy-paste directives in their domestic legislation, while others add additional objectives or relate the directive to specific legislation in other policy fields.

Ad 3. The *implementation* of a directive depends on a variety of decisions regarding the question how the objectives of the directive can be best met given the existing domestic policy system and mechanisms. In one case existing policies already cater for meeting the directive's objectives, in other cases existing policies need to be revised or complemented by new policies and instruments.

Ad 4. The *actual use* of a policy depends amongst others on the organization and functioning of the public administration, available governance capacity and resources and on the *legal system* within a member state or region and whether the decision made in the transposition and implementation phases allow certain degrees of flexibility.

This questionnaire aims to perform a very first preliminary analysis to filter out which domestic governance characteristics might amplify or mitigate the territorial effects of EU directives on domestic territories. Based on these characteristics the project will identify member states where territorial impact of specific directives might cause significant impact. These member states will be indicated by a *Flag*. The focus is on the *member state level* because governance characteristics are usually similar for all regions within a country. This is of course an assumption and respondents are invited to provide counter-evidence in those cases where this assumption does not seem to be valid. The outcome of this questionnaire is not only relevant for the ESPON ARTS project but may form the basis for further analysis in future ESPON projects.

In order to find out through a preliminary analysis how governance structures influence the territorial impact of EU directives across the ESPON space, the ESPON ARTS project has selected three directives for further case study analysis. The case study directives that have been selected are the following:

- (1) **Water Framework Directive** – Council Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy
- (2) **Air Quality Directive** – Council Directive 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air
- (3) **Environmental Noise Directive** – Council Directive 2002/49/EC of the European Parliament and of the Council relating to the assessment and management of environmental noise

Selection criteria include: 1) the directive should be transposed and in force and 2) should have clear direct territorial impact.

The questionnaire itself is structured around four hypotheses on how government and governance structures may amplify or mitigate potential territorial impact of a directive. Also, by means of introduction and conclusion, two more open questions are posed. Depending on its appropriateness you can answer the questions by either referring to one of the three EU directives indicated above, or to another directive which has caused territorial impact in your country/region. The final question offers the opportunity to issue comments and suggestions as well as to provide further information on experiences related to the territorial impact of EU directives in your country. Relevant documentation to support your answers is welcomed and can be e-mailed or posted to the addresses below.

# ESPON ARTS Questionnaire

## Governance as an explaining factor for territorial impact

Liège, 17-18 November 2010

### Respondent

Name:  
E-mail:  
Country:  
Affiliation:

### Date/Place

### General questions

1. Have any of the three directives (Water Framework Directive, Air Quality and Environmental noise) mentioned above caused unexpected territorial impact in your country? What kind of (major) impact did the directive cause and was this considered negatively or positively?
2. Do you know of any other EU directive having caused unwanted or unexpected territorial impact in your member state? If so, indicate which directive or directives and what briefly characterize the impact, its main reasons and how this was dealt with.
3. Has negative impact of EU directives led to more political attention for territorial impact? And if so, how did this materialize?

Answers/comments/suggestions

**Hypothesis 1** – EU directives will lead to unexpected territorial impacts when their substance and internal logic do not (closely) match existing policies and instruments at the domestic level. This may result from the fact that their transposition into domestic legislation and policies will require many additional decisions.

Questions to be answered in relation to the three directives mentioned above, or any other directive that has had clear territorial impact:

1. Do objectives of the directive run counter to domestic objectives in the same policy field?
2. Have completely new objectives and methodologies been introduced in the domestic policy system?
3. Was it easy to fit the directive in the existing legislative and policy system? (For example, the Water Framework Directive poses a fundamental institutional requirement by asking member states to install management authorities at the level of water bodies.)
4. Any other relevant observation.

Answer/comments/suggestions

**Hypothesis 2** – Unexpected territorial impact of EU directives can be avoided if the transposition and implementation of the directive is made subject to sound inter-sectoral coordination and (informal) consultation of important domestic stakeholders which are affected by the directive(s) in question (ngo's, private sector, civic organizations and others).

Questions to be answered in relation to the three directives mentioned above or any other directive that has had clear territorial impact:

1. Which branches of government have been responsible for translating EU directives into domestic policy in the case of the directives mentioned above and was this translation the subject of inter-sectoral coordination and wider consultation?
2. Is there a tendency to relate the directive to other domestic policy objectives or add additional objectives to those of the directive?
3. Have there been any complications during the transposition and implementation and in what mitigating measures were taken?
4. Any other relevant observations?

Answers/comments/suggestions

**Hypothesis 3** – Unexpected territorial impact of EU directives can be avoided when member states start a dialogue with the European Commission.

Questions to be answered in relation to the three directives mentioned above or any other directive that has had clear territorial impact:

1. Was there any sort of dialogue with the European Commission?
2. If so: when did it occur in the policy process (expert, comitology, transposition, implementation) and what caused this dialogue?
3. What have been the results of this dialogue in terms of solutions to be applied to deal with certain unwanted situations?
4. Any other relevant observations?

Answers/comments/suggestions

**Hypothesis 4** – There is a positive correlation between the unexpected territorial impacts of EU directives and the opportunities that the judicial system offers for stakeholders to file a case to the court.

Questions to be answered in relation to the three directives mentioned above or any other directive that has had clear territorial impact:

1. Does the judicial system of your country offer the possibility for specific groups of actors/stakeholders to formally object to certain decisions on the basis of EU directives? And do stakeholders use these opportunities?
2. Did this result in some unexpected behaviour like a widening of the scope for formal complaints?
3. Is the legal interpretation of the policy different and more strict than expected?
4. Any other relevant observations?

Answers/comments/suggestions

**Any remarks, suggestions, comments that you would like to make in relation to**

1. The general assumptions underlying this project
2. This questionnaire and its hypotheses
3. Territorial impact and the factor governance in your country
4. Other?

Answer/comments/suggestions

**Thank you very much for your time and effort!**

On behalf of the ESPON ARTS team  
Wil Zonneveld and Bas Waterhout

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2600 GA Delft  
The Netherlands

## **A7 TIA quick check – Standard Version**

# The TIA quick check

## Standard Version

A methodology for a TIA ex-ante quick check  
ESPON ARTS aims to develop a tool by which to analyse the impact of EU legislation that takes the sensitivity of regions into account. The analysis of regional sensitivity to EU directives and policies is intended as a simplified, evidence-based procedure of Territorial Impact Assessment (TIA). This 'quick check' should be as simple, comprehensible and user-friendly as possible.



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The 'TIA quick check' was developed within  
the Applied Research Project ESPON  
ARTS. This project was conducted within  
the framework of the ESPON 2013  
Programme, partly financed by the  
European Regional Development Fund.

Information on the ESPON Programme and  
projects can be found on [www.espon.eu](http://www.espon.eu)

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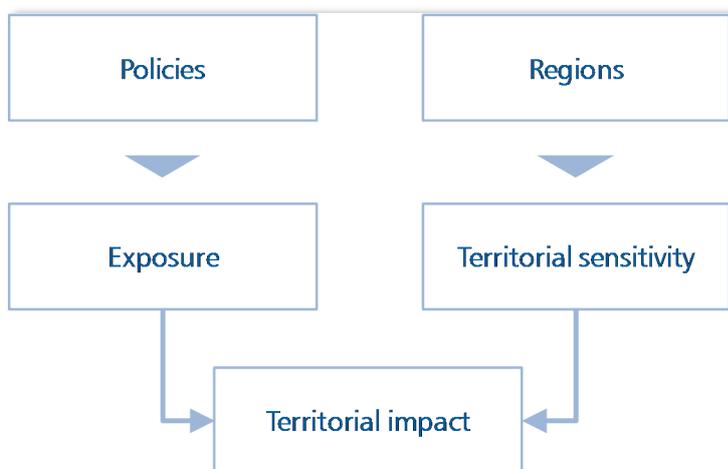


## The methodology: based on the vulnerability concept

The TIA quick check is based on the vulnerability concept developed by the Intergovernmental Panel on Climate Change (IPCC). In this case, the effects deriving from a particular policy measure (exposure) are combined with the characteristics of a region (territorial sensitivity) to produce potential territorial impacts. In the TIA quick check the following definitions are used:

- The *exposure* describes the intensity by which EU directives and policies potentially affect European territory through a double logical chain. On the one hand single directives and policies may affect specific classes of regions (*regional exposure*), without reference to the specificity of each region; on the other hand they may affect particular “fields” of the territorial realm, e.g. surface water quality, emissions, sectoral production (*field exposure*);
- The (territorial) *sensitivity* describes how *single* territories/regions are subject and evaluate impacts in specific exposure fields, due to their socio-economic and geographical characteristics and to the social values and priorities they are likely to show;
- The *territorial impact* is the final, likely effect of a given EU policy or directive as a product of exposure and regional sensitivity. The impact can be direct or indirect along specific cause-and-effect logical chains.

Figure 1  
Territorial impact combining exposure with sensitivity



## The result: An excel tool and a procedure for a TIA quick check

The objective of ESPON-ARTS was to devise a user-friendly methodology that allows one to make a ‘quick and dirty’ ex-ante analysis of the potential impact of EU legislation, policies and directives on the development of regions. To this end, the methodology combines a standardised indicator-based tool developed in Excel with a means to systematically collect expert knowledge in a workshop setting. The expert contribution serves as input for the analysis and for providing the interpretation of the output of the impact indicators.

The TIA quick check uses the indicators and typologies as developed in the ESPON ARTS project. It covers the full range of potential impacts at a general level with common indicators for European NUTS 2 regions.



