



Brussels, 17.6.2014  
SWD(2014) 185 final

**COMMISSION STAFF WORKING DOCUMENT**

**IMPACT ASSESSMENT**

*Accompanying the document*

**Proposal for a Directive of the European Parliament and of the Council  
on the dissemination of Earth observation satellite data for commercial purposes**

{COM(2014) 344 final}  
{SWD(2014) 184 final}

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**Disclaimer:** This report commits only the Commission's services involved in its preparation and does not prejudge the final form of any decision to be taken by the Commission.

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## EXECUTIVE SUMMARY SHEET

Impact assessment on a proposal for a Directive of the European Parliament and of the Council on the dissemination of Earth observation satellite data for commercial purposes

### A. Need for action

#### Why? What is the problem being addressed?

Satellite imagery enables the repeated observation of specific regions, at different scales and without the need to enter into any territory on the ground. High Resolution Satellite data (HRSD) has a significant economic value and is used in geospatial products for which there is a growing market. HRSD and HRSD-based applications have become an indispensable tool for environment monitoring, urban planning, natural resources management and disaster and emergency management, but are important for security and defence, too. Therefore, the production and dissemination of HRSD by commercial operators are regulated by the States where they are registered. The present Impact Assessment examines the obstacles to market development that stem from the fact that HRSD today is regulated in different ways by EU Member States and the options to overcome those obstacles to the free circulation HRSD while preserving security interests.

#### What is this initiative expected to achieve?

The general policy objective of this initiative will be to ensure the functioning of the internal market for HRSD products and services. More specifically it seeks to establish a more reliable access to HRSD, a good and sufficient level of information on accessibility of HRSD for VAS/data-resellers and customer businesses, and to facilitate competition at data provider level by creating a transparent, predictable and fair legal framework across Member States and by ensuring the free circulation of data throughout the EU.

#### What is the value added of action at the EU level?

National initiatives alone will not ensure a coherent legal framework for HRSD distribution. A coherent framework can only be achieved by concerted action by Member States within the EU or action at EU level capable to ensure general compliance.

### B. Solutions

#### What legislative and non-legislative policy options have been considered? Is there a preferred choice or not? Why?

This impact assessment identifies three options – in addition to the baseline scenario – that seek to achieve the objectives by setting up a legal framework for the handling and dissemination of high-resolution Earth observation data in the European Union: Option 1 - Baseline scenario, Option 2 - Recommendations and guidelines, Option 3 - Basic legislative instrument and Option 4 - Extended legislative instrument.

The problems identified (lack of transparency, predictability and equal treatment) stem from the absence of a common definition of HRSD, clear criteria to determine whether HRSD should be considered sensitive, clear authorisation procedures, free circulation guarantees and clear requirements to become HRSD data provider. Any of these options, except the baseline scenario, will seek to address these issues. The difference between options 3 and 4 concerns the scope, with option 4 including a licensing element that option 3 leaves to Member States.

Option 3 is the preferred option combining a good level in terms of economic, strategic and social benefits with a very high level of effectiveness and efficiency while at the time leaving as much room as possible for Member States for controlling the data-providing businesses in their territory.

**Who supports which option?**

Member States, except UK, have expressed scepticism regarding option 2, which is seen as overly cumbersome and ineffective. Most Member States are favourable to the light approach as proposed in option 3 rather than the more ambitious option 4. Industry representatives have not provided comprehensive positions on the different options but have made clear their preference for a light regulatory approach, avoiding the creation of extra "red tape".

**C. Impacts of the preferred option**

**What are the benefits of the preferred option (if any, otherwise main ones)?**

The preferred option would create an internal market for HRSD. Positive economic impacts are expected due to higher level of transparency, legal certainty and business predictability. Beneficial effects are foreseen for the establishment and exercise of businesses, for data sales and regarding competitiveness. Besides direct job growth in the data reseller/value-adding-service (VAS) businesses and data providing businesses, additional job growth at other levels of the value chain is probable (i.e. HRSD user businesses, satellite manufacturers and operators), as a result of higher quality services and more competitive prices. Furthermore additional indirect job growth is also expected, as the creation of 1 new job in the space industry leads up to 5 new jobs in other sectors.

**What are the costs of the preferred option (if any, otherwise main ones)?**

For data provider businesses, the cost would be comparable to that occurring in Member States where regulations are in place. For data resellers/VAS there will be less administrative burden than at present. For Member States, there would be very minor additional administrative costs stemming from the transposition of the directive, given its limited scope.

**How will businesses, SMEs and micro-enterprises be affected?**

The present initiative targets, notably, data resellers which are mainly SMEs; therefore there will be a direct positive impact on SMEs in this sector.

**Will there be significant impacts on national budgets and administrations?**

Minor transposition/implementation costs; otherwise national budgets will not be affected.

**Will there be other significant impacts?**

A coherent approach to HRSD distribution may result in greater and more immediate availability of HRSD. That in turn should lead to more and better HRSD applications in a multitude of areas, for example environment monitoring or emergency management, with the accompanying benefits for the economy and citizens.

