



territorial  
impact  
assessment

Brussels  
30 April 2016

COTER  
Commission

## Territorial Impact Assessment

# Remotely Piloted Aircraft Systems

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### Disclaimer

This report was produced by the European Committee of the Regions secretariat to assist the rapporteur and the COTER commission in preparing the opinion on Aviation Strategy. This report will be shared with the European Commission, the European Aviation Safety Agency and the European Parliament. The findings of this report are not binding for the European Committee of the Regions and do not prejudice the final content of its opinions. This report is for information purposes only. The effects observed in our analysis might not necessarily be a result of the RPAS themselves but rather a result of national implementation.

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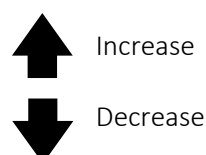
## Acronyms, legend and contributing experts

<b>CoR</b>	European Committee of the Regions
<b>EP</b>	European Parliament
<b>ESPON</b>	European Observation Network for Territorial Development and Cohesion
<b>EASA</b>	European Aviation Safety Agency
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>LRA</b>	Local and Regional Authority
<b>RPAS</b>	Remotely Piloted Aircraft Systems
<b>MS</b>	Member State(s)
<b>NUTS</b>	Nomenclature des unités territoriales statistiques Common classification of territorial units for statistical purposes
<b>OiR</b>	Austrian Institute for Spatial Planning (ÖIR)
<b>TIA</b>	Territorial Impact Assessment

### Effects of the directives – colour code

	Positive effects
	Minor positive effects
	Neutral
	Minor negative effects
	Negative effects

### Legend – direction of effects



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# 1 Introduction

The development of Remotely Piloted Aircraft Systems (RPAS) began in the 1950s and recently matured in a military context. RPAS are now entering the civil market, opening up a promising new chapter in the history of aviation. Civil drones offer huge potential for developing innovative applications in a wide variety of sectors that benefit European society, creating jobs and carrying out useful tasks. As the civil aviation evolves towards more automation, drone technologies will also be crucial for the competitiveness of the European aeronautics industry as a whole.

## European Commission's work on RPAS<sup>1</sup>

The European Commission has developed a strategy to support the progressive development of the RPAS market in Europe, while also addressing concerns about safety, security, privacy, liability and/or public acceptance.

This strategy has been endorsed by the aviation community in the Riga Declaration<sup>2</sup> and was made public after the conference organised on 5 - 6 March 2015 by the Ministry of Transport of Latvia and the Civil Aviation Agency of Latvia, in cooperation with the European Commission, during the Latvian Presidency of the Council of the European Union.

The European Commission's strategy is presented in a Communication<sup>3</sup>, adopted in April 2014, entitled "A new era for aviation: Opening the aviation market to the civil use of RPAS in a safe and sustainable manner". The strategy focuses on Remotely Piloted Aircraft Systems, a sub-set of Unmanned Aircraft Systems (UAS), which excludes fully autonomous systems. It aims to ensure the safe and secure integration of RPAS into the European aviation system, from 2016 onwards, through the development of:

- a common safety regulatory framework, proportionate to risks for drones of all classes; this is to enable the creation of a single European market for civil drone applications;
- the necessary enabling technologies ('sense and avoid', 'comment and control communication link' etc.) within the SESAR joint undertaking, in close coordination with other initiatives;
- measures to ensure the protection of citizens (privacy, insurance, etc.);
- measures to support market development and European industries.

The Strategy was established after extensive public consultation between 2009 and 2012, as well as the creation of a Roadmap for the Integration of civil RPAS into the European Aviation System, prepared by a group of representative European stakeholders.

In the EU, the current regulatory system for RPAS is based on fragmented rules, with many Member States having already regulated or planning to regulate some aspects of civil drones with an operating mass of 150 kg or less. However, the extent, content and level of detail of national regulations differs, and conditions for mutual recognition of operational authorisations between EU Member States have not been reached. The Council is in favour of a harmonised European approach, and considers the European Aviation Safety Agency to be best placed to develop technical and safety standards, licences and certificates. In October 2015, the European Parliament plenary adopted a report on the safe use of RPAS in the field of civil aviation<sup>4</sup>. In its report, the Parliament calls for proportionate and risk-based rules.

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<sup>1</sup> [http://ec.europa.eu/growth/sectors/aeronautics/rpas/index\\_en.htm](http://ec.europa.eu/growth/sectors/aeronautics/rpas/index_en.htm)

<sup>2</sup> <http://ec.europa.eu/transport/modes/air/news/doc/2015-03-06-drones/2015-03-06-riga-declaration-drones.pdf>

<sup>3</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52014DC0207>

<sup>4</sup> EP report A8-0261/2015

In March 2015, the European Aviation Safety Agency (EASA) presented its New Regulatory Approach for RPAS for safely operating Remotely Piloted Aircraft Systems.

In July 2015, the EASA launched a consultation on the Introduction of a regulatory framework for the operations of drones (A-NPA 2015-10). This consultation covered an overall regulatory framework for drone operations, as well as concrete proposals for the regulation of low-risk drone operations.

If the development and use of drones are promoted appropriately, Europe can assume a leadership role. The "Proposal on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and repealing Regulation No 216/2008 - COM (2015) 613 final" deals with drones in Articles 45 and 46 of the proposal. The Commission further suggests that it will task the European Aviation Safety Agency with preparing more detailed rules which will permit drone operations and allow for the development of industry standards. The Commission suggests that all drones will be covered, including small ones (under 250 grams).

### **European Committee of the Regions**

The CoR is planning to issue an opinion on the Aviation Strategy which is currently being drafted by the rapporteur, Ulrika Carlefall Landergren (SE/ALDE). The opinion will be discussed and adopted at the COTER meeting on 4 July 2016 and will be submitted for adoption at the October 2016 CoR plenary.

The CoR would like to see a basic legal framework for the safe use of RPAS at the European level and stresses the need to open up the debate between EU and national policymakers/regulators to all relevant stakeholders, including local and regional authorities. The rapporteur supports the ambition to put the EU at the forefront of the emerging commercial market for Remotely Piloted Aircraft Systems (RPAS) as the development of RPAS may be of significant benefit to society, while recognising at the same time that the public interest must be safeguarded, including, in particular, issues relating to privacy, data protection, accountability and civil liability.

As the proliferation of civil drones also poses many challenges for local and regional authorities, particularly with regard to the safety of air traffic, security, personal privacy, and the licencing of their use, regional and local authorities must engage with this issue. There is a need to set out essential requirements for drones in good time and a demand to establish the framework for drones at EU level, while respecting the principles of subsidiarity and better regulation.