## How to do the advanced TIA quick check

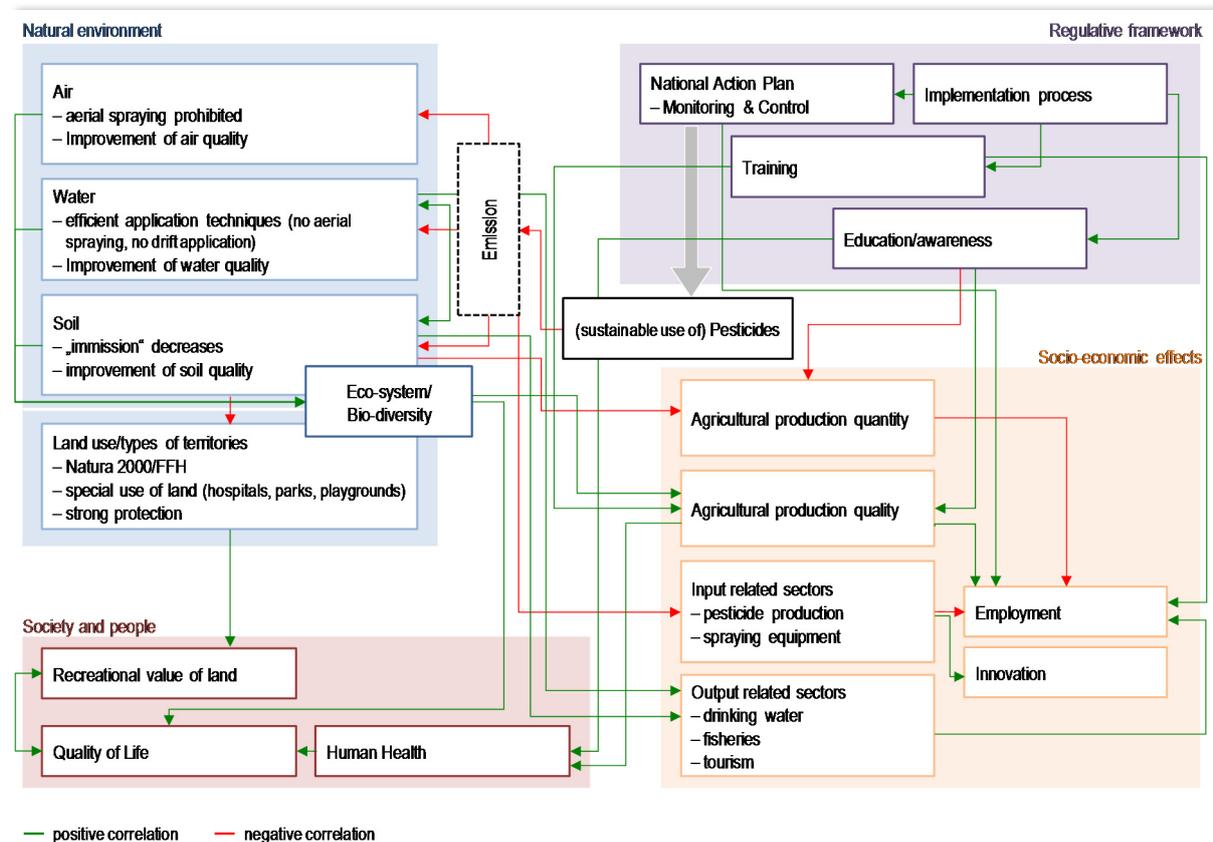
The standardised TIA quick check is done in nine steps using expert knowledge and a set of standardised indicators and types of regions. It can be performed in a workshop atmosphere; preferably with a group of experts in the field of the policy proposal and experts on regional development.

### (1) The conceptual model: How does a policy influence the development of regions?

In a first step, it is necessary to detect the potential effects of a policy (in the case of ARTS, EU-directives were chosen) on territorial development. Based on a careful study of the actual text of the proposal, the experts then draw a conceptual model that translates the text into cause/effect relations (the intervention logic). Not only intended effects, but also unintended and indirect effects are considered, and on as many different fields as possible. This exercise is best done in an informal workshop setting so as to maximize the amount of input.

The cause/effect relationships can then be drawn out. Here, links between all the effects deriving from the policy proposal (exposure in the vulnerability concept) and the receptive capacity of a region (sensitivity in the vulnerability concept) are made explicit. The result is a systemic picture or flowchart showing the conceptual model of the proposal according to its intervention logic and potential effects (see following example).

Figure 2  
Conceptual model of the directive 2009/128/EC / Directive on the sustainable use of pesticides



## (2) Dealing with discrete cause/effect chains (branching)

In some cases, a policy will have only one chain of effects. In most cases, there are different, often mutually exclusive alternatives. For example, some policies only set targets, allowing member states to implement their own measures to meet these targets. Depending on the measure, the policy can have quite different territorial impacts. In other cases, the effects of a policy will vary according to type of region. In order to deal with this variability the policy is “branched” into different cause/effect chains, and each one is analysed separately.

## (3) Which types of regions are affected? (regional exposure)

A policy proposal may affect only particular regions (e.g. coastal regions, regions with presence of particular productions or facilities like nuclear power plants etc.) or different types of regions could be affected in different ways. Therefore, it is essential to only include those regions being affected in the analysis. Exposed regions are selected using typologies (e.g. rural/urban, central/peripheral, advanced/lagging, high/low presence of certain sectors). ESPON ARTS provides a set of pre-selected types of NUTS2 regions to choose from, but in theory any typology or selection is possible.<sup>1</sup>

## (4) What is the intensity of exposure on different fields? (exposure matrix)

In the next step, the conceptual model is translated into a set of indicators that describe the intensity of policy exposure. This is done using a predefined set of thematic fields such as natural environment, regional economy as well as society and people. To do this, the project produced a Directive-Exposure Matrix (DEM) Excel tool which allows data to be entered according to each field.

**Table 1**  
Example for filling in the Directive Exposure Matrix (DEM)

		Effects on ...	Natural environment					
		Details	Soil			Landscape and cultural heritage		Air
Directive on good weather		Detailed effects on ...	erosion	pollutants in soil	share of artificial areas / soil sealing	conservation of natural heritage (landscape)	conservation of cultural heritage	pollutants in air
potential effects on:		Indicator value						
1	Tourist		no effect	no effect	decrease	increase	no effect	no effect
1	Urban		no effect	decrease	no effect	no effect	increase	strong decrease
comments							reduction of acid rain	
Transformation: from indicator value to territorial welfare								
exposure type: cost or benefit for region?			cost	cost	cost	benefit	benefit	cost
potential effect on terr.welfare								
1	Tourist		0	0	1	1	0	0
1	Urban		0	1	0	0	1	2

<sup>1</sup> The following types of NUTS2 regions are available at the moment: Agglomerated regions, areas at highest technological/environmental risk, regions with relevant chemical industries, densely populated regions, forest regions, harbour regions, regions with a high density of rail, regions with a high density of road, regions with highest density of rail and road network, regions with highest share of employment in automotive, industrial regions, major airport location, regions with a high share of natural areas, rural regions, shrinking regions, regions with unprofitable farming, urban regions, wealthy regions, regions exposed to PM<sub>10</sub>.



**Table 2**  
**List of exposure fields**

Natural environment				
Soil	Water	Air	Climatic factors	Fauna/Flora/Habitat
erosion	water consumption	pollutants in air	emissions of CO2	biodiversity
pollutants in soil	pollutants in ground/surface water		heavy rain/flood hazard/occurrence of landslides	conservation of natural heritage (landscape diversity)
share of artificial areas/soil sealing				conservation of cultural heritage
Regional economy				
Economic development	Agriculture	Industry	Services	Tourism
economic growth	employment in primary sector	employment in secondary sector	employment in tertiary sector	overnight stays
innovation	% of arable area, permanent grass/-crop area			
entrepreneurship				
market barriers				
Society and people				
Social disparities	Demography	Accessibility	Built environment	Governance
disposable income in PPS per capita	out-migration/brain drain/"shrinking" regions	daily accessibility by air	increase of urbanization relative to population growth	efficiency of government/governance mechanisms
equal income distribution	number of people exposed to noise	daily accessibility by waterways	mixed land use	duration or complexity of planning procedures
Employment rate	accident rate in transport	daily accessibility by road		participation rate
	accident risk: industry/energy supply	daily accessibility by rail		societal transfers (e.g. tax added)
	healthy life expectancy at birth	renewable energy		transnational cooperation between member states
		fossil fuel consumption		

For each field, the level of exposure is defined by expert judgement according to the following classes:

- ++ strong advantageous effect on territorial welfare (strong increase)
- + weak advantageous effect on territorial welfare (increase)
- O no effect
- weak disadvantageous effect on territorial welfare (decrease)
- strong disadvantageous effect on territorial welfare (strong decrease)
- ? Unknown effect / effect cannot be specified
- +/- direction cannot be specified (diverse effects)

These classes are then converted into numerical terms so as to allow further computation.



