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 and the ESPON typologies

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[3] 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).

[3] ESPON (2007): Operational Programme – ESPON 2013 (CCI 2007 CB 163 PO 022) adopted by European Commission Decision C(2007) 5313 of 7 November 2007

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 affect 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 affected 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[4] 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.

[4] 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[5] 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 IPPC approach differ. In ESPON ARTS we retain the IPPC definitions in order to be able to better communicate the TIA concept with this scientific community.

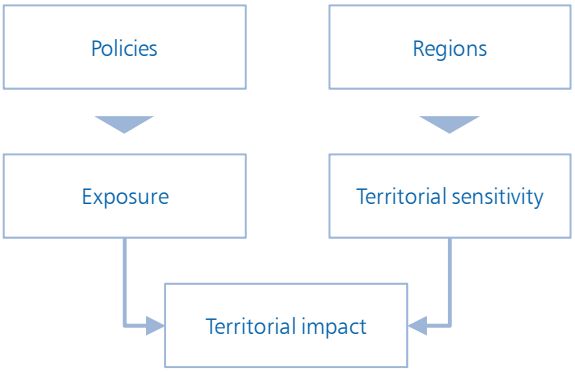
The concept of vulnerability consists of four core elements: exposure, sensitivity, territorial impact and adaptive capacity:

- *"**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.

[5] 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.)

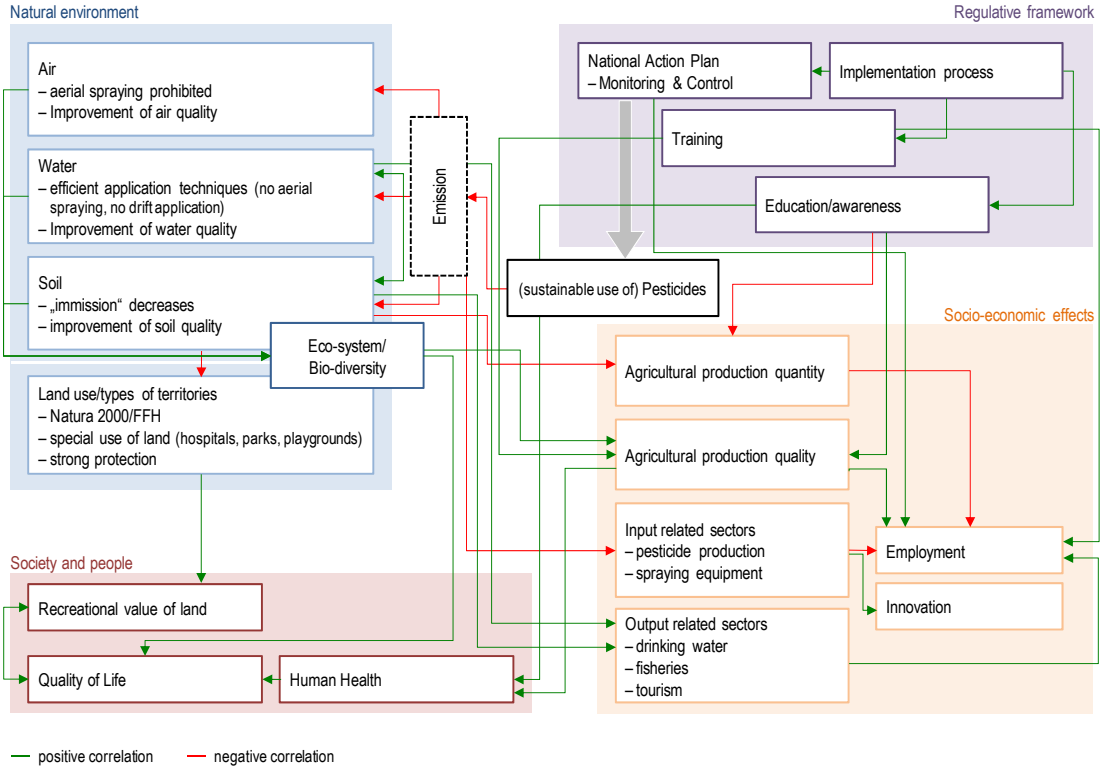
The standardised TIA quick check is done in nine steps using expert knowledge and a set of standardised indicators and types of regions. It covers the full range of potential impacts at a general level with common indicators for European NUTS 2 regions. It can be performed in a workshop atmosphere; preferably 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 affect 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.[6]

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 field.

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

- ++ strong advantageous effect on territorial welfare
- + weak advantageous effect on territorial welfare
- O no effect
- - weak disadvantageous effect on territorial welfare
- - - strong disadvantageous effect on territorial welfare
- ? Unknown effect/effect cannot be specified
- +/- direction cannot be specified

[6] 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_{10}.

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

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 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 affects 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 affected in which fields? (mapping the results)

When the results are reliable, maps showing the impact of different indicators can be drawn up. This is can be followed by another plausibility check. In the trial run (see chapter 2.6.2) 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, it 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.[7]

2.3.2 The statistical and assessment tools

One of the goals of the project is to build a "*KISS*" ("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,

(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).

[7] 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.

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 affected 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 in 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 affected 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 affected 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.

In this project, the Exposure values are indicated by positive and negative scores[8], 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

[8] 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.

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 [9].