**D. Follow up**

**When will the policy be reviewed?**

An evaluation would be carried out 5 years after entry into force.

## 1. PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

### 1.1. Identification

Lead DG: DG Enterprise and Industry

Agenda Planning/WP Reference: 2012/ENTR/024

### 1.2. Introduction

This impact assessment concerns the production and dissemination of earth observation data for commercial purposes that are generated by high-performance remote sensing satellites.

For the purpose of this impact assessment, earth observation data comprises mainly optical and radar data. A distinction can be made between low (ground-) resolution and High Resolution Satellite Data (HRSD<sup>1</sup>) or even very high resolution (VHR) data. The higher the ground resolution is, the higher the capacity to identify smaller objects.

For simplicity sake, we will use the term HRSD in this document to refer to both, i.e. high and very high resolution satellite data.

Satellite imagery enables the repeated observation of specific regions, at different scales and without the need to enter into any territory on the ground. HRSD has a significant economic value and is used in geospatial<sup>2</sup> products for which there is a growing market.

HRSD and HRSD-based applications have become an indispensable tool for environment monitoring, urban planning, natural resources management and disaster and emergency management, but are important for security and defence, too., as the information provided by satellites can help in shaping the security decisions of a nation, or a community of nations, through the evaluation of the economic, geographic and military situation of a given region of interest anywhere in the world, and the corresponding evolution over time.

Therefore, the production and dissemination of HRSD by commercial operators are regulated by the States where they are registered.

**The present Impact Assessment examines the obstacles to market development that stem from the fact that HRSD today is regulated in different ways by EU Member States and the options to overcome those obstacles to the dissemination of HRSD while preserving security interests.**

This initiative does not concern data obtained in the context of Copernicus, as the data is not high resolution and is not disseminated for commercial purposes.

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<sup>1</sup> See also glossary in the annex.

<sup>2</sup> Geospatial technologies are tools and techniques used in land surveying, remote sensing, cartography, global navigation satellite systems, photogrammetry, geography and related forms of earth mapping.



### 1.3. Organisation and timing

For the preparation of this impact assessment, DG Enterprise and Industry set up an Impact Assessment Steering Group (IASG) to which the following Commission services have been invited: SG, SJ, RTD, MOVE, BUDG, ECFIN, MARKT, RELEX, ENV, ENER, EMPL, EAC, JRC, JUST, INFSO, COMP, TRADE, BEPA, AGRI, CLIMA, REGIO, AIDCO, ECHO, DEV, MARE, SANCO. The IASG met four times. The first meeting took place on the 19th of April 2012, the 2nd on the 26th of June 2012, the 3rd on 24th of April 2013 and the last one was organised on 25th July 2013.

### 1.4. Consultation and expertise

Over a period of almost two years, DG Enterprise and Industry has, directly or through external consultants, consulted all institutional actors in the Member States and a wide range of actors in the value chain involved in space and geospatial activities on issues related to this impact assessment.

Two studies<sup>3</sup> commissioned by DG Enterprise and Industry to external consultants have analysed the existing regulatory framework regarding HRSD and are used, alongside other sources for this IA. The studies identified different rules and approaches to the dissemination of HRSD.

Experts from Germany and France, the only Member States, who have enacted specific legislation in this domain for the regulation of their HRSD technical capabilities, explained to DG Enterprise and Industry services the details of the dedicated systems implemented in their countries and perceived as a positive development the idea of a common EU framework.

A workshop with space legal experts was organised in March 2012. Regarding satellite data, experts confirmed that there is a fragmented regulatory framework across Europe that prevents internal market development.

In March, July, December 2012 and April, July and October 2013, the Commission presented its reflections on HRSD to the Space Policy Expert Group (SPEG) made up of national space experts. The issues and the options envisaged were discussed.

A consultation of stakeholders consisting of an online questionnaire targeted to data resellers and a public hearing to solicit the views of data providers and data resellers were carried out in June and July 2013.

The main conclusions of these consultations can be summarised as follows:

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<sup>3</sup> An ex-post evaluation study on " **Evaluation of the Impact of European Space Policy on European Space Manufacturing and the Services Industry** " has been carried out by CSES (concluded in summer 2012). This study partially addressed the issue of satellite data protection. The study is available at [http://ec.europa.eu/enterprise/dg/files/evaluation/space\\_final\\_report\\_evaluation\\_of\\_the\\_impact\\_of\\_esp\\_en.pdf](http://ec.europa.eu/enterprise/dg/files/evaluation/space_final_report_evaluation_of_the_impact_of_esp_en.pdf). An IA support study on "EVALUATION OF OPTIONS FOR AN EU INITIATIVE ON THE IMPROVEMENT OF CERTAIN FRAMEWORK CONDITIONS FOR THE ECONOMIC DEVELOPMENT OF SPACE RELATED ACTIVITIES - EO VHR Satellite Data Regulation and Market" has been carried out by Booz&Co is not published on the web due to the sensitivity of parts of its contents.

There is a consensus among Member States that the dissemination of HRSD raises security concerns and needs to be regulated.