## (5) What is the territorial impact in European regions? (Territorial Impact Matrix, TIM)

Once the Directive Exposure Matrix in the previous step has been filled in, the impact values are calculated using predefined sensitivity adjustments. These are determined for each field and called the Regional Sensitivity Matrix. The Territorial Impact Matrix (TIM) calculates the impact for each thematic exposure field and for each NUTS 2 region (= 42 fields x 287 NUTS 2 regions) and sorts the results into 9 classes:

**Table 3**  
Example for the Territorial Impact Matrix (TIM)

		E1	E2	E3	E10	E11	E12	E13	E14
AT11	Burgenland	0,00	0,00	0,00	0,00	0,00	0,00	na	0,00
AT12	Niederösterreich	0,00	0,00	0,00	0,00	0,00	0,00	na	0,00
AT13	Wien	0,00	0,00	-1,06	-0,77	0,00	0,78	na	1,79
AT21	Kärnten	0,00	0,00	0,00	0,00	0,00	0,00	na	0,00
AT22	Steiermark	0,00	0,00	0,00	0,00	0,00	0,00	na	0,00
AT31	Oberösterreich	0,00	0,00	-0,77	-0,78	0,00	0,81	na	1,78
AT32	Salzburg	0,00	0,00	-0,76	-0,99	0,00	0,80	na	1,74
AT33	Tirol	0,00	0,00	0,00	0,00	0,00	0,00	na	0,00
AT34	Vorarlberg	0,00	0,00	-0,78	-1,04	0,00	0,80	na	1,78
BE10	Région de Bruxelles-Capi	na	0,00	-1,19	-0,75	0,00	0,76	na	1,69
BE21	Prov. Antwerpen	0,00	0,00	-0,91	-0,76	0,00	0,80	na	1,74
BE22	Prov. Limburg (B)	0,00	0,00	-0,88	-0,78	0,00	0,84	na	1,76
BE23	Prov. Oost-Vlaanderen	0,00	0,00	-0,88	-0,75	0,00	0,83	na	1,73
BE24	Prov. Vlaams Brabant	0,00	0,00	-0,91	-0,75	0,00	0,81	na	1,74
F1	erosion			F11	conservation of culture heritage				
F2	pollutions in soil			F12	economic growth				
F3	soil sealing			F13	innovation				
F10	landscape diversity			F14	entrepreneurship				

**Table 4**  
Scale of potential territorial impact

	very high positive impact		minor negative impact
	high positive impact		moderate negative impact
	moderate positive impact		high negative impact
	minor positive impact		very high negative impact
	no exposure		

## (6) Do the results make sense? (plausibility and quality check)

The results calculated in the territorial impact matrix allows for a first plausibility check. Usually the results show that a proposal only impacts a few thematic fields. The results should be discussed with the experts along two lines:

- Does the selection of regions provide a plausible picture? If not, the selection of the types of regions may need to be modified.
- Is the relationship between the different fields of exposure plausible? If not, the expert judgment about the intensity of exposure may need to be modified.

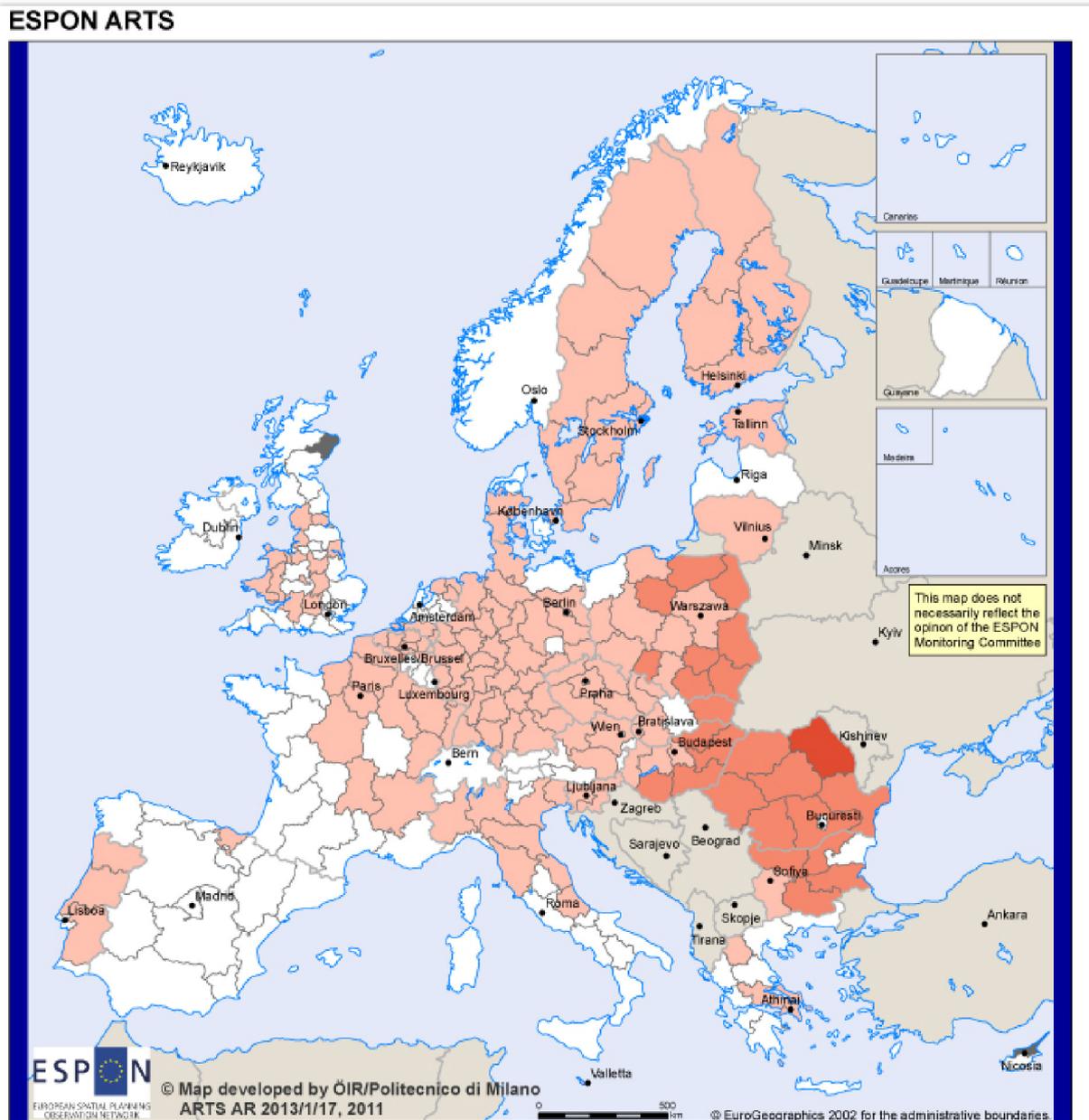
Once adjustments are made, the Territorial Impact Matrix (TIM) can be recalculated with the new values



**(7) Which regions will be hit in which fields? (mapping)**

When the results are reliable, maps showing the impact of different indicators can be drawn up. This can be followed by another plausibility check. In the trial run using 12 directives, several TIMs were recalculated after scrutinising the final maps.

**Map 1**  
Example for a Map depicting the territorial impact on one field



#### **(8) What are the policy implications? (discussion)**

The maps provide the framework for the subsequent discussion on policy implications. The territorial patterns of both the positive impacts and negative effects are examined and discussed. Furthermore, the issue of potential adaptive capacity should be raised, as well as governance strategies to facilitate a successful implementation

#### **(9) How to communicate the results (reporting)**

Based on the results of the territorial impact assessment and the expert discussion, a short report should be drawn up including maps on relevant indicators. This communicates the results of the ex-ante analysis to the relevant audience.



## Proposed agenda of a TIA workshop

- 9:00: Step 1:  
**The conceptual model: how does a policy influences the development of regions?**  
Result: a systemic picture showing the conceptual model of the policy proposal investigated according to its intervention logic and potential effects
- 11:00 Coffee break
- 11:30 Step 2:  
**Dealing with discrete cause/effect chains (branching)**  
Step 3:  
**Which types of regions are affected? (regional exposure)**  
Result: decision about different logical chains (branches) deriving from one policy proposal and about the types of regions affected (regionally exposed)
- 12:00 Step 4:  
**What is the intensity of exposure on different fields? (exposure matrix)**  
Result: the translation of the conceptual model into a set of indicators that describe the intensity of policy exposure (directive exposure matrix) for each branch
- 13:00 Lunch break
- 14:00 Step 5:  
**What is the territorial impact on regions? (Territorial Impact Matrix, TIM)**  
Step 6:  
**Do the results make sense? (plausibility and quality check)**  
The impact values are calculated using predefined sensitivity adjustments automatically. The TIM provides information about the relevant fields touched by the policy proposal.  
Result: a stable result of the territorial impact of a policy proposal
- 15:00 Step 7:  
**Which regions are hit in which fields? (mapping the results)**  
Result: maps of the territorial impact for the relevant indicators
- 15:30 Step 8:  
**What are the policy implications? (adaptive capacity discussion)**  
Result: information about policy implications, and the potential adaptive capacity and governance strategies to facilitate a successful implementation.
- 17:00 End of the meeting
- After the meeting:  
Step 9:  
**How to communicate the results (write-up)**  
result: minutes





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## **A8 TIA quick check – Advanced Version**



# The TIA quick check

## Advanced Version

A methodology for a TIA ex-ante quick check  
ESPON ARTS aims to develop a tool by which to analyse the impact of EU legislation that takes the sensitivity of regions into account. The analysis of regional sensitivity to EU directives and policies is intended as a simplified, evidence-based procedure of Territorial Impact Assessment (TIA). This 'quick check' should be as simple, comprehensible and user-friendly as possible.