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[10].

only regions directly affected by the directives are considered; indirect and side effects, both expected or generally unexpected, are supposed to take place only inside the regions directly affected and not to spill-over the regional borders.

In this project, the regional exposure is indicated in a dychotomic, simplified way: Yes or No[11]. 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.

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9 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).

10 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.

11 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).

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 [12].

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 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:

[12] 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 ± 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.

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) and regional sensitivity (0.75-1.25), 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	>=1.5
high positive impact	1.2-1.49
moderate positive impact	1-1.19
minor positive impact	0-0.99
no exposure	O
minor negative impact	-0.99-0
moderate negative impact	-1.19—1
high negative impact	-1.49—1.2
very high negative impact	<=-1.5

A further elaboration concerns the possibility of calculating a “summative” 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/high negative exposure intensity (strong decrease)/low negative exposure intensity (decrease).

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:

- $Xnorm_i$ the normalized value of the sensitivity indicator for impact field i
- X_i the original value of the sensitivity indicator for impact field i
- $Xmin_i$ the minimum original value of the sensitivity indicator for impact field i
- $Xmax_i$ the maximum original value of the sensitivity indicator for impact field i
- Then, normalization follows this formula:
- $Xnorm_i = 0{,}75+((1.25-0.75)*((X_i - Xmin_i)/(Xmax_i - Xmin_i)))$

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[13] 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

[13] 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.

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.

2.6.2 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 affect 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).[14] 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_2 emissions. Specifically, fields such as soil sealing and pollutants in ground, local CO_2 emissions and biodiversity will be negatively affected 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

[14] 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 potentially affects 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 affected 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_2 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 affect 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 affect safety, both in terms of reduced accident rates and lower technological/environmental risks.

The directive is likely to affect several fields (overall 16 out of 41) at once, ranging from society and people and natural environment to economy and governance. The most affected 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 affect 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 affect 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.

2.6.3 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

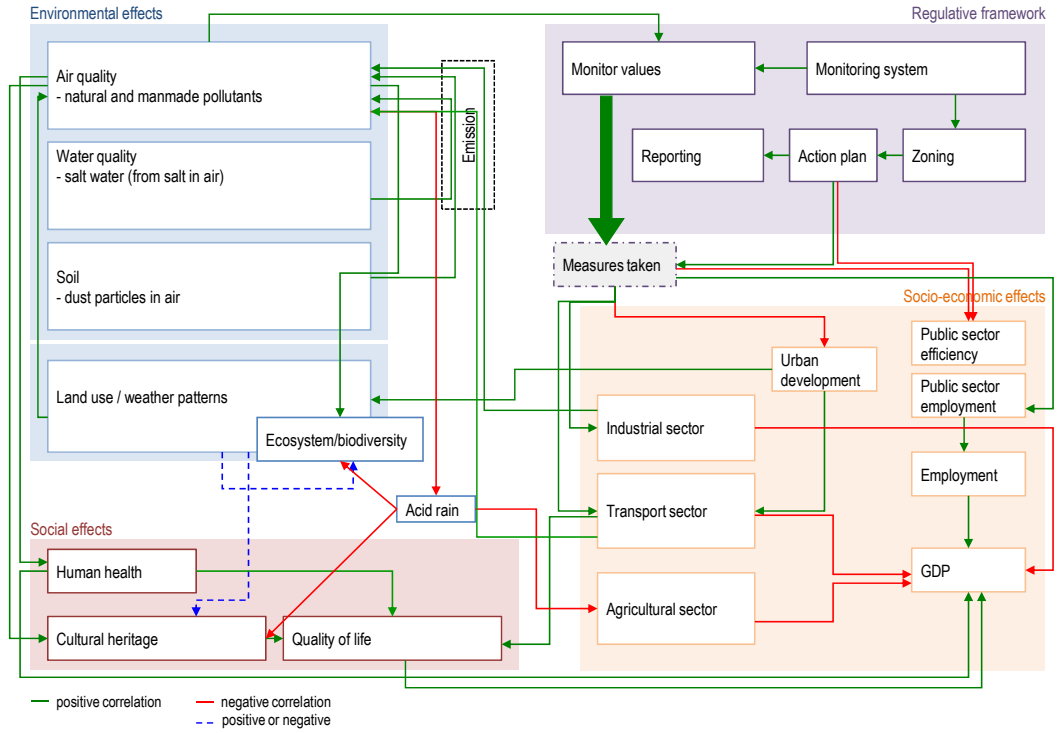
This directive does not specify policy options in cases where pollution levels exceed maximum levels. Member states are free to decide for themselves which steps to take to improve air quality in these areas. In practice, a wide range of measures can be implement, each of which can form its own branch. 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 2007, 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 affected 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_{10}. 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)[15], 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_2 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 affected by improved air quality, which is not surprising because the regional sensitivity is the same for both branches; therefore, the most affected 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 affected 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 affected

[15] These abbreviations are related to the corresponding exposure fields and indicators in the TIM. (For a detailed description see scientific report, chapter 3.5.

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 summative 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 summative analysis. 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.