Overall Member States are open to the adoption of a common approach dealing with HRSD to ensure an effective integrated treatment of security and market issues, provided that the measures employed are proportionate to the objectives and no security hazards will be entailed. It is a notable fact that during the last meeting of the SPEG group (held on 30 October) the UK, the only country with prior express reservations to this initiative, has modified its position and is open to support an EU initiative. The condition formulated is that the ultimate responsibility for security related decisions must stay with Member States, but uniform requirements for data handling and simple procedures for screening and authorising HRSD can be put in place.

Industry representatives and in particular data resellers confirm that the existing framework for the distribution of HRSD lacks transparency, predictability and does not guarantee equal treatment and therefore prevents the market from developing to its full potential. A large majority consider that action to address this situation would improve the business environment. Some industry representatives, while not contesting the security-related constraints of the existing framework, consider that these have not been an obstacle for their businesses.

Further analysis and details on these consultations are provided in section 3.1 and Annex VI.

### **1.5. Scrutiny by the Commission Impact Assessment Board**

The Impact Assessment Board of the European Commission assessed a draft version of the present impact assessment and issued a negative opinion on 04.10.2013. The Impact Assessment Board made several recommendations and, in the light of the latter, the impact assessment report:

Describes the market on HRSD in a more detailed way, by providing a clearer description of the market, how it works in practice, which services and products are provided, its overall size and the role and number of SMEs and micro-enterprises and by explaining how security concerns and commercial drivers interact.

Provides a better identification of the problems by outlining the national regulatory systems in place in the three Member States presently concerned, by identifying the internal market related problems faced by EU companies, by providing further evidence in support of this problem, by explaining more clearly at what stage regulatory barriers are encountered and by which market actors and by explaining that the problems identified are currently being faced by EU market actors and are likely to increase over time with an emerging EU market for HRSD.

Clarifies the content of the options and demonstrates their proportionality by providing a more detailed account of each of the policy options, including the technical details of the possible definitions and procedures needed for the dissemination of HRSD, and by clarifying the scope of the options.

Better assesses the impacts by providing a fuller assessment of the impacts of each of the options against a strengthened baseline scenario, on both the functioning of the market for HRSD, and the security of Member States and by assessing in greater detail the impacts on

businesses, on job creation and on competitiveness, with a particular focus on SMEs and micro-enterprises.

A revised version of the impact assessment was submitted to the Board, on which it issued a positive opinion on 09.01.2014. In its second opinion, the Board made additional recommendations for improvements. In order to respond to the Board's recommendations, the final impact assessment report:

Further strengthens the problem definition with additional evidence in particular regarding the cross-border dimension of the problem.

Provides further detail on each of the policy options, and clarifies what further decisions on the technical criteria for defining HRSD, the screening procedure, and the authorisation procedures will be taken in conjunction with Member States, and how.

Provides further detail on the administrative costs for the different actors and for Member States, notably with regard to the preferred policy option.

## **2. CONTEXT**

### **2.1. EU context**

The Commission's Communication "Towards a space strategy for the European Union that benefits its citizens" adopted in April 2011<sup>4</sup> defines priorities for the future involvement of the EU in space and sets out options for EU action.

In response to this Communication, the Competitiveness Council addressed the issue of data security policy and in its conclusions of May 2011 indicated that there is a "need for an appropriate European data security policy in order to protect the interest of EU".

Some Member States have specifically asked the Commission for the possibility of an EU common framework for the distribution of HRSD to be examined.

The present initiative is one of the possible measures put forward by the Commission in its Communication on the EU Space Industrial Policy from February 2013 "Releasing the potential for economic growth in the space sector"<sup>5</sup>. One of the objectives identified by this Communication is an EU space industrial policy which ensures that the right regulatory framework is in place to facilitate space industrial development. In this context, the Communication refers in particular to the establishment of a possible regulatory initiative for the production and dissemination of high resolution satellite data for commercial purposes.

The EU is in the process of putting in place and thus making operational its space infrastructures – the Galileo constellation for navigation and positioning, and the Copernicus sentinels for Global Monitoring for Environment and Security. The expansion of space activities and in particular the growing market for space products and services means in general an increase in cross-border commercial transactions in the foreseeable future and this initiative can usefully complement these infrastructural activities. At the same time there are

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<sup>4</sup> COM(2011) 152 final.

<sup>5</sup> COM(2013) 108 final.

no direct links with or effects on the Galileo and the Copernicus programmes stemming from this initiative as neither programme concerns HRSD.

As regards to the protection of personal data, this initiative does not intend to have negative impacts on the protection of individual's rights and freedoms with regard to the processing of personal data. In any event, the EU data protection framework applies to the processing of personal data which might be involved in the context of HRSD. The Member States apply in that regard the national measures adopted to implement Directive 95/46/EC. The application of these implementing measures is monitored in the Member States by national data protection authorities. In that respect it is worth stressing that first, the initiative addresses a very specific issue (i.e. ensure free circulation HRSD while preserving security interests) and does not aim at full harmonisation of all relevant elements in the HRSD business (e.g. data formats and standards, processing and dissemination technologies, quality and legal issues etc.). Second, it does not influence the manner in which the existing HRSD capabilities and technologies are used in the Member States and worldwide with regard to a possible processing of personal data, i.e. if databases are created using HRSD for example, this initiative will have no influence on that issue. Finally, the information to be gathered for monitoring by the EC and provided from the respective national authorities should be primarily of technical nature and delivered in aggregated format suitable for the statistical control purposes established by the EC. If any such information contains personal data (e.g. in the list of data providers) its processing by the Commission will be subject to the provisions of Regulation 45/2001.