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projects can be found on [www.espon.eu](http://www.espon.eu)

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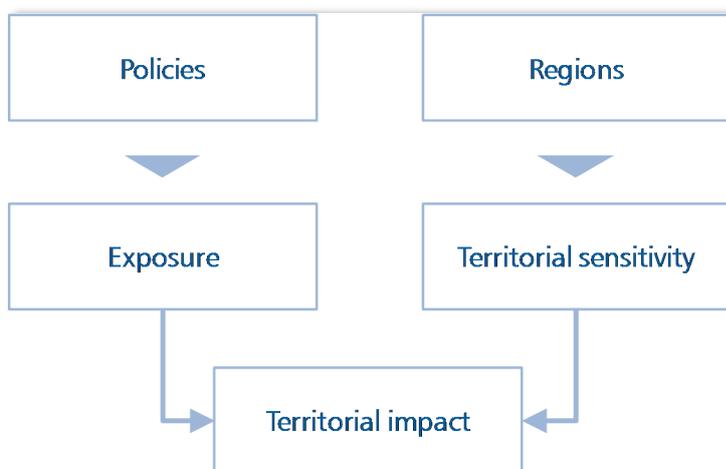


## The methodology: based on the vulnerability concept

The TIA quick check is based on the vulnerability concept developed by the Intergovernmental Panel on Climate Change (IPCC). In this case, the effects deriving from a particular policy measure (exposure) are combined with the characteristics of a region (territorial sensitivity) to produce potential territorial impacts. In the TIA quick check the following definitions are used:

- The *exposure* describes the intensity by which EU directives and policies potentially affect European territory through a double logical chain. On the one hand single directives and policies may affect specific classes of regions (*regional exposure*), without reference to the specificity of each region; on the other hand they may affect particular “fields” of the territorial realm, e.g. surface water quality, emissions, sectoral production (*field exposure*);
- The (territorial) *sensitivity* describes how *single* territories/regions are subject and evaluate impacts in specific exposure fields, due to their socio-economic and geographical characteristics and to the social values and priorities they are likely to show;
- The *territorial impact* is the final, likely effect of a given EU policy or directive as a product of exposure and regional sensitivity. The impact can be direct or indirect along specific cause-and-effect logical chains..

Figure 1  
Territorial impact combining exposure with sensitivity



## The result: An excel tool and a procedure for a TIA quick check

The objective of ESPON-ARTS was to devise a user-friendly methodology that allows one to make a ‘quick and dirty’ ex-ante analysis of the potential impact of EU legislation, policies and directives on the development of regions. To this end, the methodology combines a standardised indicator-based tool developed in Excel with a means to systematically collect expert knowledge in a workshop setting. The expert contribution serves as input for the analysis and for providing the interpretation of the output of the impact indicators.

The advanced TIA quick check enables one to use the standard methodological framework and also allowing users to define special indicators describing the exposure to policy proposals combine these with new indicators describing regional sensitivity. In this case, the tool provides the technical framework, but the indicators are defined individually.



## How to do the advanced TIA quick check

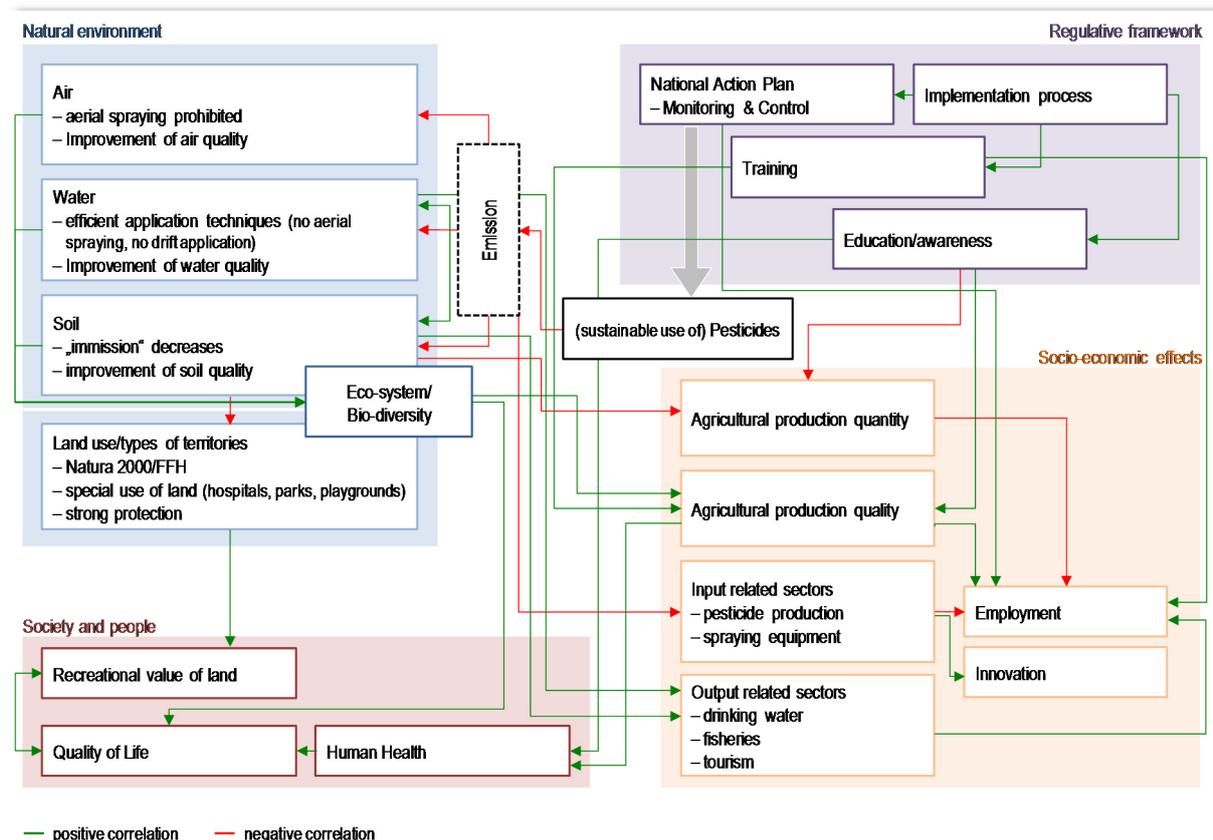
The advanced TIA quick check enables one to assess the impact of a policy proposal along self-defined thematic fields using new indicators for exposure and sensitivity of regions. The TIA-tool provides the technical setting for linking the exposure and sensitivity indicators, but the indicators themselves need to be defined individually. In principle the nine steps of the TIA quick check are the same as in the standardised quick check. However, the introduction of new indicators and hence new data requires some readjusting within the Excel tool. These changes to the tool take place in step (3) and (4), and if necessary, as consequence of the plausibility check (6).

### (1) The conceptual model: How does a policy influence the development of regions?

In a first step, it is necessary to detect the potential effects of a policy (in the case of ARTS, EU-directives were chosen) on territorial development. Based on a careful study of the actual text of the proposal, the experts then draw a conceptual model that translates the text into cause/effect relations (the *intervention logic*). Not only intended effects, but also unintended and indirect effects are considered, and on as many different fields as possible. This exercise is best done in an informal workshop setting so as to maximize the amount of input.

The cause/effect relationships can then be drawn out. Here, links between all the effects deriving from the policy proposal (*exposure* in the vulnerability concept) and the receptive capacity of a region (*sensitivity* in the vulnerability concept) are made explicit. The result is a systemic picture or flowchart showing the conceptual model of the proposal according to its intervention logic and potential effects (see following example).

Figure 2  
Conceptual model of the directive 2009/128/EC / Directive on the sustainable use of pesticides



## (2) Are there discrete cause/effect chains? (branching)

In some cases, a policy will have only one chain of effects. In most cases, there are different, often mutually exclusive alternatives. For example, some policies only set targets, allowing member states to implement their own measures to meet these targets. Depending on the measure, the policy can have quite different territorial impacts. In other cases, the effects of a policy will vary according to type of region. In order to deal with this variability the policy is “branched” into different cause/effect chains, and each one is analysed separately.

## (3) Which types of regions are affected?

A policy proposal may affect only particular regions (e.g. coastal regions, regions with presence of particular productions or facilities like nuclear power plants etc.) or different types of regions could be affected in different ways. Therefore, it is essential to only include those regions being affected in the analysis. Exposed regions are selected using typologies (e.g. rural/urban, central/peripheral, advanced/lagging, high/low presence of certain sectors). ESPON ARTS provides a set of pre-selected types of NUTS2 regions to choose from, but the advanced TIA quick check allows one to define specific types of regions that could be affected.

The user has to fill the Regional Exposure Matrix (REM) by assigning each NUTS 2 region either an ‘0’, indicating that a region is not that type of region, or ‘1’, classifying a region as being part of that specific type of region.

Figure 3  
Example for filling in a new type of regions in the Regional Exposure Matrix (REM)

	A	B	C
1	<input type="checkbox"/>	<input type="checkbox"/>	type of region "tourist"
2	AT11	Burgenland	0
3	AT12	Niederösterreich	0
4	AT13	Wien	0
5	AT21	Kärnten	0
6	AT22	Steiermark	0
7	AT31	Oberösterreich	1
8	AT32	Salzburg	0
9	AT33	Tirol	0
10	AT34	Vorarlberg	0
11	BE10	Région de Bruxelles-Capitale	0



#### (4) What are the fields of exposure and how can the sensitivity of regions towards this exposure be described?

In the next step, the conceptual model is translated into a set of indicators that describe the intensity of policy exposure.

- One indicator describing the potential exposure deriving from an LPD. – This indicator will be filled in into the Directive Exposure Matrix (DEM).

For each defined field the exposure of a directive is defined by expert judgement in a qualitative attitude along the following classes: high positive exposure intensity (strong increase) / low positive exposure intensity (increase) / no exposure / high negative exposure intensity (strong decrease) / low negative exposure intensity (decrease).

Besides identifying a fitting indicator, the exposure field also needs to be evaluated as being either harmful ('cost') or favourable ('benefit') for the regions welfare. The tool will automatically transform the experts rating into numbers for further calculation

**Table 1**  
Example for filling in the Directive Exposure Matrix (DEM)

Effects on ...		Natural environment					
Details		Soil			Landscape and cultural heritage		Air
Detailed effects on ...		erosion	pollutants in soil	share of artificial areas / soil sealing	conservation of natural heritage (landscape)	conservation of cultural heritage	pollutants in air
<b>potential effects on:</b>		<b>Indicator value</b>					
1 Tourist		no effect	no effect	decrease	increase	no effect	no effect
1 Urban		no effect	decrease	no effect	no effect	increase	strong decrease
<b>comments</b>		reduction of acid rain					
<b>Transformation: from indicator value to territorial welfare</b>							
exposure type: cost or benefit for region?		<b>cost</b>	<b>cost</b>	<b>cost</b>	<b>benefit</b>	<b>benefit</b>	<b>cost</b>
<b>potential effect on terr.welfare</b>							
1 Tourist		0	0	1	1	0	0
1 Urban		0	1	0	0	1	2

- One Indicator describing the sensitivity of a region. This indicator will be normalized in the range 0.75 to 1.25. – This indicator will be filled in into the Regional Sensitivity Matrix (RSM).