(d) Insights for policy options

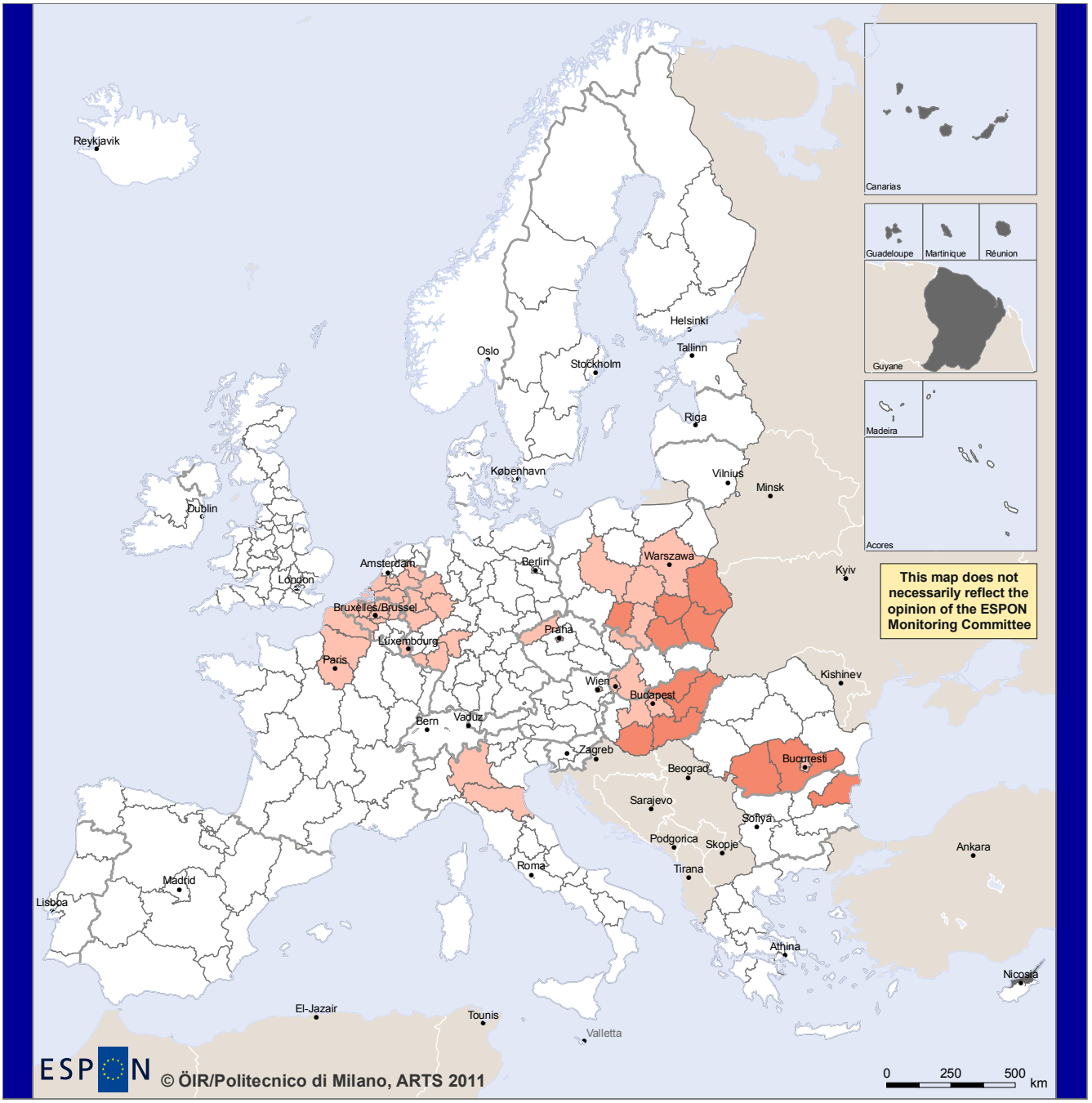
When examining the summative impacts, it seems prima facie as if the positive impacts are more widespread than the negative, both geographically as well as in magnitude, and for both branches. While not necessarily untrue, policymakers should be restrained from drawing hasty conclusions from these results 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 summative effects. Finally, it should be stressed that summative 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 summative 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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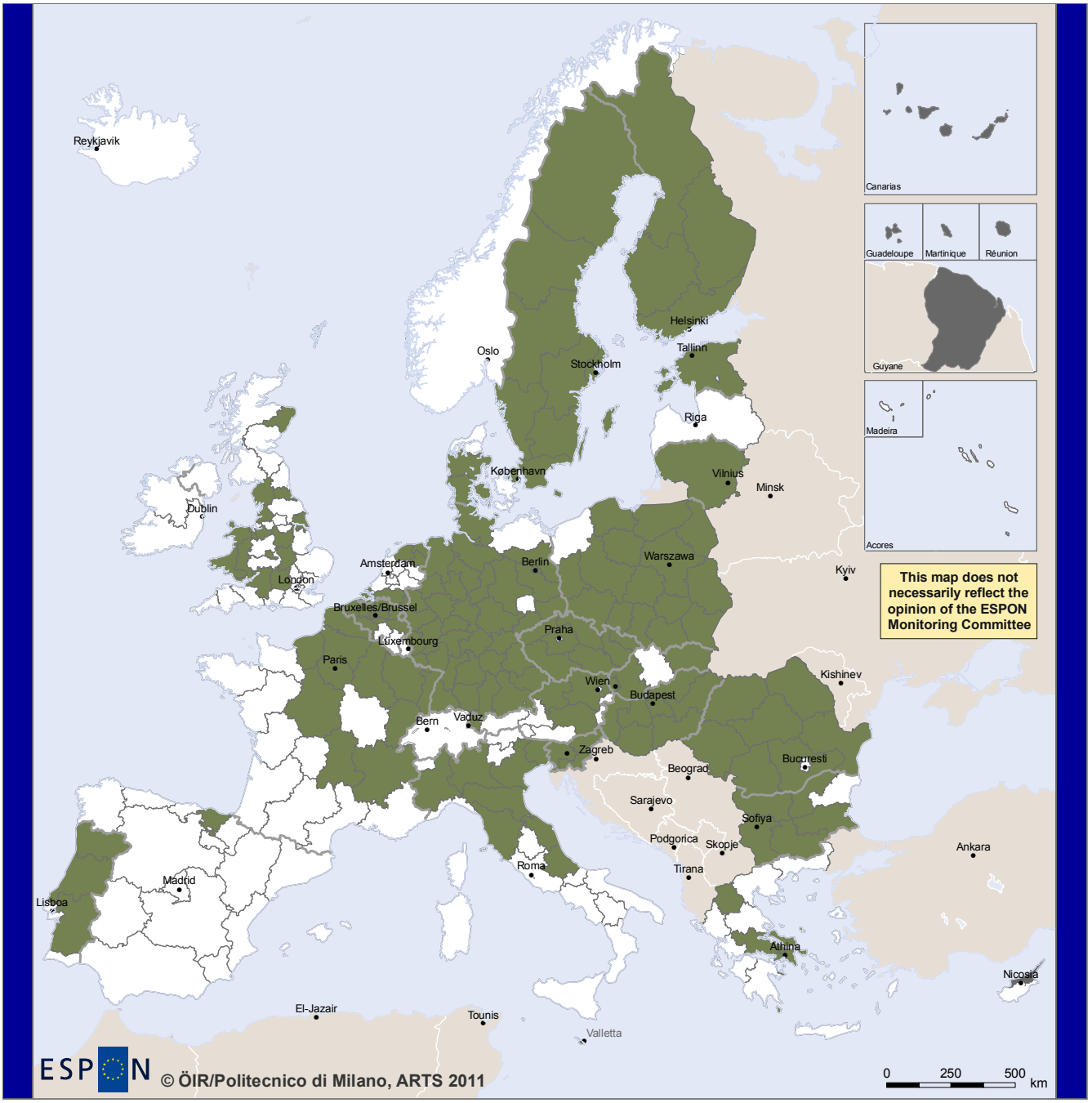
Regional level: NUTS 2
Transformation and Compilation of Data based on:
ESPON Projects, EUROSTAT, EEA Corine Land Cover,
5th Cohesion Report, BOKU University, DG AGRI