## **2.2. International context**

As far as international practice is concerned, it is a well-established fact that access to HRSD is restricted for security reasons. To mention only the most important international actors in space, the access to satellite data can be subject to restrictions e.g. in the US, Canada, Russia, India or China.

## **2.3. Overview of the legislation in the EU Member States**

Two Member States - Germany and France - have adopted primary legislation in the domain of high resolution satellite data. Italy has put in place secondary legislation. These are the only three Member States that have HRSD capabilities. In all the other Member States there is currently no specific legal framework to regulate the use of HRSD. Nevertheless, it is likely that in the future other Member States will acquire the relevant technology creating a need for regulation.

The main reasons for Germany and France to regulate the production and dissemination of HRSD have been security concerns. In order to prevent a potential misuse of HRSD, both countries have put in place security screening procedures. A clear rationale for this legislation was to overcome a legislative gap that existed previously. An exhaustive analysis of the existing national frameworks has been carried out by the external consultant Booz & Co<sup>6</sup>.

**In Germany**, there is a unique situation where specific legislation was developed in the context of TerraSarX (the first German HRSD satellite) and the public-private partnership that establishes and serves as the *primary data service provider*. As a result, Germany is the only

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<sup>6</sup> See Booz&Co, Section 3 (p. 16 et seqq.) and annex III.

country that has detailed provisions within a legislative framework, which include the detailed procedural aspects that define the data security process.

**In France**, there are somewhat comparable principles in one chapter of the national space law and in a dedicated decree. The recently added Decree<sup>7</sup> sets the thresholds for HRSD to be controlled in a range comparable to the German ones. However, for the time being, most of the comparable detailed provisions remain in classified governmental guidelines, and in regular instructions issued by the Government for the *primary data service provider*. In the specific case of Pleiades satellites, additional relevant provisions can also be found in a bilateral agreement between France and Italy of 2001, and in the French national security legislation.

**In Italy**, there is no specific national legislation to address HRSD issues, but there are legal provisions within the broader regulatory framework for Cosmo-Skymed<sup>8</sup>, which is currently the only HRS-system in Italy. A number of these lower-level provisions are comparable to those in the German legislation. At legislative (high) level in Italy, there are only a few comparable principles that are relevant to this study - mostly in a law from 2004 ratifying a bilateral agreement between France and Italy for the establishment of the cooperation on the development of the Pleiades and Cosmo-Skymed programmes.

The more detailed and comparable provisions exist primarily in classified governmental data policy and guidelines. These provisions, which are in lower tier regulation, establish most of the detailed procedural aspects of the data security process relevant to Italian generated HRSD. As a result of these rules within the Cosmo-Skymed framework, the private company responsible for distribution of Cosmo-Skymed data (the data provider) is operating within rules that are non-accessible to business partners, customers or the public.

In brief, the existing Member States regulatory systems control the production and dissemination of HRSD by operators and data providers registered in the respective Member State to data resellers or VAS within or outside their borders. These systems do not allow business activities as satellite operator or data provider, if the business is not registered in the territory of the respective Member State. HRSD dissemination to any other Member State is possible but no activities as satellite operator or data provider for entities based outside the territory of the respective Member State and direct and unrestricted access as data provider to HRSD via the satellite operator or directly from the satellite is possible only for data providers based and licensed in the same Member State as the satellite operator.

## **2.4. Overview of the HRSD industry**

### *2.4.1. Market actors and value chain*

The HRSD industry is composed of a value chain that includes satellite operators, data providers, data-resellers (selling HRSD from EU and non-EU satellite operators and data providers), value-adding service providers, geo-information service providers, research

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<sup>7</sup> Décret no 2013-653 du 19 juillet 2013 modifiant le décret no 2009-640 du 9 juin 2009 portant application des dispositions prévues au titre VII de la loi no 2008-518 du 3 juin 2008 relative aux opérations spatiales.

<sup>8</sup> An overview of the Cosmo-Skymed regulatory framework can be found in N. Bini, „La disciplina relativa alla distribuzione dei dati del sistema di Osservazione della Terra Cosmo-Skymed e comparazione con le normative di altri Paesi“.

Institutes and customers. It has to be taken into consideration that many companies are active in more than one segment of the value chain<sup>9</sup>, especially the bigger companies, e.g. the data providers. HRSD is produced by satellite operators, distributed by data providers and processed combined with additional information by the so-called value added service industry and then delivered to the customer businesses. A diagram illustrating the value chain can be found in annex IV<sup>10</sup>.