The normalization follows a linear procedure and normalized values range from 0.75 up to 1.25. Basically, normalized sensitivity indicators represent coefficients that can increase (if greater than 1) or decrease (if lower than 1) each directive's impact on a specific field.

For this step the following definitions are needed:

- $X_{norm_i}$ , the normalized value of the sensitivity indicator for impact field i
- $X_i$ , the original value of the sensitivity indicator for impact field i
- $X_{min_i}$ , the minimum original value of the sensitivity indicator for impact field i
- $X_{max_i}$ , the maximum original value of the sensitivity indicator for impact field i

Then, normalization follows this formula:

$$X_{norm_i} = 0,75 + ((1.25 - 0.75) * ((X_i - X_{min_i}) / (X_{max_i} - X_{min_i})))$$



## (5) What is the territorial impact in European regions? (Territorial Impact Matrix, TIM)

Based on the Directive Exposure Matrix and the pre-defined sensitivity of the regions the territorial impact is calculated automatically and sorted into 9 classes of impact.

**Table 2**  
Example for the Territorial Impact Matrix (TIM)

		E1	E2	E3	E10	E11	E12	E13	E14
AT11	Burgenland	0,00	0,00	0,00	0,00	0,00	0,00	na	0,00
AT12	Niederösterreich	0,00	0,00	0,00	0,00	0,00	0,00	na	0,00
AT13	Wien	0,00	0,00	-1,06	-0,77	0,00	0,78	na	1,79
AT21	Kärnten	0,00	0,00	0,00	0,00	0,00	0,00	na	0,00
AT22	Steiermark	0,00	0,00	0,00	0,00	0,00	0,00	na	0,00
AT31	Oberösterreich	0,00	0,00	-0,77	-0,78	0,00	0,81	na	1,78
AT32	Salzburg	0,00	0,00	-0,76	-0,99	0,00	0,80	na	1,74
AT33	Tirol	0,00	0,00	0,00	0,00	0,00	0,00	na	0,00
AT34	Vorarlberg	0,00	0,00	-0,78	-1,04	0,00	0,80	na	1,78
BE10	Région de Bruxelles-Capi	na	0,00	-1,19	-0,75	0,00	0,76	na	1,69
BE21	Prov. Antwerpen	0,00	0,00	-0,91	-0,76	0,00	0,80	na	1,74
BE22	Prov. Limburg (B)	0,00	0,00	-0,88	-0,78	0,00	0,84	na	1,76
BE23	Prov. Oost-Vlaanderen	0,00	0,00	-0,88	-0,75	0,00	0,83	na	1,73
BE24	Prov. Vlaams Brabant	0,00	0,00	-0,91	-0,75	0,00	0,81	na	1,74
F1	erosion			F11	conservation of culture heritage				
F2	pollutions in soil			F12	economic growth				
F3	soil sealing			F13	innovation				
F10	landscape diversity			F14	entrepreneurship				

**Table 3**  
Scale of potential territorial impact

	very high positive impact		minor negative impact
	high positive impact		moderate negative impact
	moderate positive impact		high negative impact
	minor positive impact		very high negative impact
	no exposure		

## (6) Do the results make sense? (plausibility and quality check)

The results calculated in the territorial impact matrix allows for a first plausibility check. Usually the results show that a proposal only impacts a few thematic fields. The results should be discussed with the experts along two lines:

- Does the selection of regions provide a plausible picture? If not, the selection of the types of regions may need to be modified.
- Is the relationship between the different fields of exposure plausible? If not, the expert judgment about the intensity of exposure may need to be modified.

All values, typologies of regions and decisions about the exposure can be changed at this stage. The modified Territorial Impact Matrix (TIM) is then recalculated with the new values.

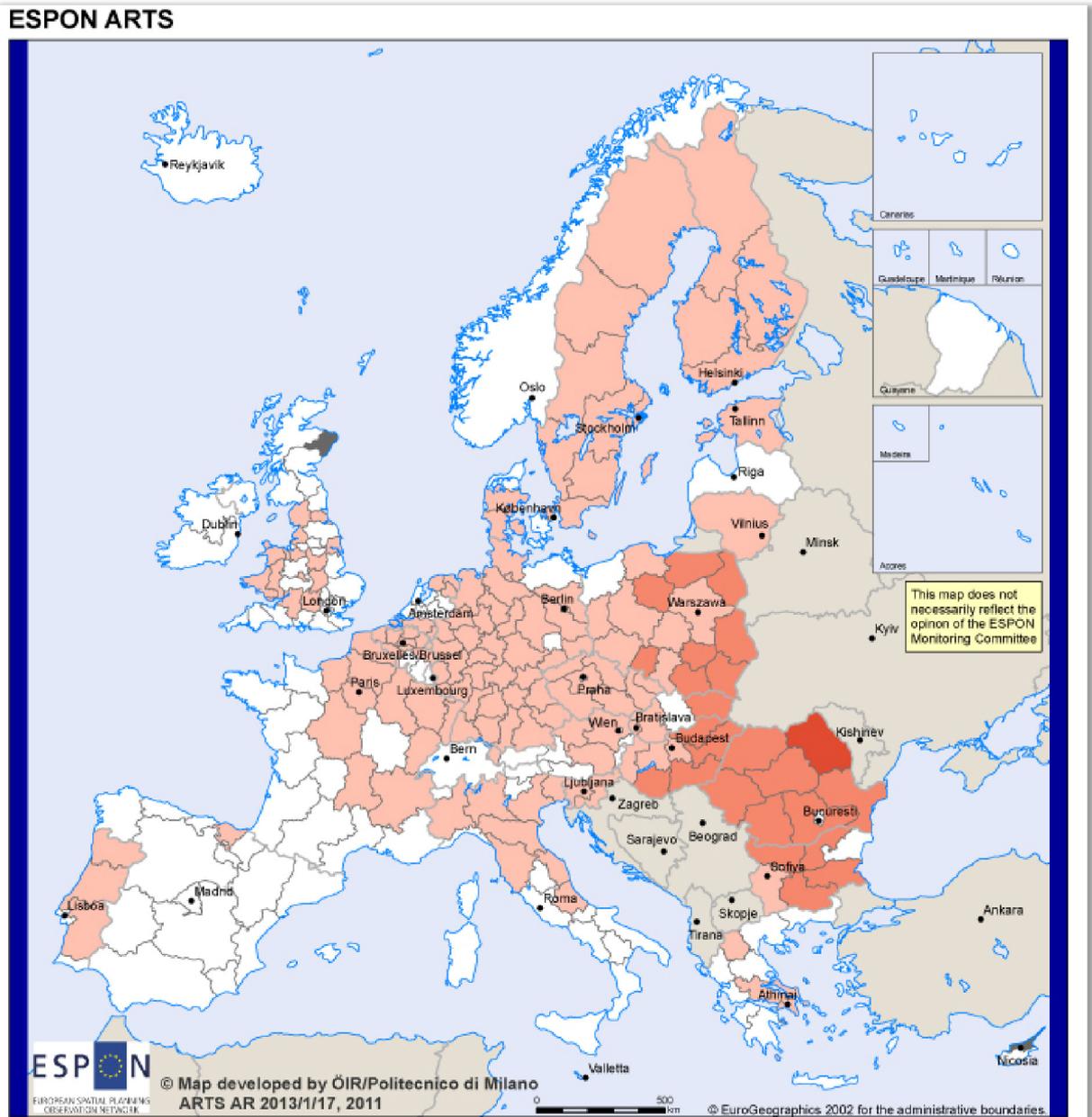


**(7) Which regions will be hit in which fields? (mapping)**

When the results are reliable, maps showing the impact along the different indicators can be drawn up. This can be followed by another plausibility check.

**Map 1**

Example for a Map depicting the territorial impact on one field



**Regions affected by Directive on air quality branch b  
Economic Growth (GDP/capita) (F12)**

Negative Impact

- Very high impact
- High impact
- Moderate impact
- Minor impact
- Not affected
- No Data
- Neighbourhood Countries

Transformation and Compilation of Data based on:  
ESPON DB, EUROSTAT, 5th Cohesion report, DG-AGRI



#### **(8) What are the policy implications? (discussion)**

The maps provide the framework for the subsequent discussion on policy implications. The territorial patterns of both the positive impacts and negative effects are examined and discussed. Furthermore, the issue of potential adaptive capacity should be raised, as well as governance strategies to facilitate a successful implementation

#### **(9) How to communicate the results (reporting)**

Based on the results of the territorial impact assessment and the expert discussion, a short report should be drawn up including maps on relevant indicators. This communicates the results of the ex-ante analysis to the relevant audience.