Negative Impact

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

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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5th Cohesion Report, BOKU University, DG AGRI

Positive Impact

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

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. 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. This was surely the case with the air quality directive. The fact that these exercises generate maps already contributes towards territorial consciousness-raising.
- 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. 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. It is also feasible to use this methodology to test different governance approaches using branches.
- 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. As the sensitivity adjustment proved so determinative of results, it is vital to include this factor in the discussions with policymakers. It is perfectly feasible within the current methodology to 'branch' according to hypotheses on sensitivity.

Bearing all these caveats in mind, 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.

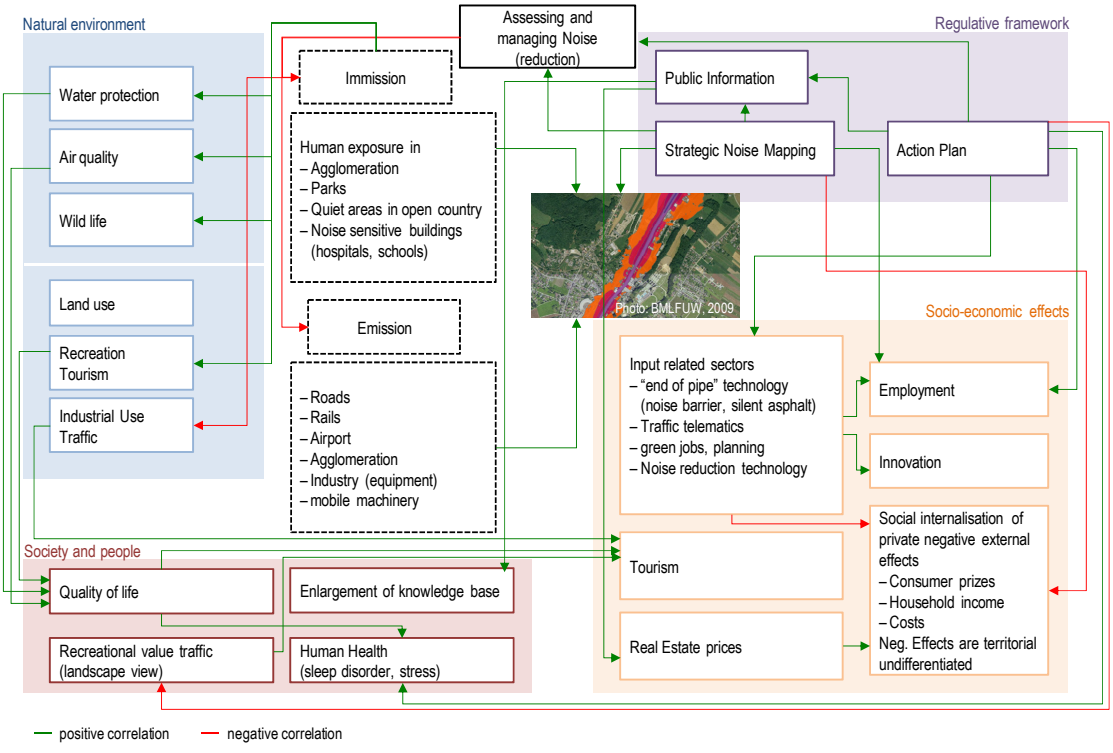
Directive relating to the assessment and management of environmental noise

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[16] such as land-use planning, systems engineering for traffic, traffic planning, abatement by sound insulation measures and noise control of sources.