At present, the existing three satellite operators in the EU are public or publicly controlled entities and there are only three primary data providers (one in FR, IT, DE), each of them disseminating the data generated by the respective Member State's HRS-system. At the same time, the existing data providers are (minor) subsidiaries of the big European Space Industries and of the manufacturer of the respective HRS-system (EADS Astrium and Thales Alenia Space) and two of them (from FR and DE) belong to the same consortium (EADS Astrium). There are approx. 100 value adding services or data reseller businesses all over Europe, among those approx. 20 - 30 data resellers incl. a few larger ones (medium sized enterprises) selling data from American, Canadian and Indian Satellites. The number of end user businesses is not precisely known, as every business with a need for geo-information is a possible customer, from the very large ones like Google (-earth) or GPS-maps producers to a large number of SMEs providing services and products based on HRSD<sup>11</sup>.

It is the request of the valued-added service providers that triggers a process whereby the requested data transaction needs to be screened (sensitivity-check) to see whether according to existing criteria – defined by Member States where HRS operators are based – it is to be considered HRSD and whether it can be released immediately or whether it requires further screening. This step is accomplished in the three Member States (FR, IT, DE) by the data provider.

If the data-transaction requires further examination because of sensitivity, then a second step takes place whereby, in the light of security criteria and following a certain procedure, the competent authority in the Member State concerned will decide whether the data can be released or must be withheld.

#### 2.4.2. *Use and application of HRSD*

The provision and use of HRSD traditionally has been driven by defence needs. However, due to technological progress, high resolution remote sensing satellite (HRS) systems are getting easier to develop and prices are decreasing, which is expected to result in a growth of HRS Earth Observation systems for commercial purposes<sup>12</sup>.

At present, HRSD based applications and services are in use not only for defence/security purposes and for environment monitoring and protection, but also: map making, registry of

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<sup>9</sup> European Association of Remote Sensing Companies (EARSC) – “A Survey into the State and Health of the European EO Services Industry” (2013), p.7 (available at [http://earsc.org/file\\_download/157/EO+Industry+Survey+Sept2013+%C2%A9+EARSC.pdf](http://earsc.org/file_download/157/EO+Industry+Survey+Sept2013+%C2%A9+EARSC.pdf)).

<sup>10</sup> See also illustration of the value chain in EARSC, final report, p. 112. For reasons of simplification and to better reflect the situation with a focus on the existing HRSD distribution channels within EU, we decided to sort the market actors into the groups “data provider”, “VAS/data resellers” and “customer businesses”.

<sup>11</sup> See also graph by Euroconsult, Satellite-Based Earth Observation, p. 59 and in Annex IV.

<sup>12</sup> See Booz&Co, p. 82 et seq.

lands, urban planning, natural resource management, land use and land coverage, crop monitoring and precision agriculture, forestry management, verification of insurance claims or agricultural subsidies, disaster and emergency management. It has to be mentioned that security products represent the largest thematic area of interest but land products in general are of interest for many companies<sup>13</sup>. In terms of revenues of the Earth observation businesses, the five most important market segments (security and defence, local and regional planners, oil and gas, environmental and climate, agriculture) represent together more than 75 % of the revenues<sup>14</sup>. As none of these sectors is particularly concentrated in the three Member States having HRSD capabilities at present (FR, DE, IT), there is a strong indication, that the demand from the user businesses exists irrespective of the location of the business in EU.

For illustration purposes, there are as typical fields of applications for HRSD two examples given in Annex V describing more in detail the use of HRSD for crop monitoring and precision agriculture and for disaster and emergency management.

In defence or security, HRSD is used e.g. for strategic and tactical reconnaissance and intelligence, for example to gather near-real-time information, to make possible the use of certain weapon capabilities or to increase its impact. In addition, political threats can be considerably reinforced by using such data. To avoid the proliferation of these capabilities (e.g. for use in organised crime, terrorism, regional conflicts, failed states etc.) HRSD should not be disseminated commercially without prior control.

#### 2.4.3. *Market size and competition*

The European market (all Earth Observation services, incl. all satellite data sales) could be seen as being still small in absolute terms (turnover 2012: 700m €, approx. 300 companies, approx. 5000 employees). Yet it is an important element of the European space sector, as it is growing very fast (>10% average revenue growth per year), dynamic (8% growth p.a. in number of companies and companies devote more than 10% of the resources to developing new business) and R&D intensive<sup>15</sup>. The revenues coming from public customers are still dominant, but the private sector demand reached 43% in 2012 and a growth of almost 300% over the last 6 years. Approx. 60 % of the market is based on HRSD. There is a high percentage of young, innovative companies. The vast majority of them are micro (67%) or small companies (together 99%<sup>16</sup>).

But despite the high growth rate, the EU market for HSRD is rather underdeveloped compared to the U.S., where a single market exists. The U.S. companies were the first to enter the market in the 1990s when the U.S. government decided to allow commercial providers to distribute HSRD by creating legislation regulating the dissemination capacities. The strong position of U.S. earth observation industries is based on technically advanced satellite systems, a clear regulatory framework and a large public demand for commercial HRSD and services. This demand is to a great extent fulfilled through long duration commercial contracts (e.g. one of them worth 600m € a year), fostering U.S. industries' competitiveness, while in the EU Member States, the approach is rather to purchase and operate satellite-systems

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<sup>13</sup> EARSC, survey, p. 9.