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## A9 Directive/Exposure Matrix



Directive #	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19	F20	F21	F22	F23	F24	F25	F26	F27	F28	F29	F30	F31	F32	F33	F34	F35	F36	F37	F38	F39	F40	F41								
1a	0	1	0	0	1	1,5	1	0	0	0	1	-1	0	0	-1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0					
1b	0	1	0	0	1	1,5	0	0	0	0	0	-1	1	0	-1	0	0?		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
2	0	0	0	0	1,5	0	0	1	1,5	1,5	0	0	1	0	0	-1	-1,5	-1	1?		-1	0	0	0	0	0	0	0	0	-1	0	0?		0	0	0	0	-1	-1,5	0	-1	1	1						
3	0	1	-1	0	1	1	0	0	1	0	0	0	1	0	1	1	1	0	1	0	-1	0	0	0	0	0	1,5	1	0	0	0	0	0	0	0	0	-1	1	-1	1	0	1,5	0						
4a	0	1	0	0	1	1	1	0	1	0	1?		0	0	0	0	0?		0	1?		0	0	0	1,5	1	0	1	-1	0	-1	-1	0	1	0	0	1	-1	1	0	0	0	0						
4b	0	0	-1	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	-1	-1	0	0	-1	-1	1	-1	1	0	1	0	1						
4c	0	0	0	0	0	0	-1	0	1	-1	0	1	1	1	0	0	0	1	1	1	1	-1	1	0	1,5	0	0	1	0	0	0	0	0	-1	0	0	1	-1	1	0	0	0	0	0					
5a	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	0	0	0	0	0	0				
5b	0	0	-1	0	0	-1	-1	0	-1	0	0	1	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	-1	0	0	0	0	0	0	0	0	0	1				
6	0	1	0	0	1	1	0	0	0	0	0	0	1	0	-1	0	0	0	0	0	-1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	-1	1	0	0	0	0				
7	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
8a	0	0	-1	0	0	0	-1	0	0	-1	0	1	1	1,5	1,5	-1?		1	1	1?		1	1,5	1	0	0	0	1	0	0	0	0	0	-1	-1	0	1	0	0	0	0	0	0	0	0	0			
8b	0	0	0	0	0	0	-1	0	0	1	0	-1	1	1,5	1,5	-1?		-1	-1	1?		1,5	-1	-1,5	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0			
9	1	1	-1	0	0	0	0	0	0	-1	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	1,5	1,5	1,5	1,5	0	0	0	0	0	1	-1	0	0	1	0	0	1				
10a	0	1,5?		0	1,5	1	0	0	1?		0	-1	1	0	0	1	-1	-1,5	1?		1	-1	1	1	0	0	1	1,5	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0			
10b	0	1?		0	1	1	0	0	0?		0	-1	1	0	0	1	-1	-1,5	1?		-1	-1	-1	-1	0	0	1	1,5	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0		
11a	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
11b	0	0	0	0	0	0	0	0	0	0	0	1	1,5	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	1	-1	0	1	1	0	0	0	-1,5	1	1,5	1	0	0	0	1	1	0	0	-1,5	0	0	0	0	0?		0	0	0	0	0	0	1,5	-1	1	-1	0	0	0	0	0	0	0	0	0	0	

**Legende**

- 1,5 strong advantageous effect on territorial welfare
- 1 weak advantageous effect on territorial welfare
- 0 no effect
- 1 weak disadvantageous effect on territorial welfare
- 1,5 strong disadvantageous effect on territorial welfare
- ? unknown effect / effect cannot be specified



## A10 Regional Exposure Matrix

		1a	1b	2	3	4a	4b	4c	5a	5b	6	7	8a	8b	9	10a	10b	11a	11b	12	
AT11	Burgenland	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
AT12	Niederösterreich	0	1	1	0	1	1	1	0	1	0	0	0	0	0	1	1	0	0	0	
AT13	Wien	1	0	1	0	1	1	1	0	1	0	1	1	0	1	0	1	1	0	1	
AT21	Kärnten	0	0	1	0	1	1	1	0	0	0	1	0	1	1	1	0	0	0	0	
AT22	Steiermark	0	1	1	0	1	1	1	0	0	1	0	0	0	0	1	0	0	1	0	
AT31	Oberösterreich	0	1	1	1	1	1	1	0	0	1	0	1	0	1	0	1	0	1	1	
AT32	Salzburg	0	0	1	0	1	1	1	0	0	0	1	1	0	1	0	0	0	0	1	
AT33	Tirol	0	0	1	0	1	1	1	0	0	0	1	0	0	1	1	0	0	0	0	
AT34	Vorarlberg	0	1	1	0	1	1	1	0	0	1	1	1	0	1	0	0	0	0	1	
BE10	Région de Bruxelles-Capitale	1	1	1	0	1	1	1	0	0	1	1	1	0	1	0	1	1	1	1	
BE21	Prov. Antwerpen	1	1	1	0	1	1	1	0	1	1	0	1	0	0	0	1	1	1	1	
BE22	Prov. Limburg (B)	1	1	1	1	1	1	1	0	0	1	0	1	0	1	0	1	1	1	1	
BE23	Prov. Oost-Vlaanderen	1	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	1	1	1	
BE24	Prov. Vlaams Brabant	1	1	1	0	1	1	1	0	0	1	1	1	0	1	0	1	1	0	1	
BE25	Prov. West-Vlaanderen	1	1	1	0	1	1	1	0	0	1	1	0	1	0	0	0	1	0	1	
BE31	Prov. Brabant Wallon	1	1	1	0	1	1	1	0	0	1	0	1	0	0	0	1	1	0	1	
BE32	Prov. Hainaut	1	1	1	1	1	1	1	0	0	1	0	1	0	1	0	1	1	0	1	
BE33	Prov. Liège	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	0	0	1	
BE34	Prov. Luxembourg (B)	0	0	1	0	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	
BE35	Prov. Namur	0	0	1	1	1	1	1	0	0	0	0	1	0	1	0	1	0	0	1	
BG31	Severozapaden	0	1	1	0	1	1	1	1	1	1	0	0	1	0	1	0	0	0	0	
BG32	Severen tsentralen	0	1	1	0	1	1	1	1	1	1	0	1	1	0	0	0	0	0	1	
BG33	Severoiztochen	1	0	1	0	1	1	1	1	1	0	0	1	1	0	0	0	0	0	1	
BG34	Yugoiztochen	0	1	1	0	1	1	1	1	1	1	0	1	1	0	0	0	0	0	1	
BG41	Yugozapaden	0	1	1	0	1	1	1	1	1	0	1	0	1	1	0	0	1	0	1	
BG42	Yuzhen tsentralen	0	1	1	0	1	1	1	1	1	0	1	1	1	0	0	0	0	0	1	
CH01	Région lémanique	na	na	1	0	1	1	1	na	0	na	0	1	0	0	0	1	0	0	1	
CH02	Espace Mittelland	na	na	1	1	1	1	1	na	0	na	0	1	0	1	0	1	0	0	1	
CH03	Nordwestschweiz	na	na	1	1	1	1	1	na	0	na	0	1	0	1	0	1	1	0	1	
CH04	Zürich	na	na	1	1	1	1	1	na	0	na	0	1	0	1	0	1	1	0	1	
CH05	Ostschweiz	na	na	1	0	1	1	1	na	0	na	0	1	0	0	0	0	0	0	1	
CH06	Zentralschweiz	na	na	1	1	1	1	1	na	0	na	0	1	0	1	0	0	0	0	1	
CH07	Ticino	na	na	1	0	1	1	1	na	0	na	na	1	0	0	0	0	0	0	1	
CY00	Cyprus	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	0	1	
CZ01	Praha	1	0	1	0	1	1	1	0	1	0	0	1	0	0	0	1	1	0	1	
CZ02	Strední Čechy	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	1	0	1	1	
CZ03	Jihozápad	0	1	1	0	1	1	1	0	0	1	0	1	0	0	0	0	0	1	1	
CZ04	Severozápad	1	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	1	1	
CZ05	Severovýchod	0	1	1	0	1	1	1	0	0	1	0	1	0	0	0	0	0	1	1	
CZ06	Jihovýchod	0	1	1	1	1	1	1	0	0	1	0	1	1	1	0	1	0	1	1	
CZ07	Střední Morava	0	1	1	0	1	1	1	0	0	1	0	1	1	0	0	0	0	0	1	
CZ08	Moravskoslezsko	1	1	1	1	1	1	1	0	0	1	0	1	1	1	0	0	0	1	1	
DE11	Stuttgart	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	1	1	1	
DE12	Karlsruhe	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	0	1	1	1	
DE13	Freiburg	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	0	0	1	
DE14	Tübingen	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	0	0	1	1	
DE21	Oberbayern	0	1	1	1	1	1	1	0	0	1	0	1	0	1	0	1	1	1	1	
DE22	Niederbayern	0	1	1	1	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	
DE23	Oberpfalz	0	1	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	
DE24	Oberfranken	0	1	1	0	1	1	1	0	1	1	0	1	1	0	0	0	0	1	1	
DE25	Mittelfranken	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	1	1	
DE26	Unterfranken	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	0	0	1	1	
DE27	Schwaben	0	1	1	1	1	1	1	0	0	1	0	1	0	1	0	0	0	1	1	
DE30	Berlin	0	1	1	0	1	1	1	0	1	1	0	1	1	0	0	1	1	0	1	
DE41	Brandenburg - Nordost	0	1	1	0	1	1	1	0	1	1	0	1	1	0	0	0	0	0	1	
DE42	Brandenburg - Südwest	0	1	1	0	1	1	1	0	0	1	1	1	1	0	0	0	0	0	1	
DE50	Bremen	0	1	1	0	1	1	1	0	1	1	0	1	1	0	0	0	1	na	1	
DE60	Hamburg	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	1	na	1	
DE71	Darmstadt	1	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	1	1	1	
DE72	Gießen	0	1	1	0	1	1	1	0	0	1	0	1	1	0	0	0	0	0	1	
DE73	Kassel	0	1	1	0	1	1	1	0	0	1	0	1	1	0	0	0	0	1	1	
DE80	Mecklenburg-Vorpommern	0	0	1	0	1	1	1	0	1	0	0	1	1	0	0	0	0	0	1	
DE91	Braunschweig	0	1	1	0	1	1	1	0	1	1	0	1	1	0	0	0	0	na	1	
DE92	Hannover	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	1	0	na	1	
DE93	Lüneburg	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	na	1	
DE94	Weser-Ems	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	1	1	
DEA1	Düsseldorf	1	1	1	1	1	1	1	0	1	1	0	1	1	1	0	1	1	0	1	
DEA2	Köln	1	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	1	1	1	
DEA3	Münster	1	1	1	0	1	1	1	0	1	1	0	1	0	0	0	1	1	0	1	
DEA4	Detmold	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	1	0	1	
DEA5	Arnsberg	1	1	1	1	1	1	1	0	1	1	0	1	1	1	0	1	1	0	1	
DEB1	Koblenz	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	0	0	0	1	
DEB2	Trier	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	0	0	na	1	
DEB3	Rheinhesen-Pfalz	1	1	1	1	1	1	1	0	1	1	0	1	0	1	0	0	1	na	1	
DECO	Saarland	1	1	1	0	1	1	1	0	1	1	0	1	1	0	0	0	1	1	1	
DED1	Chemnitz	0	1	1	0	1	1	1	0	0	1	0	1	1	0	0	0	0	1	1	
DED2	Dresden	0	1	1	0	1	1	1	0	1	1	0	1	1	0	0	0	0	0	1	
DED3	Leipzig	0	0	1	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	1	
DEEO	Sachsen-Anhalt	0	1	1	0	1	1	1	0	1	1	0	1	1	0	0	1	0	0	1	
DEF0	Schleswig-Holstein	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	1	
DEGO	Thüringen	0	1	1	0	1	1	1	0	0	1	0	1	1	0	0	0	0	1	1	
DK01	Hovedstaden	0	1	1	0	1	1	1	0	1	1	1	1	0	1	0	1	1	na	1	
DK02	Sjælland	0	0	1	0	1	1	1	0	1	0	0	0	0	0	1	1	0	na	0	
DK03	Syddanmark	0	1	1	0	1	1	1	0	1	1	0	0	0	0	1	1	0	na	0	
DK04	Midtjylland	0	1	1	0	1	1	1	0	1	1	0	0	0	0	1	1	0	na	0	
DK05	Nordjylland	0	0	1	0	1	1	1	0	1	0	0	0	0	0	1	1	0	na	0	
EE00	Estonia	0	1	1	0	1	1	1	0	1	1	0	1	1	0	0	0	0	na	1	
ES11	Galicia	0	0	1	0	1	1	1	0	0	1	0	0	1	0	0	0	0	0	1	1
ES12	Principado de Asturias	0	0	1	0	1	1	1	0	0	0	0	1	1	0	0	1	0	0	1	
ES13	Cantabria	0	0	1	1	1	1	1	0	1	0	0	1	0	1	0	1				