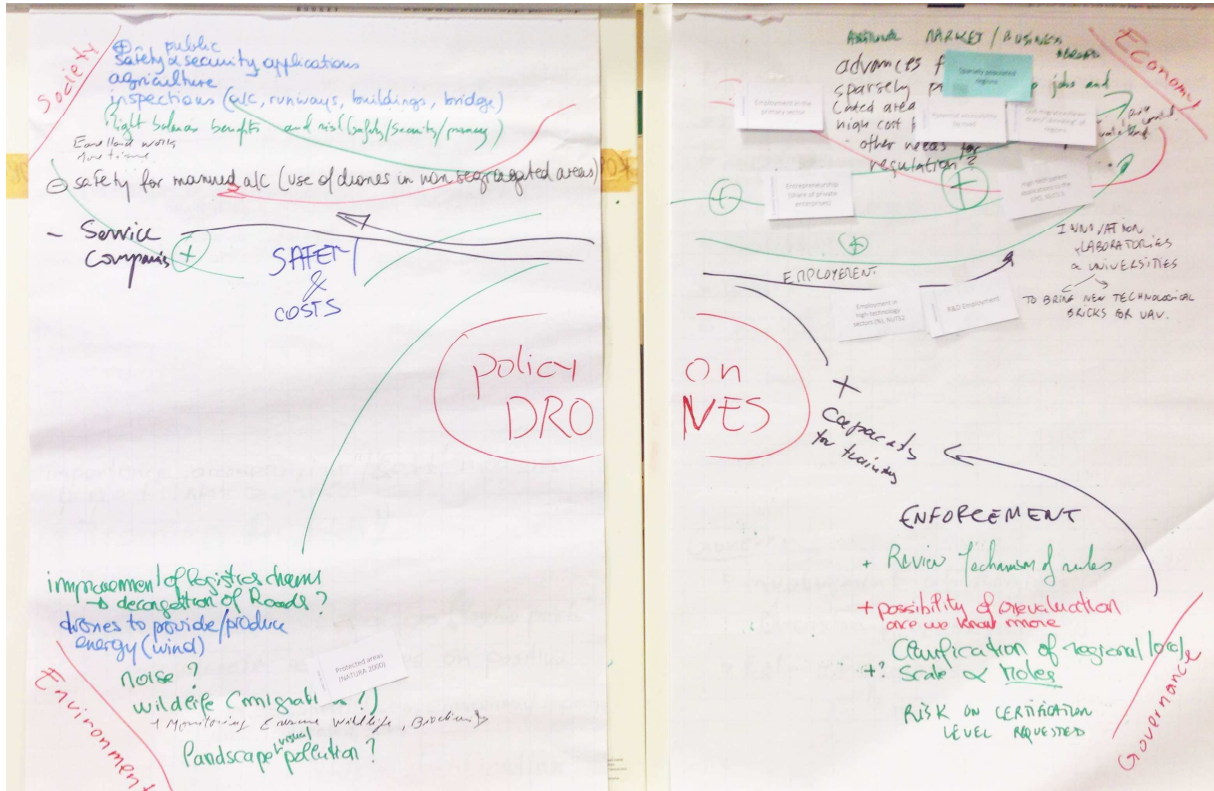
With drones, aviation is no longer limited to the proximity of airports. With drones, aviation and RPAC can be present at any local level and this is why the future legislation should take into consideration the territorial dimension.

## 2 Methodology: ESPON Quick Scan

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

In the first part of the workshop, a conceptual model was prepared on the basis of the urban experts' opinions, with the objective of identifying future potential territorial impacts of RPAS. In an interactive discussion, the participants drew a systemic picture linking the potential effects of RPAS in the fields of environment, society, economy and governance. They identified potential linkages and feed-back-loops between different effects. The following diagram visualises the experts' interaction:

Figure 1: Workshop findings: conceptual model



Source: Territorial impact assessment expert workshop: RPAS, Brussels, 4 April 2016

The next step was to select indicators to describe the identified effects. The following indicators available at NUTS 3 level were selected and discussed:

- Employment in high-technology sectors (%)
- Employment in Research and Development
- High-tech patent application to the EPO
- Entrepreneurship (share of private enterprises)
- Potential accessibility by road (sparsely populated areas)
- Protected NATURA 2000 areas

Since this technology is rather new, some effects could not be assessed quantitatively. The experts would have liked to assess the impact on; the number of accidents involving RPAS, noise created by RPAS, the increase in waste due to drone disposal and effects on road congestion.

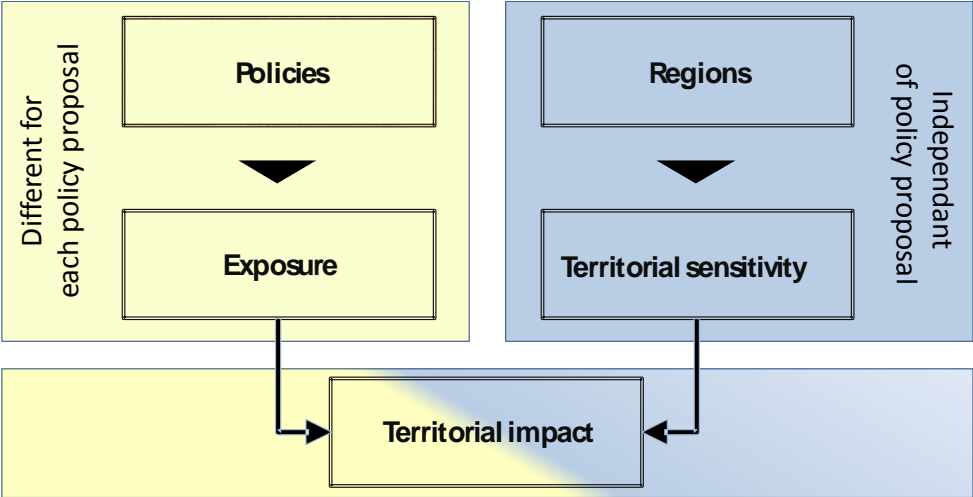
**2.2 Which types of region are affected?**

Territorial impact assessments (TIA) aimed to analyse the potential impacts of an EU policy on NUTS 2 and NUTS 3 regions. As this technology will have an impact on the EU as a whole, for the purposes of this TIA, all regions were selected and consequently the expert judgement expressed during this workshop was applied to the whole EU.

**2.3 How is "regional impact" calculated? Regional sensitivity and expert judgement**

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

Figure 2: Exposure x territorial sensitivity = territorial impact



As the figure shows, territorial impact (which is visualised in the set of maps presented later in the report) depicts a combination of so-called regional sensitivity and the exposure caused by the implementation of the policy initiative. Regional sensitivity describes the baseline situation of the region according to its ability to cope with external effects. It is a characteristic of a region that can be described by different indicators and it can be described independently of the policy measure analysed.