(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



[16] 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);

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.[17]

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 affect 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_2 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

[17] 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

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_2 emissions. Also the construction of noise barriers will harm views of the landscape.

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 affects 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 affect accessibility negatively. 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 branchs 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_2 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) affect the environment slightly negatively. Urban regions – being already quite sensitive to soil sealing (F3) and urban sprawl (F35) are affected more than others. Measures like the construction of transport routes (branch b) and the implementation of technical measures (branch c) like noise barriers will affect with landscape diversity (F10), primarily in Greece due to the sensitivity adjustment. The higher CO_2 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 affected.[18] Negative impacts on accessibility by air (F29) are generally stronger – the regions

[18] This impact only concerns accessibility by road, since neither Malta nor the Canarias have a railway system.

most affected 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 affected 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 affected 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 Czech regions leasing 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) affects all regions positively but moderately, 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 affected 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, affecting 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 affected. 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 affected occur in health related fields.

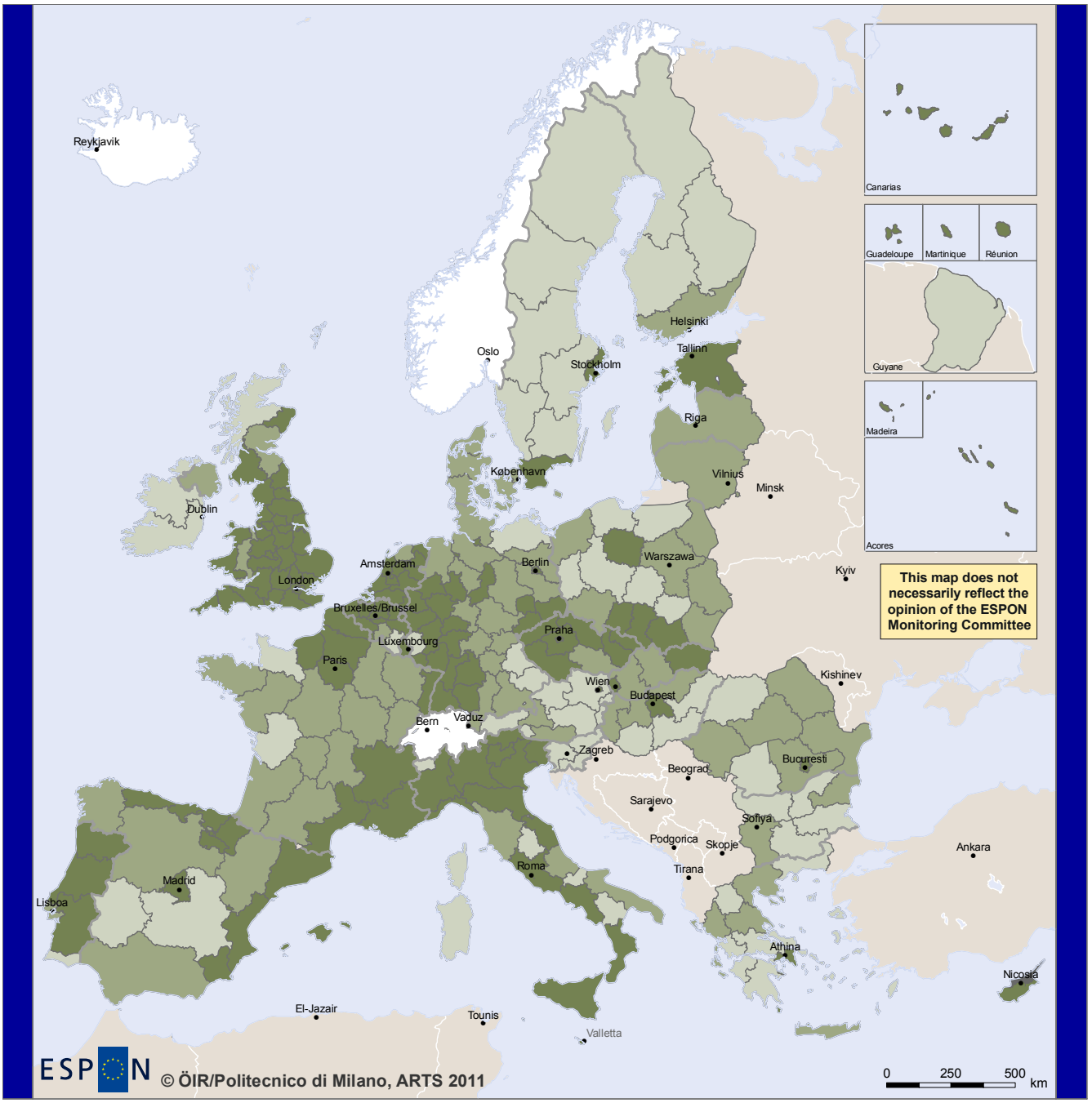
However, the most positive impacts follow if the national government decides on technical measures (**branch c**) in order to fulfil the requirements of the noise directive. The immanent boost of manufacturing and R&D are particularly conducive to the regional economy and employment while at the same 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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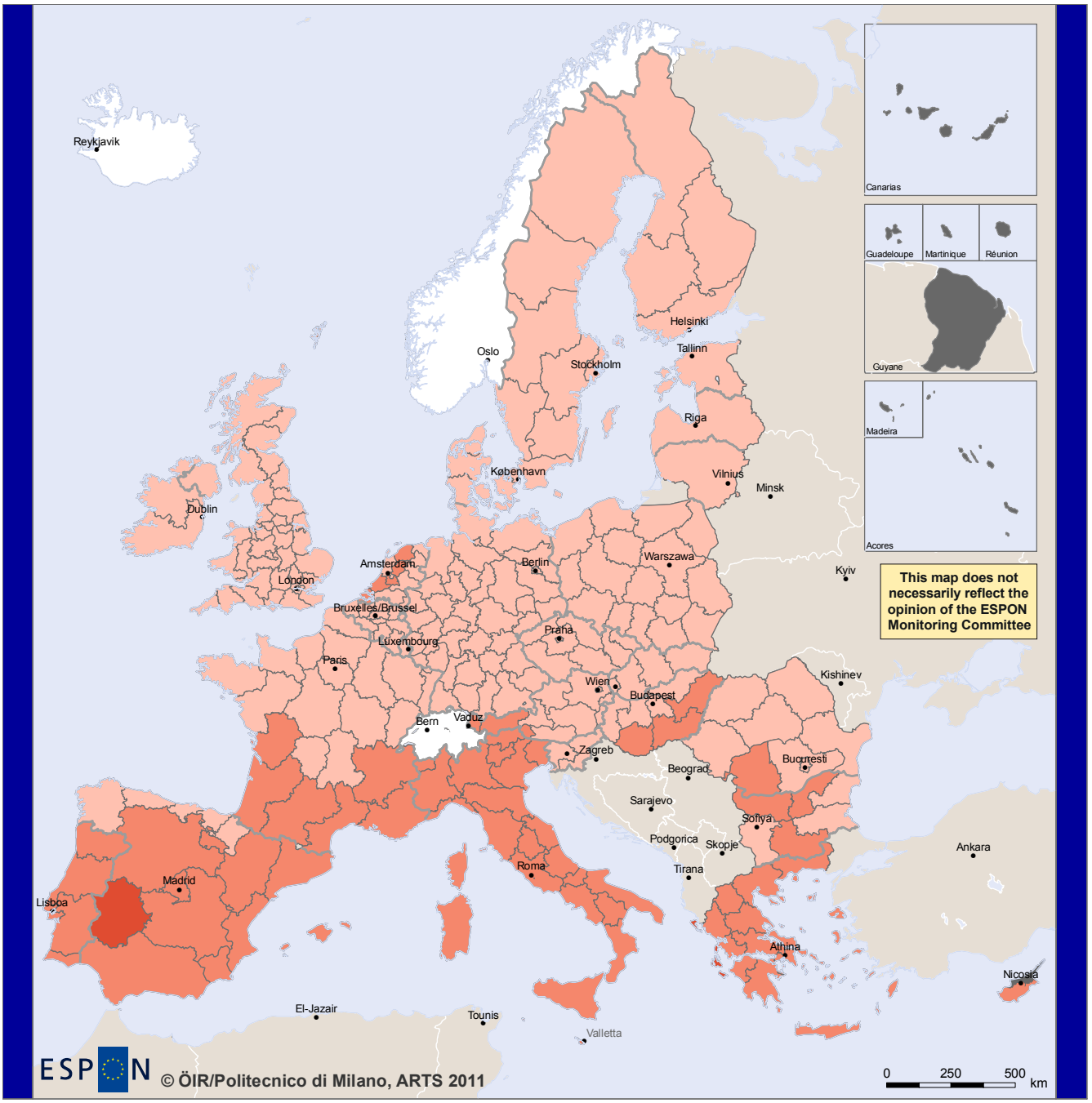
Positive Impact

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

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

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

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).