		1a	1b	2	3	4a	4b	4c	5a	5b	6	7	8a	8b	9	10a	10b	11a	11b	12
ES61	Andalucía	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	0	1
ES62	Región de Murcia	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	1	0	0	1
ES63	Ciudad Autónoma de Ceuta	0	0	1	0	1	1	1	0	1	0	1	1	0	1	0	0	1	na	1
ES64	Ciudad Autónoma de Melilla	0	0	1	0	1	1	1	0	1	0	1	1	0	1	0	0	1	na	1
ES70	Canarias (ES)	na	0	1	0	1	1	1	0	na	1	1	0	0	0	0	0	0	0	1
FI13	Itä-Suomi	0	1	1	0	1	1	1	0	1	1	0	0	1	0	1	0	0	0	0
FI18	Etelä-Suomi	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	1
FI19	Länsi-Suomi	0	1	1	0	1	1	1	0	1	1	0	0	0	0	1	1	0	0	0
FI1A	Pohjois-Suomi	0	1	1	0	1	1	1	0	1	1	0	0	0	0	1	0	0	0	0
FI20	Åland	0	0	1	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0
FR10	Île de France	1	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	1	0	1
FR21	Champagne-Ardenne	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	1
FR22	Picardie	1	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	0	0	1
FR23	Haute-Normandie	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	0	0	1
FR24	Centre	0	1	1	0	1	1	1	0	0	1	0	1	0	0	0	1	0	0	1
FR25	Basse-Normandie	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	1	1
FR26	Bourgogne	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	1	0	0	1
FR30	Nord - Pas-de-Calais	1	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	1	1	1
FR41	Lorraine	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	0	0	1
FR42	Alsace	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	0	0	1
FR43	Franche-Comté	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	1	0	1	1
FR51	Pays de la Loire	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	1	0	0	1
FR52	Bretagne	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	0	1
FR53	Poitou-Charentes	0	0	1	0	1	1	1	0	1	0	0	0	0	0	1	1	0	0	0
FR61	Aquitaine	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	1	0	0	1
FR62	Midi-Pyrénées	0	0	1	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	1
FR63	Limousin	0	0	1	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0
FR71	Rhône-Alpes	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	0	0	1
FR72	Auvergne	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	1
FR81	Languedoc-Roussillon	0	0	1	1	1	1	1	0	0	0	0	1	0	1	0	1	0	0	1
FR82	Provence-Alpes-Côte d'Azur	0	0	1	1	1	1	1	0	1	0	0	1	0	1	0	1	1	0	1
FR83	Corse	0	0	1	0	1	1	1	0	1	0	1	0	0	1	1	0	0	0	0
FR91	Guadeloupe (FR)	na	0	1	0	1	1	1	0	1	0	na	1	0	0	0	na	0	0	1
FR92	Martinique (FR)	na	0	1	0	1	1	1	0	1	0	na	1	0	0	0	na	1	0	1
FR93	Guyane (FR)	na	0	1	0	0	0	0	0	1	0	na	0	0	0	1	na	0	0	0
FR94	Reunion (FR)	na	0	1	0	1	1	1	0	1	0	na	1	0	0	0	na	1	0	1
GR11	Anatoliki Makedonia, Thraki	0	0	1	0	1	1	1	0	1	0	0	0	0	0	1	0	0	0	0
GR12	Kentriki Makedonia	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	0	1
GR13	Dytiki Makedonia	0	1	1	0	1	1	1	0	1	0	0	1	0	1	0	1	0	0	0
GR14	Thessalia	0	0	1	0	1	1	1	0	1	0	0	1	1	0	0	0	0	0	1
GR21	Ipeiros	0	0	1	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0
GR22	Ionia Nisia	0	0	1	0	1	1	1	1	1	0	0	0	0	0	1	0	0	na	0
GR23	Dytiki Ellada	0	0	1	0	1	1	1	0	1	0	0	0	0	0	1	0	0	0	0
GR24	Sterea Ellada	0	1	1	0	1	1	1	0	1	1	0	0	1	0	1	0	0	0	0
GR25	Peloponnisos	0	0	1	0	1	1	1	0	0	0	0	0	1	0	1	0	0	0	0
GR30	Attiki	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	1	1	0	1
GR41	Voreio Aigaio	0	0	1	0	1	1	1	0	0	0	0	0	1	0	1	0	0	na	0
GR42	Notio Aigaio	0	0	1	0	1	1	1	0	1	0	0	0	0	0	1	0	0	na	0
GR43	Kriti	0	0	1	0	1	1	1	0	1	0	0	0	0	0	1	0	0	0	0
HU10	Közép-Magyarország	1	1	1	0	1	1	1	1	1	1	0	1	0	0	0	1	1	0	1
HU21	Közép-Dunántúl	1	1	1	0	1	1	1	0	0	1	0	1	1	0	0	1	0	1	1
HU22	Nyugat-Dunántúl	0	1	1	0	1	1	1	1	0	1	0	1	1	0	0	0	0	1	1
HU23	Dél-Dunántúl	1	1	1	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0
HU31	Észak-Magyarország	1	1	1	0	1	1	1	1	0	1	0	1	1	0	0	0	0	1	1
HU32	Észak-Alföld	1	1	1	0	1	1	1	1	0	1	0	0	1	0	1	1	0	0	0
HU33	Dél-Alföld	1	1	1	0	1	1	1	0	0	1	0	0	1	0	1	0	0	0	0
IE01	Border, Midlands and West	0	0	1	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0
IE02	Southern and Eastern	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	1	0	0	1
IS00	Iceland	na	na	1	na	1	1	na	1	na	na	1	0	na	0	na	0	0	0	1
ITC1	Piemonte	0	1	1	1	1	1	1	0	0	1	0	1	0	1	0	1	0	1	1
ITC2	Valle d'Aosta/Vallée d'Aoste	0	0	1	0	1	1	1	0	0	0	1	0	0	1	1	0	0	0	0
ITC3	Liguria	0	0	1	1	1	1	1	0	1	0	0	1	0	1	0	1	1	0	1
ITC4	Lombardia	1	1	1	1	1	1	1	0	0	1	0	1	0	1	0	1	1	0	1
ITD1	Provincia Autonoma Bolzano	0	0	1	0	1	1	1	0	0	0	1	1	0	1	0	1	0	0	1
ITD2	Provincia Autonoma Trento	0	0	1	0	1	1	1	0	0	0	1	1	0	1	0	1	0	0	1
ITD3	Veneto	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	1	0	1
ITD4	Friuli-Venezia Giulia	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	1
ITD5	Emilia-Romagna	1	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	0	0	1
ITE1	Toscana	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	1	0	0	1
ITE2	Umbria	0	0	1	0	1	1	1	0	0	0	0	0	0	0	1	1	0	0	0
ITE3	Marche	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	1
ITE4	Lazio	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	1	1	0	1
ITF1	Abruzzo	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	1	1
ITF2	Molise	0	0	1	0	0	0	0	0	1	0	0	0	1	0	1	1	0	1	0
ITF3	Campania	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	1	0	1
ITF4	Puglia	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	0	1
ITF5	Basilicata	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0
ITF6	Calabria	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	0	1
ITG1	Sicilia	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	0	1
ITG2	Sardegna	0	0	1	0	1	1	1	0	1	0	0	0	0	0	1	0	0	0	0
LI00	Liechtenstein	na	na	1	na	1	1	na	0	na	na	0	0	na	0	na	1	na	1	1
LT00	Lithuania	0	1	1	0	1	1	1	1	1	1	0	1	1	0	0	0	0	na	1
LU00	Luxembourg (Grand-Duché)	1	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	na	1
LV00	Latvia	0	0	1	0	1	1	1	1	1	0	0	1	1	0	0	0	1	na	1
MT00	Malta	0	1	1	0	1	1	1	0	1	1	na	1	0	0	0	0	1	na	1
NL11	Groningen	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	1	0	0	1
NL12	Friesland	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	1
NL13	Drenthe	0	1	1	0	1	1	1	0	0	1	0	1	0	0	0	1	0	na	1
NL21	Overijssel	1	0	1	0	1	1	1	0	0	0	0	1	0	0	0	1	1	0	1
NL22	Gelderland	1	0	1	0	1	1	1	0	1	0	0	1							