The exposure describes the intensity of the effect caused by the policy initiative on a specific indicator. It is the effect of the implementation of the policy. Exposure illustrates the experts' judgement, i.e. the main findings of the expert discussion at the TIA workshop. The TIA quick check shows the potential territorial impact in the selected types of region by combining the experts' judgement with the given sensitivity of a region within the selected exposure fields.

## **2.4 Mapping the impact**

The result of the territorial impact assessment is presented in maps. Whereas expert judgement is a qualitative judgement (strongly advantageous effect on territorial welfare / weakly advantageous effect / no effect / weakly disadvantageous effect / strongly disadvantageous effect), sensitivity is a quantitative indicator. The detailed descriptions are provided in the annexes.

## **2.5 Questionnaire**

Prior to the workshop, a questionnaire was prepared and sent to the experts. The results of this questionnaire are integrated in this report.

## **2.6 Data availability**

Data for Continental Croatia was unavailable due to the changes of NUTS 2 regions in the country. Data for Greece was unavailable for this Territorial Impact Assessment. A detailed description of the indicators used can be found in Annex 1.

The maps in this report will also show the impacts on non-EU countries (ESPON area) but the report is based on EU-28 countries. This report refers to the potential effects of RPAS 10 years from the date of publishing this report.








### 3 Economic and social effects

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 Strong Positive effects     Minor positive effects     Neutral     Minor negative effects     Negative effects

The questionnaire sent to the experts and the results from the discussions clearly show that the two main issues observed by the experts are safety and privacy.

#### 3.1 Safety and privacy

This technology entails both negative and positive safety aspects. In terms of positive aspects, RPAS can improve the working conditions for certain professions (e.g. pilots not needed to navigate in dangerous situations). They can contribute to fire fighting and disaster aid efforts of local authorities, keeping the personnel safer and bringing more targeted results, reducing the costs and increasing efficiency. This technology can also assist private and public enterprises in providing better protection of properties through active surveillance.

Possible future uses of drones include supporting law enforcement and search and rescue activities. The use of this technology can be already observed in Croatia, where the local search and rescue services are using drones to locate missing persons and carry out reconnaissance missions. This has a double positive effect, the first being the safety of the personnel who are largely volunteers and secondly, significantly lower costs. Until recently, helicopters were the only reliable technology used in search and rescue; however, the costs of only one hour of helicopter time can pay for up to three RPAS that can be used for a longer period of time. Even in bad weather conditions, drones are still considered to be a better option.

Apart from the positive aspects this technology could bring, it is important to take into account the potential negative effects. The experts found that the use of RPAS could pose a threat to security because they could be used for unlawful actions such as spying, criminal activities or even terrorism.

Over recent months it was observed on several occasions that RPAS that are big enough to cause damage, have entered protected airspace and on occasion even came close to airplanes in the process of landing. This is one of the main concerns surrounding RPAS. However, solutions and technology that allow the management of such situations do exist. At the moment there is no legal constraint on producers, so the technology that could prevent drones from entering protected airspace has not yet been sufficiently implemented.

Another safety concern is the increased risk of injuries due to the misuse of RPAS or technical failures. As the technology is available to a large portion of the population, an increase in cases where a drone has caused injury could be expected. This is to be expected more frequently in urban areas due to the larger number of RPAS present, larger proportion of inhabitants and the increased navigation challenges.

Over and above safety concerns, the experts present at the workshop see privacy as the main concern. While larger RPAS are due to be regulated, the smallest ones, those below 250 grams are not expected to be regulated and it is precisely these that could lead to the biggest privacy concern.

The technology used today is expected to improve exponentially in a very short space of time, with sensors and cameras becoming ever smaller and batteries lasting longer. This opens up the possibility for intrusion into the private lives of EU citizens with various negative consequences such as blackmail and public humiliation. This is not expected to have a specific territorial impact as it can happen everywhere, but it is likely that urban regions will be more negatively affected.

### **3.2 Agriculture**

Both the questionnaire and the discussions show that the greatest benefits could be seen in agriculture as this technology could allow for better planning and management. RPAS could also be used to monitor and, to a certain extent, manage livestock. With the use of RPAS there could also be expected a drop in production costs and more efficient time management. This could be most clearly observed for farmers in sparsely populated areas who could benefit from the use of drones.

It is important that the rules are not too strict and that they acknowledge that the safety and privacy issues associated with the use of RPAS in agriculture are not the same as when RPAS is used for other purposes. Smaller farming businesses also need to be able to benefit from this technology, through contractors, service providers and cooperatives (e.g. CUMAs, machinery rings), for example.

RPAS in agriculture shows great potential. In combination with other “smart” techniques, RPAS can contribute to enhanced resource efficiency, productivity and profitability as well as greater sustainability, and provide reassurance for farmers. As the farming community is ageing rapidly, drones can help ease hard work, reduce working time, increase efficiency and they have tremendous potential to involve young entrepreneurs in agriculture.

RPAS in agriculture can be used in aerial precision spraying, pest management, yield forecast; condition monitoring (e.g. soil erosion & moisture), environmental impact assessment (e.g. flood risk surveys, precise weather forecasts), remote aerial monitoring & herd monitoring and farm machinery and automated devices monitoring/tracking and assets management. All these uses would strengthen the agricultural sector and reduce costs.

### 3.3 Delivery of goods

Delivery of goods could be one of the first commercial uses for drones in the near future, with many different pilot projects already taking place around the EU. Drones have been used by the Finnish postal services in a pilot project for the Helsinki area and in northern Germany for delivery of medicines in remote areas.

Up until now there has not been any widespread delivery as the technology and legal framework are not yet in place, especially for urban areas where RPAS would be most profitable. The experts believe that RPAS could be a complimentary service, not necessarily the primary means of delivery.

Delivery by RPAS could bring many positive effects for sparsely populated areas, islands and remote areas which were not commercially attractive for companies due to the high costs entailed. For the same reason, this could open new markets for companies in those areas.