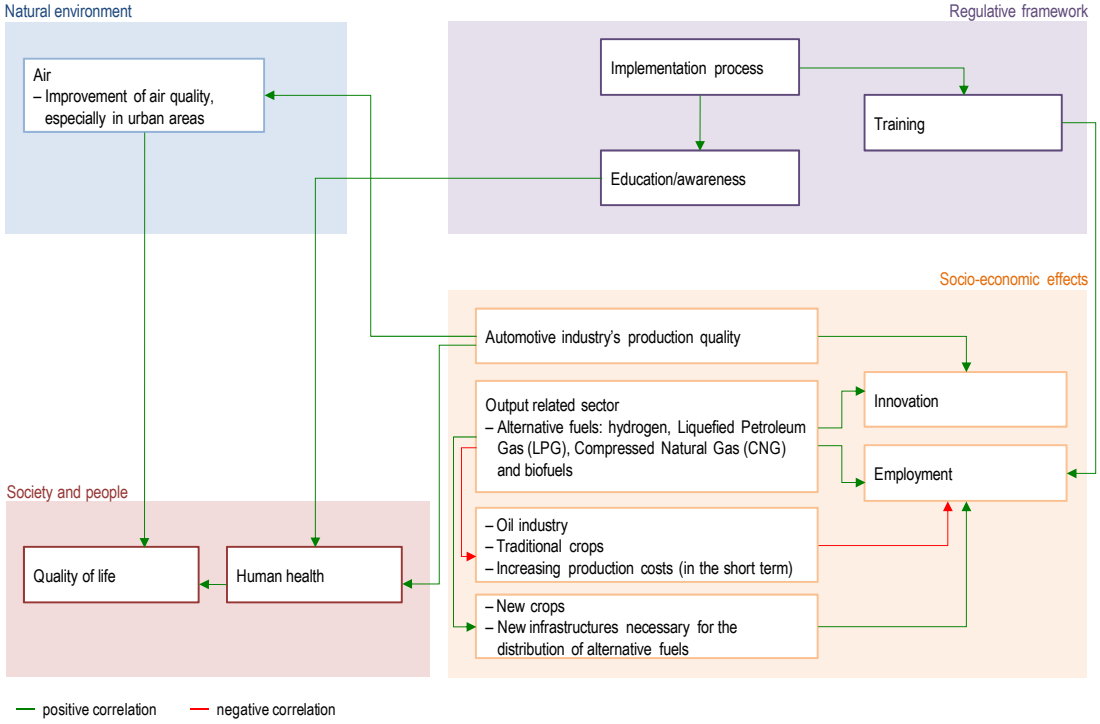
On the other hand, impacts also depend on the supply side: investments in and production of cleaner and more efficient vehicles are expected to affect employment and GDP and promote innovations in cleaner and greener technologies (branch b).

The exposure fields affected in branch a of this directive pertain to the natural environment, namely a moderate reduction of CO_2 emissions and the level of pollutants in air (PM_{10}). 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_2 emissions.

The impact via the supply side (i.e. branch b) will bear moderately positive on GDP and employment (namely in manufacturing) since it affects 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_2 (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 affected 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 6below.

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 variatation 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 affected 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.