<sup>14</sup> EARSC, final report, p. 60.

<sup>15</sup> EARSC – Comprehensive Industry Survey, Final Report (2013), p.21 et seqq. (available at [http://earsc.org/file\\_download/155/Industry+Survey+final+report+Sept2013+%C2%A9+EARSC.pdf](http://earsc.org/file_download/155/Industry+Survey+final+report+Sept2013+%C2%A9+EARSC.pdf)).

<sup>16</sup> EARSC, final report, p. 24.

publicly and not buying EO-products and services on the market. In addition, the U.S. competitors benefit from the very effective synergies between the civilian and the military/defence sector in terms of R&D. That has led to a situation where, for example, in 2009, 84% of the images that the European Union Satellite Centre (EUSC) used (and thus one of the bases for the Common Security and Defence Policy (CSDP)) came from U.S. providers<sup>17</sup>. As a consequence, the geospatial industry continues to grow in the U.S. while Europe is likely to continue in terms of at least partial reliance on U.S. HRSD providers, at least in short and mid- term perspective. In addition to the heavy international competition from the U.S., mainly on the level of data providers bringing the HRSD on the European market via data resellers, there are serious competitive pressures coming from India, China, Canada and others (in particular Korea and Taiwan).<sup>18</sup>

The EU market is not in a position to develop as fast as the U.S. largely because a number of structural problems exist (see problem definition below).

Within a decade (2010 to 2019), the number of commercial EO satellites expected to be launched worldwide will more than double from 140 during the previous decade to approximately 280<sup>19</sup>. The number of HRS-systems offering commercial data is expected to double even earlier (2015 onwards compared to 2010) as new private enterprises and government systems offering commercial solutions enter the market.<sup>20</sup>

The commercial remote sensing industry is a worldwide *emerging industry with strong growth and employment potential*<sup>21</sup>. EUROCONSULT has estimated that the size of the global commercial data market was approximately 1.3bn US\$ per annum (circa 1bn EUR) in 2010, a figure that has grown from just over 200m US\$ in 2001. In terms of the breakdown of the global market by spatial and spectral resolution, according to the study of Booz&Co, very high resolution (sub-meter resolution) data accounts for about 73% of the global market, high-resolution for about 20% and medium-resolution for the remaining rest<sup>22</sup>. This breakdown supports the current trend showing that low resolution EO data become more and more easily accessible (cheaper or even free of charge) while high resolution EO data are expensive and sensitive, representing therefore the main business for commercial EO data distributors.

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<sup>17</sup> [http://www.consilium.europa.eu/uedocs/cms\\_data/docs/mailing/file904.PDF](http://www.consilium.europa.eu/uedocs/cms_data/docs/mailing/file904.PDF)

<sup>18</sup> In the near future, the number of envisaged satellite launches and the growth of EO satellites systems operated in these countries are considerable: For example, Canada aims to launch 3 Satellites (Radarsat constellation) in 2018, leading to tripling the HRSD capacities compared to the current situation, India is quickly improving its HRSD capacities by the Cartosat (optical) and Risat (radar) satellite series and China will launch (after Gaofen-1 in April 2013) four or five satellites for high definition earth observation before 2016.

<sup>19</sup> See Euroconsult Research Report: “Satellite-Based Earth Observation - Market Prospects to 2020” (2011), p. 3. The study is available in ARES ((2013)2869223).

<sup>20</sup> See Euroconsult, Satellite-Based Earth Observation, p. 49.

<sup>21</sup> The world’s first high-resolution fully commercial Earth-observation satellite (Geo-Eye’s Ikonos) was launched in 1999 in the US. Since then, demand for commercial satellite imagery has increased as a result of improvements in spatial and spectral resolution, and hence in the number and range of its potential applications for government and defence purposes and across a wide range of sectors.

<sup>22</sup> See Booz&Co, p. 8.



According to EUROCONSULT, the sales for EO data are expected to rise up to nearly 4bn US\$ (approx. 3 bn €) in 2020 with a compound annual growth rate (CAGR) of 12%, with HRSD as primary supply source.<sup>23</sup>

For Europe, it is expected that the HRSD market revenue will increase from approx. \$ 250 M to approx. \$ 400 M in 2015.<sup>24</sup> Two additional countries will acquire HRSD capabilities: Spain (Ingenio, PAZ and the new Deimos satellites) as well as the UK (DMC3 satellite).<sup>25</sup>

However, commercially more important is the data-reselling or Value-Adding-Service industry as it globally generated 1.9 b\$ of revenues in 2010 with a 7% CAGR<sup>26</sup>.