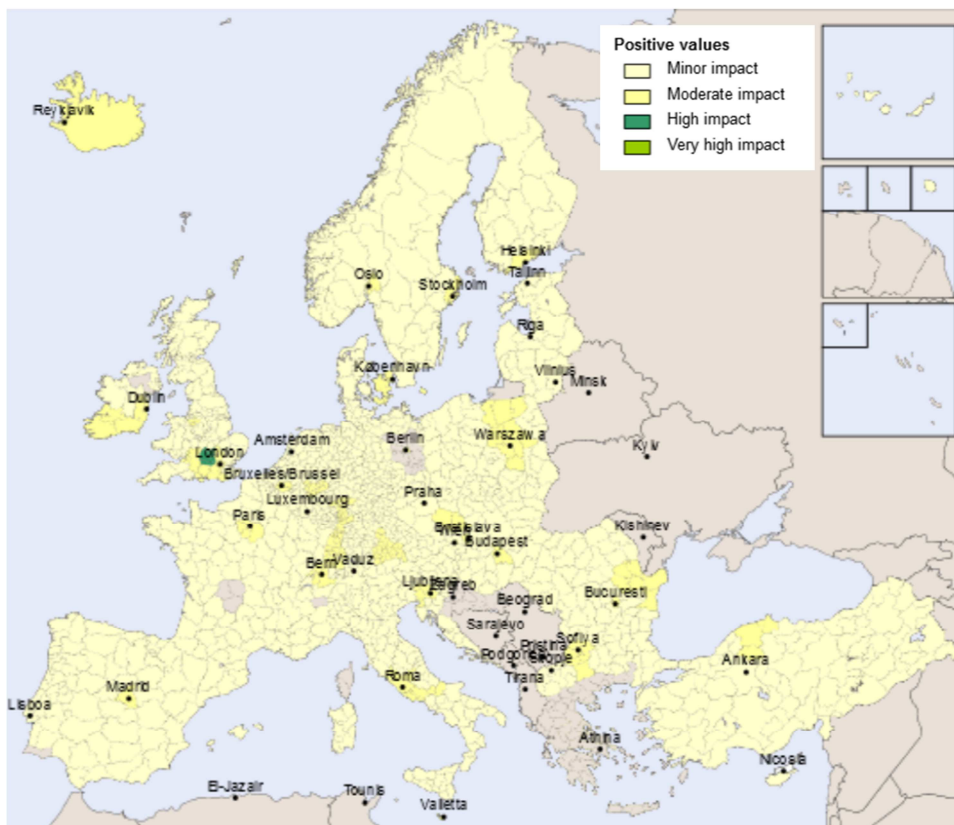
### 3.4 Employment in the high-technology sector

Expert judgement on the indicator: Weakly advantageous

The experts chose the indicator "employment in the high-technology sector" to measure the positive effects on employment. It is expected that this technology will create new jobs but the experts estimated that the effects would be weakly advantageous. Compared with the territorial sensitivity, the effects would be minor in most of the regions with modest effects in some regions, mostly metropolitan regions where most of these types of companies have their headquarters and research centres. The model shows that a high impact could be observed in England. More detailed results can be observed on Map 1 below.

#### Map 1: Employment in the high-technology sector

Source: Territorial impact assessment expert workshop: RPAS, Brussels, 4 April 2016



### 3.5 Employment in Research and Development

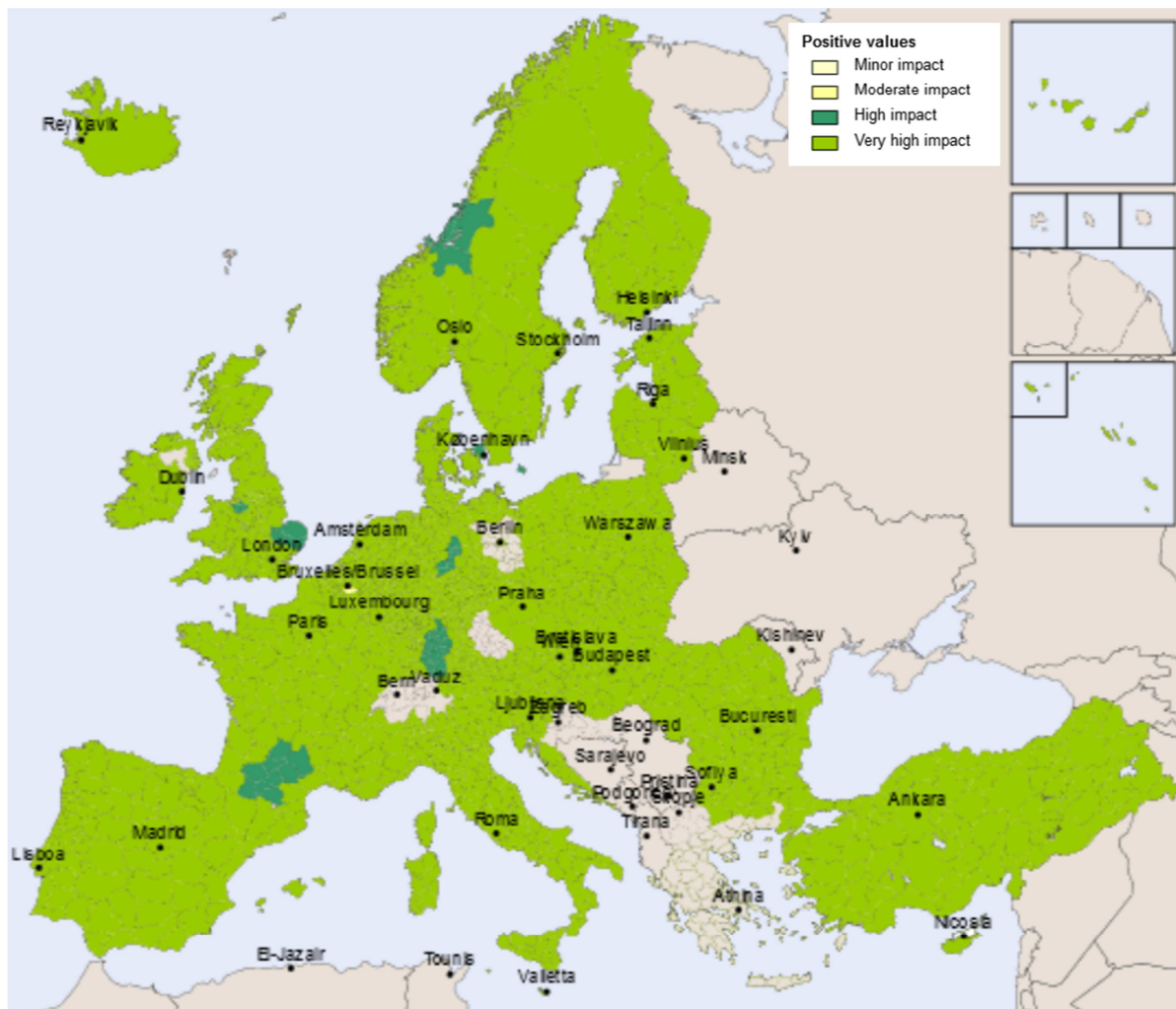
Expert judgement on the indicator: Strongly advantageous

Similarly to the previous indicator, the experts expect that the rise in employment in research and development will be strongly advantageous as the potential of this technology has not been yet fully explored. The technology used in RPAS has not reached its maximum potential, leaving a lot of opportunities for further development and, consequently, for a rise in employment in research and development.