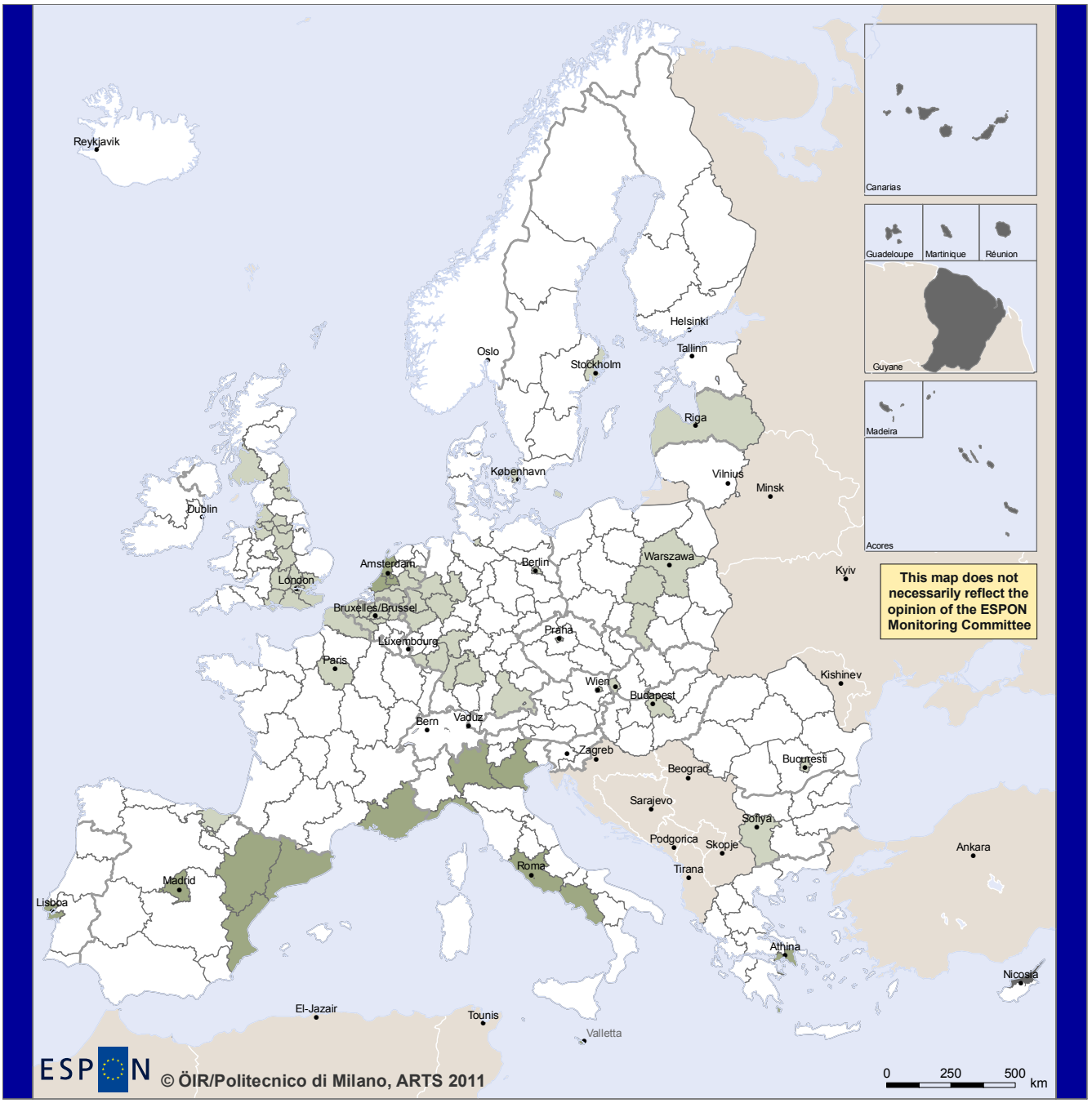
Regarding the summative impacts, branch a does not produce any high negative impacts, and high positive impacts are limited to two regions (and on just one impact field): Inner London and Bucaresti. In branch b, no high negative impacts were produced either. Contrary to branch a, most regions will experience 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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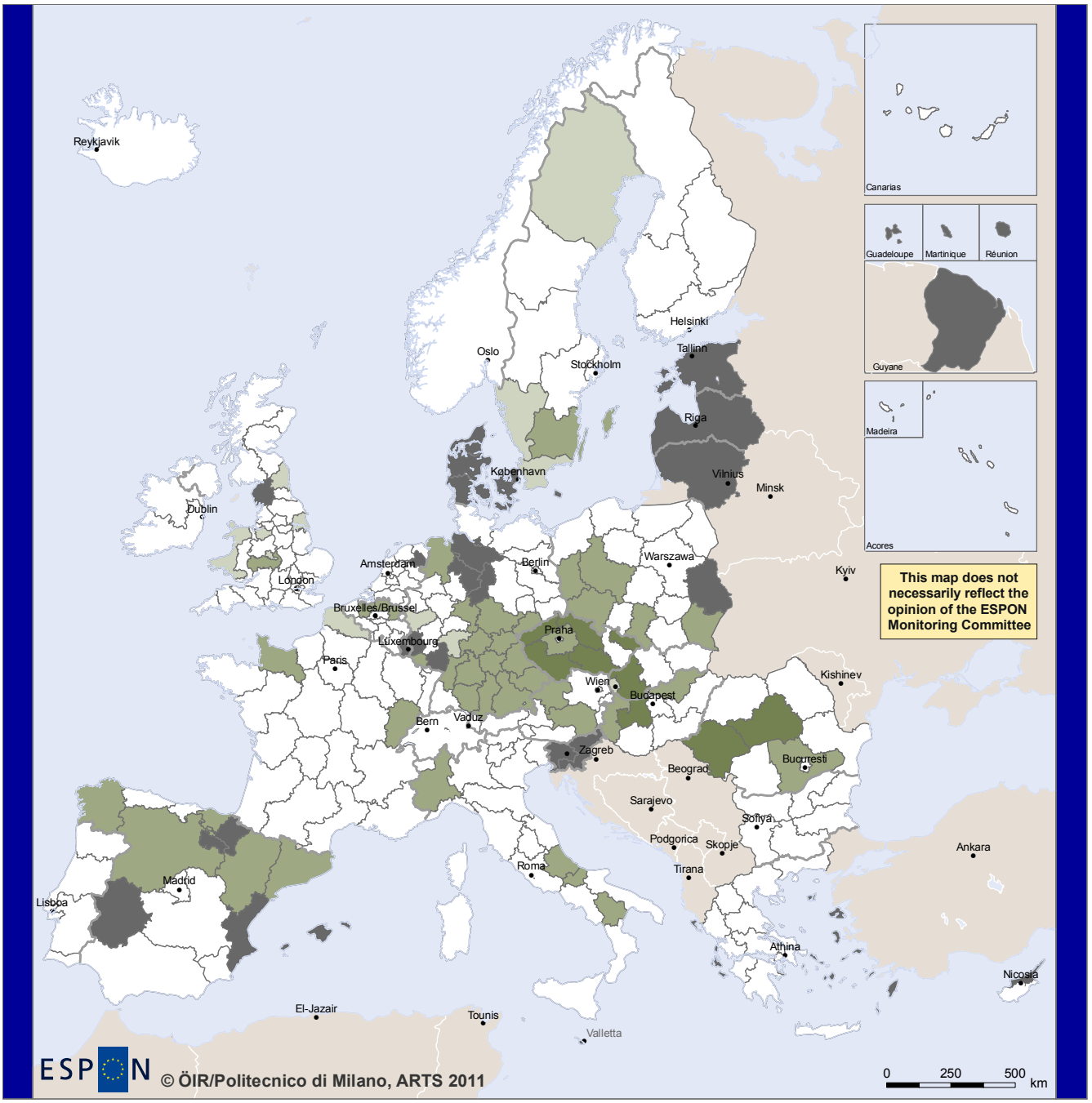
Positive Impact

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

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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Positive Impact

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

Types of regions affected: highest share of employement 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 affecting 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 directly affects the share of agricultural land and may introduce a shift in crops towards biofuels.

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 pro-actively 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 panning 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 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.

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 (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).

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 summative 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 “summative” 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 “summative” 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 an 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.