		1a	1b	2	3	4a	4b	4c	5a	5b	6	7	8a	8b	9	10a	10b	11a	11b	12
NO05	Vestlandet	na	1	1	0	1	1	na	1	1	0	0	0	0	0	1	0	0	0	0
NO06	Trøndelag	na	0	1	0	1	1	na	1	0	0	0	0	0	0	1	0	0	0	0
NO07	Nord-Norge	na	0	1	0	1	1	na	1	0	0	0	0	0	0	1	0	0	0	0
PL11	Lódzkie	1	1	1	0	1	1	1	1	0	1	0	1	1	0	0	1	1	0	1
PL12	Mazowieckie	1	1	1	0	1	1	1	1	0	1	1	0	1	0	0	1	1	0	1
PL21	Malopolskie	1	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	0	0	1
PL22	Slaskie	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1
PL31	Lubelskie	1	1	1	0	1	1	1	1	0	1	0	0	1	0	1	0	na	0	0
PL32	Podkarpackie	1	1	1	0	1	1	1	1	0	1	0	0	0	0	1	0	0	1	0
PL33	Swietokrzyskie	1	1	1	0	0	0	0	1	0	1	0	0	1	0	1	0	0	0	0
PL34	Podlaskie	0	1	1	0	1	1	1	0	0	1	0	1	1	0	0	0	0	0	1
PL41	Wielkopolskie	1	1	1	0	1	1	1	0	0	1	0	0	0	0	1	0	0	1	0
PL42	Zachodniopomorskie	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	0	1
PL43	Lubuskie	0	1	1	0	1	1	1	0	0	1	0	0	0	0	1	0	0	1	0
PL51	Dolnoslaskie	0	1	1	0	1	1	1	1	0	1	0	1	1	0	0	0	0	1	1
PL52	Opolskie	1	1	1	0	1	1	1	0	1	1	na	1	1	0	0	1	0	0	1
PL61	Kujawsko-Pomorskie	0	1	1	0	1	1	1	0	0	1	0	1	0	0	0	1	0	0	1
PL62	Warminsko-Mazurskie	0	1	1	0	1	1	1	0	0	1	0	0	0	0	1	0	0	0	0
PL63	Pomorskie	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	1
PT11	Norte	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	1
PT15	Algarve	0	0	1	0	1	1	1	0	1	0	1	1	0	1	0	0	0	0	1
PT16	Centro (PT)	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	1
PT17	Lisboa	0	0	1	0	1	1	1	0	1	0	1	1	0	1	0	1	1	0	1
PT18	Alentejo	0	1	1	0	1	1	1	0	1	1	0	0	1	0	1	0	0	0	0
PT20	Região Autónoma dos Açores	0	0	1	0	1	1	1	0	1	0	na	1	0	0	na	0	0	0	1
PT30	Região Autónoma da Madeira	0	0	1	0	1	1	1	0	1	0	na	1	0	0	na	0	0	0	1
RO11	Nord-Vest	0	1	1	0	1	1	1	0	1	0	0	1	0	1	0	0	0	0	0
RO12	Centru	0	1	1	0	1	1	1	0	1	0	0	1	0	1	0	0	0	1	0
RO21	Nord-Est	0	1	1	1	1	1	1	0	1	0	0	0	1	1	0	0	0	0	0
RO22	Sud-Est	0	1	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	1
RO31	Sud	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	0	0	1	0
RO32	Bucaresti	1	0	1	0	0	1	1	1	0	0	0	1	0	0	0	1	1	0	1
RO41	Sud-Vest	1	1	1	0	1	1	1	1	1	0	0	1	0	1	0	0	0	0	0
RO42	Vest	0	1	1	0	1	1	1	1	0	1	0	0	1	0	1	0	0	1	0
SE11	Stockholm	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	1	1	0	1
SE12	Östra Mellansverige	0	1	1	0	1	1	1	0	1	1	0	0	0	0	1	0	0	0	0
SE21	Småland med öarna	0	1	1	0	1	1	1	0	1	1	0	0	0	0	1	0	0	1	0
SE22	Sydsverige	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	1	1
SE23	Västsverige	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	1	1
SE31	Norra Mellansverige	0	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	0	0	0
SE32	Mellersta Norrland	0	1	1	0	1	1	1	0	0	1	1	0	1	1	1	0	0	0	0
SE33	Övre Norrland	0	1	1	0	1	1	1	0	0	1	1	0	1	1	1	0	0	1	0
SI01	Slovenia	0	1	1	0	0	0	0	0	1	0	0	1	0	1	0	1	0	na	0
SI02	Slovenia	0	1	1	0	1	1	1	0	1	1	1	0	1	0	1	0	0	na	1
SK01	Bratislavský	1	1	1	0	1	1	1	0	1	1	0	1	1	0	0	1	1	1	1
SK02	Západné Slovensko	1	1	1	0	1	1	1	0	1	1	0	1	1	0	0	0	0	1	1
SK03	Stredné Slovensko	0	0	1	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	1
SK04	Východné Slovensko	0	1	1	0	1	1	1	0	0	1	0	1	0	0	0	0	0	0	1
UKC1	Tees Valley and Durham	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	1	0	1
UKC2	Northumberland, Tyne and	0	0	1	0	1	1	1	0	1	0	0	1	1	0	0	1	1	1	1
UKD1	Cumbria	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	1	0	na	1
UKD2	Cheshire	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	1	1	1	1
UKD3	Greater Manchester	0	0	1	1	1	1	1	0	1	0	0	1	0	1	0	1	1	0	1
UKD4	Lancashire	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	1	1	0	1
UKD5	Merseyside	0	0	1	0	1	1	1	0	1	0	0	1	1	0	0	1	1	0	1
UKE1	East Riding and North Lincol	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	0	1	1
UKE2	North Yorkshire	0	0	1	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	1
UKE3	South Yorkshire	0	0	1	0	1	1	1	0	0	0	1	1	0	1	0	1	1	0	1
UKE4	West Yorkshire	0	0	1	0	1	1	1	0	0	0	0	1	0	0	0	1	1	0	1
UKF1	Derbyshire and Nottinghamham	0	1	1	0	1	1	1	0	0	1	0	1	0	0	0	1	1	0	1
UKF2	Leicestershire, Rutland and	0	1	1	0	1	1	1	0	0	1	0	1	0	0	0	1	1	0	1
UKF3	Lincolnshire	0	0	1	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	1
UKG1	Herefordshire, Worcestersh	0	0	1	0	1	1	1	0	0	0	0	1	0	0	0	0	0	1	1
UKG2	Shropshire and Staffordshire	0	0	1	1	1	1	1	0	0	0	0	1	0	1	0	1	0	0	1
UKG3	West Midlands	0	1	1	0	1	1	1	0	0	1	1	1	0	1	0	1	1	1	1
UKH1	East Anglia	0	0	1	1	1	1	1	0	1	0	0	1	0	1	0	1	0	0	1
UKH2	Bedfordshire, Hertfordshire	0	0	1	0	1	1	1	0	0	0	0	1	0	0	0	1	1	0	1
UKH3	Essex	0	0	1	0	1	1	1	0	0	1	0	0	0	0	0	0	1	0	1
UKI1	Inner London	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	1	1	0	1
UKI2	Outer London	0	0	1	1	1	1	1	0	0	0	0	1	0	1	0	1	1	0	1
UKJ1	Berkshire, Bucks and Oxford	0	1	1	0	1	1	1	0	0	1	0	1	0	0	0	0	1	0	1
UKJ2	Surrey, East and West Susse	0	0	1	1	1	1	1	0	1	0	0	1	0	1	0	1	1	0	1
UKJ3	Hampshire and Isle of Wight	0	0	1	0	1	1	1	0	0	1	0	0	1	0	0	0	1	0	1
UKJ4	Kent	0	0	1	1	1	1	1	0	1	0	0	1	0	1	0	1	1	0	1
UKK1	Gloucestershire, Wiltshire a	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	0	0	0	1
UKK2	Dorset and Somerset	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	0	1
UKK3	Cornwall and Isles of Scilly	0	0	1	0	1	1	1	0	0	1	0	0	0	0	1	0	0	0	1
UKK4	Devon	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	0	1
UKL1	West Wales and The Valleys	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	1	0	1	1
UKL2	East Wales	0	1	1	1	1	1	1	0	1	1	0	1	0	1	0	1	0	0	1
UKM2	Eastern Scotland	0	0	1	1	1	1	1	0	1	0	0	1	0	1	0	1	0	0	1
UKM3	South Western Scotland	0	0	1	0	1	1	1	0	1	0	0	1	1	0	0	0	1	0	1
UKM5	North Eastern Scotland	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	1
UKM6	Highlands and Islands	0	0	1	0	1	1	1	0	1	0	0	0	0	0	1	0	0	0	0
UKNO	Northern Ireland	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	0	1

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