The sensitivity of the regions shows that the anticipated strongly advantageous effects will have a very high impact in most EU regions and a high impact in some other regions such as England, parts of Germany and parts of France. A more detailed overview can be seen below on Map 2.

#### Map 2: Employment in Research and Development

Source: Territorial impact assessment expert workshop: RPAS, Brussels, 4 April 2016



### 3.6 Entrepreneurship (share of private enterprises)

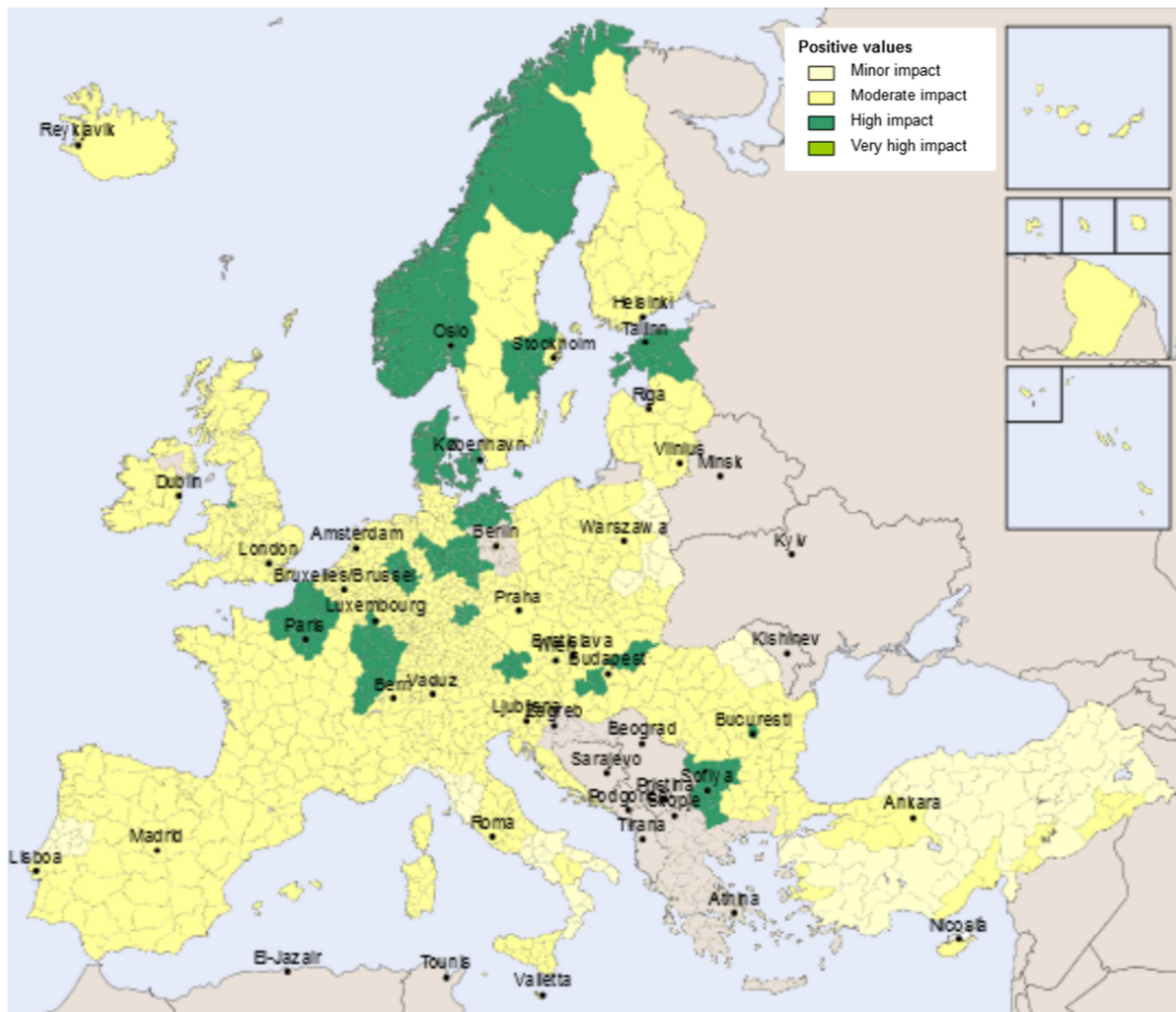
Expert judgement on the indicator: Weakly advantageous

The experts chose the indicator "Entrepreneurship (share of private enterprises)" as an indicator that could depict the potential effects of RPAS on EU regions. While the experts estimated that there will be a strongly advantageous effect on employment in R&D and a weaker advantageous effect on employment in the high technology sector, these companies do not necessarily make up a major share of private enterprises. For this reason, the experts believe that the effects on entrepreneurship will be weakly advantageous.

The model shows us that there will be a predominantly moderate impact on the number of private enterprises throughout the European Union, with high impact in certain regions of Sweden, the UK, France, Germany, Austria, Hungary, Romania and Bulgaria and a high impact is likely to be seen across the whole of Estonia. More detailed results can be seen on Map 3 below.

#### Map 3: Entrepreneurship (share of private enterprises)

Source: Territorial impact assessment expert workshop: RPAS, Brussels, 4 April 2016



## 4 Effects on governance

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■ Strong Positive effects   ■ Minor positive effects   □ Neutral   ■ Minor negative effects   ■ Negative effects

The main concern of the experts is an increased administrative burden as a result of future legislation, as a number of RPAS will need to be certified, safe and no-fly zones will need to be mapped and some users will have to go through training, which could also be provided by national governments or LRAs. Alongside the debate on the privacy concerns, the experts pointed out that there could be potential problems with copyright violations as the RPAS could be used for recording certain events such as sport events, thereby breaching copyright. This issue will also need to be addressed through legislative changes.

Another concern of the experts is increased traffic in already crowded airspace such as urban areas and, more importantly, airport regions. New management systems will need to be put in place to manage this new influx of airborne vehicles. This increase in the number of RPAS in the skies of Europe also raises the question of legal management and law enforcement. The EASA proposes that local police take over this duty, however this could be very difficult for the LRAs due to the lack of resources both financial and staff. If this were the case, it could significantly increase the burden on local and regional police forces which are already suffering from understaffing.

The EU, national governments and local and regional authorities need to work on raising the general public's awareness and educating them about the benefits and risks this technology could bring. At the moment, RPAS are known as "drones", a word that has negative connotations due to their use in wars. Both the private and public sector should work on promoting this technology as a cost-efficient and environmentally friendly technology.