### 3. PROBLEM DEFINITION

#### 3.1. The problem that requires action

##### 3.1.1. *No common definition of HRSD leading to unnecessary uncertainty for businesses*

Consultation of data resellers has revealed that the lack of transparency and predictability starts with the fact that there is **no standard definition of HRSD**. Without such definition it is not possible to know with certainty the threshold above which the access to satellite data is subject to regulation due to security reasons and, perhaps even more important for businesses, which kind of satellite data is not subject to it and therefore being considered directly and immediately available ("business ready").

In the three Member States where HRSD is regulated, there is a lack of common binding definitions and specifications which clearly establish the technical parameters for HRSD (e.g. spectral resolution<sup>27</sup>, spectral coverage<sup>28</sup>, spatial resolution<sup>29</sup>, radiometric resolution<sup>30</sup>, temporal resolution<sup>31</sup> and any additional information to be gained by the sensor), which has a negative effect on businesses. Some 60% of the stakeholder asked in the online questionnaire indicate, that it would be helpful for their business, to have a standard threshold for HRSD as it would contribute to the predictability of data availability.

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<sup>23</sup> See Euroconsult, Satellite-Based Earth Observation, p. 49.

<sup>24</sup> See Euroconsult, Satellite-Based Earth Observation, p. 178.

<sup>25</sup> See Booz&Co, p. 72.

<sup>26</sup> Euroconsult, Satellite-Based Earth Observation, p. 109.

<sup>27</sup> Spectral resolution - is determined by the specific wavelength intervals described by the minimum and maximum thresholds between which a sensor is sensitive (refer to a specific wavelength range of the electromagnetic spectrum that sensor can record). Wide ranges of the electromagnetic spectrum correspond to a so-called gross/raw spectral resolution and narrow bands of fine spectral resolution. When spectral range is narrower the power of discrimination is bigger, but the number of identifiable objects decreases.

<sup>28</sup> Spectral coverage – spectral range that can be collected by the sensor, for example UV, VIS, NIR, SWIR, TIR or microwaves.

<sup>29</sup> Spatial resolution - is the size of the smallest object that can be noticed on sensor recorded image and is defined by the area represented by each pixel (ie: ground area represented by a pixel).

<sup>30</sup> Radiometric resolution - determines how finely a system can represent or distinguish differences of intensity. The higher the radiometric resolution, the better subtle differences of intensity or reflectivity can be represented.

<sup>31</sup> Temporal resolution – minimum time between the sensing and the re-sensing of the same target area by the satellite system.

In addition, parameters to define HRSD evolve along with technology and the (international) availability of satellite data; therefore the problems caused by the absence of a definition are compounded by the fact that at present there is no mechanism to **update the HRSD definition**.

### *3.1.2. No transparent and predictable legal framework for businesses.*

The main problem is that businesses in the value chain **do not know the conditions when HRSD can be considered security-sensitive** and when they can be freely used for commercial purposes.

The **procedures and reasons for the decision that the commercial use has to be restricted** due to security concerns are also poorly known to those who are affected. This was an issue that has been particularly highlighted by respondents to the online questionnaire. In this context, 60 % of the respondents consider it helpful, if there was greater transparency when orders for HRSD are refused or not fulfilled.

**Reliable access to satellite data**, which is the “raw material” for every product or service is a key factor for the whole EO-business. So it is no surprise that in the EARSC study, the “lack of an operational data supply” was considered as the number one barrier to growth<sup>32</sup>. In line with this, our consultation gathered as a result that 70 % of the respondents consider it helpful to have improved access to HRSD. The importance of reliable, speedy and predictable access to data will become even more important in the future, when the private demand for the services and products will increase<sup>33</sup>. This derives from the fact that for the public demand the low price is the most important factor, while for the rapidly increasing private demand the high quality is the most important element<sup>34</sup>. At present, as several stakeholders stated in interviews, the VAS providers often try to replace the use of HRSD by using lower resolution data, even if the quality of their products and services is negatively affected, due to better availability of low resolution data compared to HRSD.

As HRSD is subject to controls for security reasons in any country having developed these capabilities, the reliable, speedy and predictable **access to it is heavily depending on the efficiency and transparency of the controlling system** put in place and therefore the regulatory framework. As the procedures and criteria to restrict access to HRSD for security reasons heavily affect the availability of data and its timeliness, it is crucial to have detailed knowledge about these procedures and criteria. Therefore it is problematic that data resellers/VAS and customers have almost no access to that kind of information, which for data resellers/VAS disrupts their ability to deliver according to what had been agreed with customers and for customers to get their desired product.

In this context, stakeholders (data-resellers/VAS) indicate, that they are not in a position to get a considerable share of potential business (10 – 15 %) because they cannot guarantee reliable and up to date information (e.g. for emergency response or natural disasters management) that customers require. In line with this, the consultation has also demonstrated

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<sup>32</sup> See EARSC survey, p. 13. Also Euroconsult, Satellite-Based Earth Observation, p. 110, identifies “the risk of data continuity” as “hindering growth potential”.

<sup>33</sup> See 2.4.3.

<sup>34</sup> See EARSC report, p. 66.

that a number of respondents are discouraged in day-to day practice to rely on HRSD due to the lack of sufficient guarantees for the delivery of the required data in time or at all.