This technology could also bring positive effects by decreasing the costs and personal risks of LRA staff, as certain tasks could be delegated to RPAS, such as inspections of public property (roads, infrastructure), monitoring of protected areas, traffic surveillance and management, better use of financial resources due to better planning, and the repair of public infrastructure (power lines, public lighting systems).

A challenge for the EU, MS and LRAs is to define the permanent RPAS no-fly zones (which could be difficult to «standardised» across the EU and careful geographical consideration needs to be considered), as well as temporary ones in case of a disaster, crime investigations and similar. Not only that there would be a legal framework needed for such action, a better technology should be a part of all RPAS.

Trainings for police forces would need to be organised in order to have the most efficient control of the RPAS. At the same time, it would be important to have clearly defined roles in the management of

RPAS, defined in the legislation (national, EU). As the RPAS is a technology that is rapidly evolving, a regular evaluation of the industry development in Europe would need to be carried out by authorities.

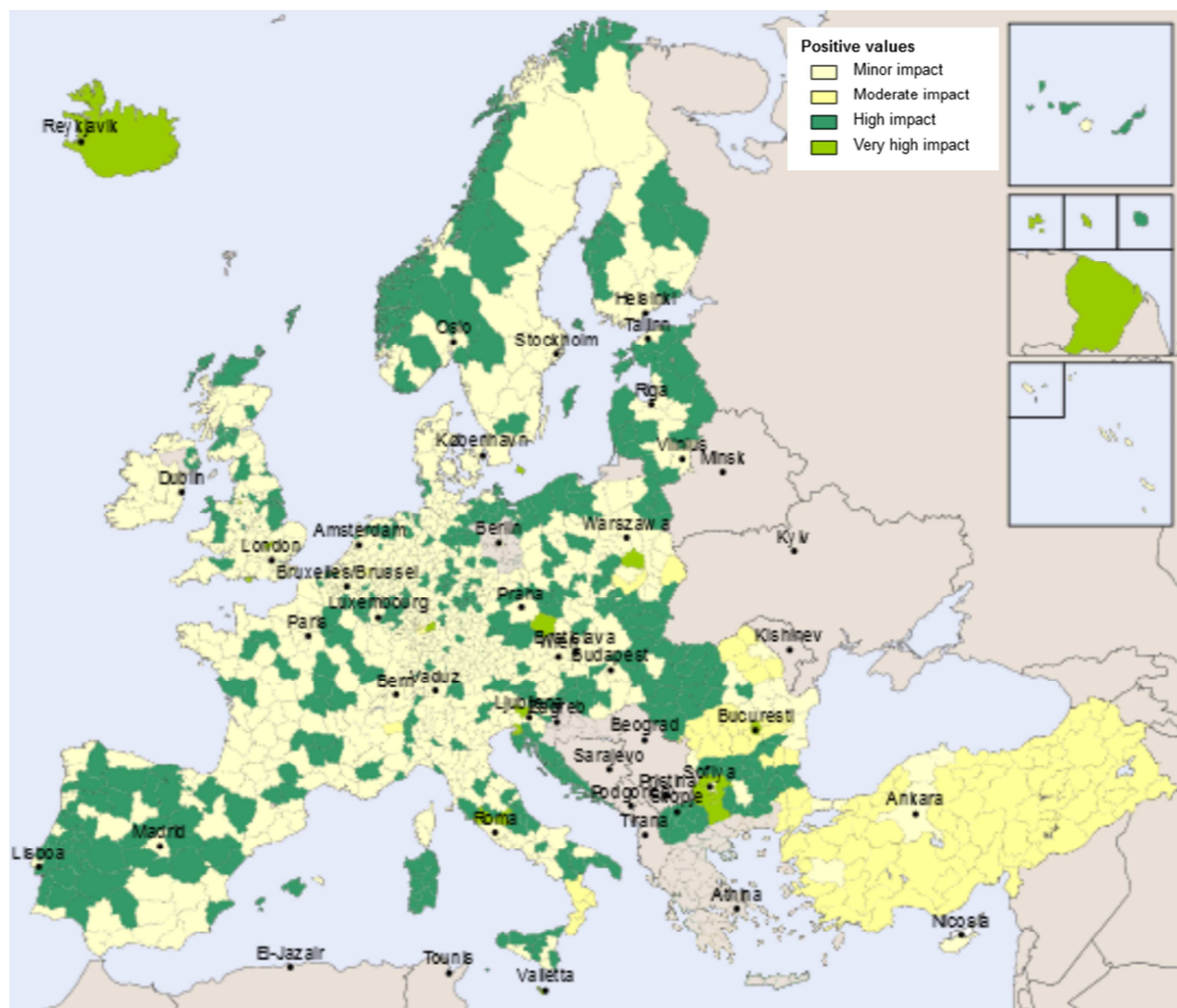
#### 4.1 High-tech patent application to the EPO

Expert judgement on the indicator: Weakly advantageous

Due to the anticipated increase in R&D and share of entrepreneurship working on RPAS, the experts expect an increase in high tech patents. Map 4 depicts model's calculations, varying from moderate to high and very high impacts on EU regions.

#### Map 4: High-tech patent application to the EPO

Source: Territorial impact assessment expert workshop: RPAS, Brussels, 4 April 2016



Source: Territorial impact assessment expert workshop: RPAS, Brussels 4 April 2016

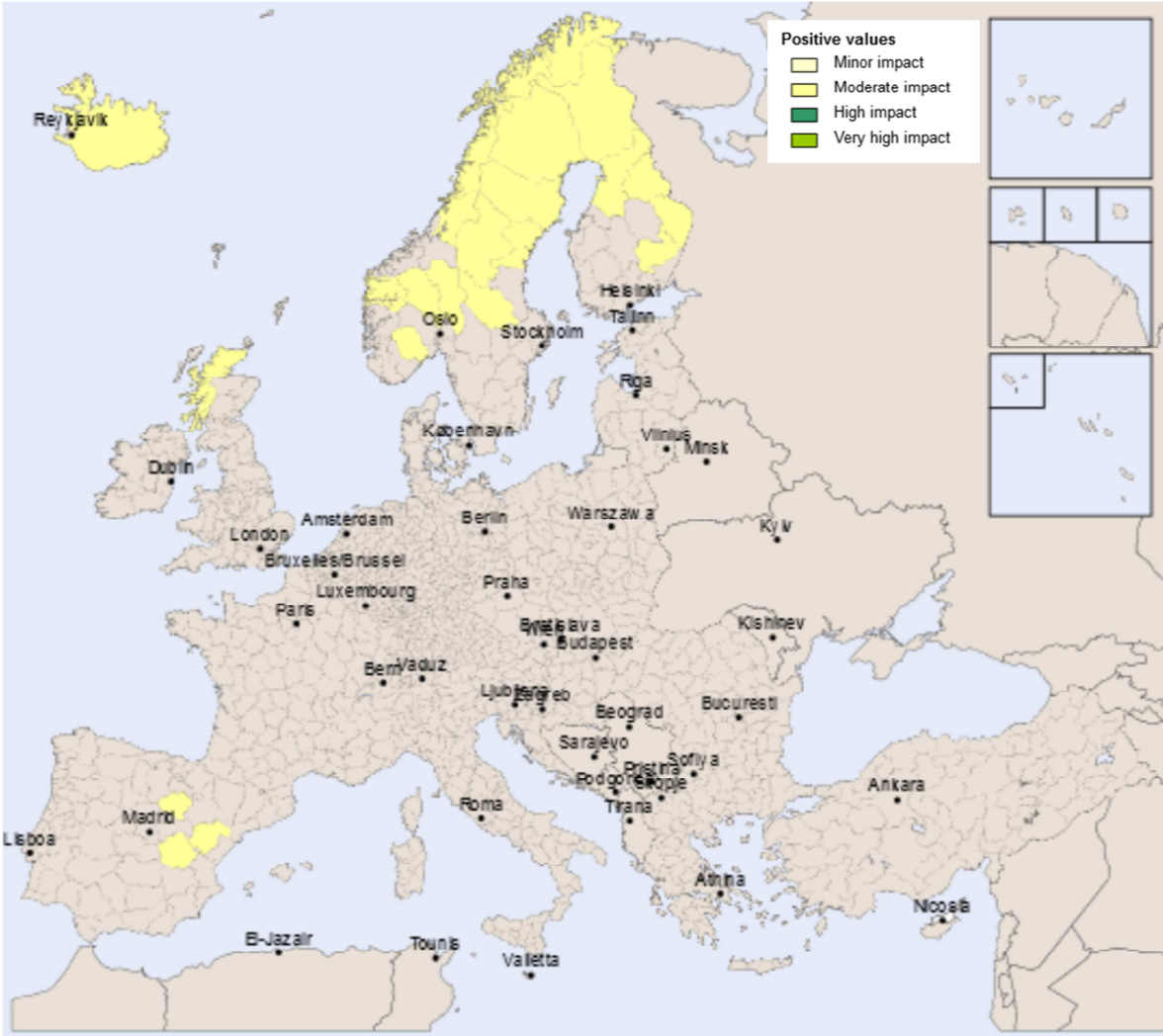
#### 4.2 Potential accessibility (sparsely populated areas)

Expert judgement on the indicator: Weakly advantageous

As RPAS have the ability to deliver goods to places that are difficult to access, they could have a minor positive effect on the accessibility of sparsely populated areas. This judgement, translated into the ESPON quick scan model shows that in general the effects would be negligible, with exceptions in the north of the UK, Sweden, Finland and central Spanish regions where a moderate increase of accessibility could be observed.

**Map 5: Potential accessibility (sparsely populated areas)**

Source: Territorial impact assessment expert workshop: RPAS, Brussels, 4 April 2016





## 5 Effects on environment

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NATURA 2000 areas



Increase in waste from obsolete drones



Strong Positive effects



Minor positive effects



Neutral



Minor negative effects



Negative effects

At this stage it is hard to estimate the potential effects of RPAS on the environment. The questionnaire shows that the experts are worried about the potential increase in waste from obsolete drones (end-of-life drones, older technology and drones, damaged beyond repair). This should be addressed by LRAs through recycling and proper waste management.

On the other hand, the issue of noise nuisance created from the increasing number of drones was raised. At present, it is difficult to assess whether the noise would increase significantly to cause problems for citizens. This aspect should be carefully monitored to prevent it from becoming an issue. Producers should pay attention to making RPAS as sound neutral as possible.

RPAS can bring a lot of benefits for the environment and energy efficiency. A good example of such use is a RPAS that harvests wind energy at higher altitudes than are currently reachable by traditional windmills.

One of the potential future uses of RPAS currently being tested is parcel delivery. If this technology were to be sufficiently developed, we could expect to see roads becoming less congested as a certain share of delivery would take place in the air. This would consequently result in a small decrease in CO2 emissions.

However, that would bring about another problem that is loosely connected to the environment: visual pollution. The number of drones could become a nuisance and a potential problem for animals living in the affected areas, especially birds, whose migratory routes and daily lives may be threatened.

### 5.1 NATURA 2000 protected areas

Expert judgement on the indicator: [Weakly advantageous](#)

The experts chose NATURA 2000 protected areas as an indicator for potential weakly advantageous effects. Stretching over 18 % of the EU's land area and almost 6 % of its marine territory, NATURA 2000 is the largest coordinated network of protected areas in the world. It offers a haven to Europe's most valuable and threatened species and habitats.

The territorial sensitivity of the EU regions shows us that the weakly advantageous effects, as estimated by the experts, would have a minor positive impact on the EU regions, with very few regions with modest positive effects and significant positive effects in Finland, around the Helsinki area and the Åland islands.

**Map 6: NATURA 2000 protected areas**

Source: Territorial impact assessment expert workshop: RPAS, Brussels, 4 April 2016



## 6 Expert's policy recommendations

To begin with, the experts discussed the need for an EU response to this technology. While this is a very local issue, and for some EU Member States it does not necessarily pose a security concern in terms of illegal border crossings, the large majority of the experts, as well as the questionnaire, indicated that the best approach would be legislation proposed by the EU, transposed into the national law, with EU certificates issued by Member States. The current legal framework in the EU is fragmented and a number of key safeguards are not addressed in a coherent way, creating uncertainties in terms of liability, privacy protection and safety.

The EU approach would allow for common rules and technical specifications, allowing producers of RPAS to sell their products in all EU states without having to adapt them for each individual MS, thus reducing their costs. Without common rules, for many producers, especially SMEs, access to other EU markets would be difficult at best. The EU approach would also be important in cross-border areas in cases where the RPAS would cross borders, or particularly where a cross-border no-fly zone would need to be established. The experts would like to see an EU-wide registry of larger RPAS that would be available to law enforcement forces across the EU.

The questionnaire showed that the experts are divided on the question of which RPAS should be regulated, with some of them wishing to regulate those that could potentially cause harm to citizens in the event of an accident, and others that would regulate all RPAS. The EASA currently plans to regulate all RPAS, except those that weigh less than 250 grams.

Regulation may prove to be very difficult due to the lack of political will at national level, with some Member States that have already regulated RPAS potentially not willing to change the rules again. On the other hand, RPAS technology is evolving too quickly and is difficult to regulate and certify. For this reason, the experts believe that the rules should be flexible and not necessarily weight-based, in order to allow this potentially important technology to be further developed.

The weight of the RPAS should not be included in the rules. The uses and the associated risks are the key issues to be addressed by these rules. Exemptions on a case by case basis should be possible in each Member State (e.g. night flights or uses in cities) in order to allow the R&D sector to innovate (e.g. technology, services, uses, etc.). There should be clear differences in the rules depending on what the technology is being used for to avoid over-regulation. The safety requirements are not the same when a RPAS flies over the sea for surveillance or in urban areas to deliver parcels.

Keeping the rules flexible and simple would help start-ups to start their business more easily, since many of them have neither the funds nor the knowledge on how to go about requesting registration or certification. The experts would also like to see funds be made available for the development of RPAS, as these currently do not exist.

The experts would like local and regional authorities to be consulted on this legislative proposal as the effects of such legislation will be most keenly felt at the local level and will have to be implemented by LRAs.

For experts, the main issues hindering the development of RPAS and their integration into society are the lack of clarity of current legislation, as well as uncertainty about future legislation, privacy and safety concerns and the insufficient technological development of RPAS, making them difficult to integrate into human-piloted aircrafts.

## Annex 1: Explanation of the indicators used

### 1. Employment in high-technology sectors

<b>Definition of sensitivity</b>	Regions with lower shares of employment in high-technology sectors are expected to benefit more from measures aimed at improving the skills and qualifications of the population. Sensitivity was thus inversely proportional to the level of employment in high-technology sectors.
<b>Description</b>	Employment in high-technology sectors (high-technology manufacturing and knowledge-intensive high-technology services) as a percentage of total employment
<b>Source</b>	EUROSTAT
<b>Reference year</b>	2014
<b>Original Indicator Spatial Reference</b>	NUTS 2, 2010
<b>Missing data</b>	-

### 2. Entrepreneurship (share of private enterprises)

<b>Definition of sensitivity</b>	Regions showing lower levels of self-employment were expected to benefit more from measures aimed at its promotion or for self-employment to have been inhibited unintentionally. Sensitivity was thus inversely proportional to the share of self-employment.
<b>Description</b>	The share of self-employed among the employed was used as a proxy for entrepreneurship.
<b>Source</b>	EUROSTAT
<b>Reference year</b>	2012
<b>Original Indicator Spatial Reference</b>	NUTS 2, 2010

### 3. Employment in Research and Development

<b>Definition of sensitivity</b>	Regions with higher shares of employment in high-technology sectors are expected to benefit more from additional market opportunities related to innovative applications, enabling technologies, etc. Sensitivity was thus directly proportional to the percentage of persons employed in high-technology manufacturing or knowledge-intensive high-technology services as percentage of employment.
<b>Description</b>	Persons employed in high-technology manufacturing or knowledge-intensive high-technology services as percentage of employment
<b>Source</b>	EUROSTAT
<b>Reference year</b>	2014
<b>Original Indicator Spatial Reference</b>	NUTS2 2010

#### 4. High-tech patent application to the EPO

<b>Definition of sensitivity</b>	Regions with a higher count of high-tech patent applications are expected to benefit more from additional market opportunities related to innovative applications, enabling technologies, etc. Sensitivity was thus directly proportional to high-tech patent applications to the EPO.
<b>Description</b>	High-tech patent applications to the EPO by priority year by NUTS 3 regions, per million inhabitants
<b>Source</b>	EUROSTAT
<b>Reference year</b>	2012
<b>Original Indicator Spatial Reference</b>	NUTS3 2010

#### 5. Potential accessibility by road (sparsely populated areas)

<b>Definition of sensitivity</b>	Regions with lower potential accessibility will benefit more from its increase and be most disadvantaged by measures that lower it. Sensitivity is thus inversely proportional to potential accessibility by road.
<b>Description</b>	Population in all destination regions + accessibility potential of the origin region weighted by travel time (index related to ESPON average)
<b>Source</b>	© S&W Spiekermann & Wegener, Urban and Regional Research, ESPON TRACC Final Report
<b>Reference year</b>	2011
<b>Original Indicator Spatial Reference</b>	NUTS 3 2006
<b>Missing data</b>	No data for French overseas departments; HR; ITC4C, ITC4D; ITF46-48; ITH59; ITI31; ITI34; ITI35; NL337-NL339; NL33A; UKD61-71; UKE44; UKE45; UKF24; UKF25; UKG36-UKG39; UKH24; UKH25

#### 6. Protected NATURA 2000 areas

<b>Definition of sensitivity</b>	Regions showing a greater area of protected natural areas are expected to be more sensitive to directives directed at biodiversity or directives that may endanger habitats. Sensitivity is thus directly proportional to the share of areas protected under the Natura 2000 programme
<b>Description</b>	NATURA 2000 areas in % of total NUTS 3 area 2009 is used as a proxy for biodiversity
<b>Source</b>	EEA, REGIO-GIS; DG ENV (5th Cohesion Report)
<b>Reference year</b>	2009
<b>Original Indicator Spatial Reference</b>	NUTS 3 2006
<b>Missing data</b>	Croatia

### **Definition of additional indicators**

During the TIA quick check it is possible to identify additional fields of exposure which are affected by the policy proposal and which are not provided by the tool as standard. Whereas it was possible for the experts to assess the exposure caused by the policy proposal during the workshop, a valid indicator for describing the sensitivity of regions needs to be defined in advance. The TIA quick check offers the possibility of uploading new indicators. It provides a template where the values of the indicator can be filled in for each NUTS 3 region.

For the new indicator it must be established whether the exposure field needs to be rated as either harmful ('cost') or favourable ('benefit') for the region's welfare. The tool will then automatically transform the experts' ratings into numbers for further calculation (= normalisation).

### **Normalisation of indicators**

The normalisation follows a linear procedure. Normalised values range from 0.75 to 1.25. In basic terms, normalised sensitivity indicators represent coefficients that can increase (if greater than 1) or decrease (if lower than 1) each policy proposal's impact on a specific field.

#### ***Methodology for normalisation of regional sensitivity values***

Source: ESPON TIA Quick Check Moderator's Guide and Methodological Background

For this step the following definitions are needed:

$X_{norm_i}$  the normalized value of the sensitivity indicator for impact field i

$X_i$  the original value of the sensitivity indicator for impact field i

$X_{min_i}$  the minimum original value of the sensitivity indicator for impact field i

$X_{max_i}$  the maximum original value of the sensitivity indicator for impact field i

Then, normalization follows this formula:

$$X_{norm_i} = 0,75 + ((1.25 - 0.75) * ((X_i - X_{min_i}) / (X_{max_i} - X_{min_i})))$$