Member States take different approaches. Only one Member State (Germany) has established clear *public* criteria to determine whether HRSD-transactions are security-sensitive. The other Member States have not done so. Consultations have revealed that although the criteria used are similar, in similar circumstances they produce different results. As a consequence, there can be an arbitrary treatment of companies of which they may not be aware, as some of the respondents to the online questionnaire have suggested in additional bilateral interviews.

Bilateral consultations and the questionnaire targeted at data resellers show that there is a large **majority (70% of respondents) of data resellers/VAS** in favour of standard criteria and procedures, to identify clearly when HRSD could be security-sensitive. Moreover, 60% of the respondents consider that it would be helpful for their businesses if criteria and procedures were identical across Europe.

According to the study of Booz&Co<sup>35</sup>, **less than 1 % of the data collected by the existing HRS-systems was subject to some kind of restriction due to security concerns**. More than 99% could be used commercially without restriction at the end, i.e. either directly after a successful security screening or with an authorisation by the security authorities. Therefore, with having an efficient screening and authorisation system for HRSD businesses should be able to obtain these more than 99% either without any delay (the vast majority) or with a very minor delay (the minor part that needs a prior authorisation). However, 45% of the data resellers experienced delays often (3 – 10 % of their requests for HRSD) and 10% of them even very often (more than 10 % of their requests). Among those, 40% state not to know the reasons. It has to be mentioned, that also for the data-providers delays are an important issue. For example, only for one specific product of one of the data providers, it is estimated that these losses are in the order of 1.5 to 2 m Euro per year.<sup>36</sup> Overall, the replies to the online questionnaire<sup>37</sup> showed that 23% of the data resellers have experienced security-related difficulties in obtaining HRSD from data providers.

To underline the importance and the high negative significance of delays to the business models, it has to be mentioned that any product or service that is based on reliable and timely access to HRSD cannot be offered when delays appear. On the basis of the EARSC report<sup>38</sup>, it appears that at present a large part (at least 30 - 40 %) of the revenues are made on the basis of speedily available data. This market is potentially at risk if to VAS/data resellers face problems with delays. And this problem will become more severe, as commercial demand for EO products and services is strongly increasing.

The above evidence confirms the lack of transparency and predictability in the current situation. The existing regulatory regimes only offer a limited and diverging level of transparency and therefore limited predictability for data providers, data-resellers and customers that cannot meet their legitimate expectations for favourable business conditions premised on free circulation of the HRSD throughout the EU internal Market.

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<sup>35</sup> See Booz&Co, p. 43 to 49.

<sup>36</sup> See Booz&Co, p. 96.

<sup>37</sup> See aggregated statistics of the online questionnaire in annex VI.

<sup>38</sup> See EARSC report, p. 60.

Especially for **SMEs/micros**, transparency of business conditions is a key element for business success and growth. SMEs cannot afford to deal with complex procedures to buy the necessary data or to invest to cope with administrative burden. As 99% of the businesses in the market are SMEs (incl. 67% micro) there is a strong need for a transparent and predictable legal framework.

In summary, the stakeholders' consultation, including data resellers/VAS, revealed that at present business development is thwarted by the lack of transparency, predictability and legal certainty.

### 3.1.3. *Obstacles to cross-border business activities.*

There is a **lack of guaranteed and fair access to HRSD for data resellers/VAS and their customers (businesses using (value-added) HRSD) regardless where in the EU the respective business is exercised**. This is not a commercial issue. It is the result of the application of systems that were designed with security as a primary concern.

The current national regulatory regimes<sup>39</sup> for HRSD take into consideration the **nationality** and the **location** of the business of the data providers and data resellers. Euroconsult explains, that “the localized [...] nature of the value-added services sector has created a fragmentation at this level of the value chain that has hindered growth”<sup>40</sup>. De facto, evidence gathered during the consultation process indicates that depending on the nature of the request, the nationality of the data reseller can influence the way in which HRSD is handled and whether authorisations for the release of HRSD are given or not. The reasons given for that are national security reasons. As a consequence, there is room to favour national/domestic businesses over those coming from another Member State. The online consultation of data resellers has revealed that 20% of them are aware of cases where the location of their business may have been an obstacle to obtaining HRSD. It could be argued that if a data reseller cannot get HRSD from one particular data provider it will address its request to another. However, this is not always possible as the data from one HRS system cannot be replaced with another (radar imagery cannot be replaced by optical imagery). Even if there is no hard evidence for discrimination against value-adding service providers on the basis of their nationality, it is a fact that the existing regulations in Member States and the decisions on the dissemination of HRSD take into account the nationality and the location of business of the VAS and their customers, and are therefore not unlikely to create more favourable conditions for nationals.

Serving as an indicator, it has to be mentioned, that although Earth Observation companies can be found in almost every Member State, the cross-border activities seem to be still limited. Almost 60 % of the employees are concentrated in the few Member States having HRSD-capabilities (FR, DE, IT) and the domestic or home market is still the most important<sup>41</sup> despite the nature of products and services allowing an easy transfer within the EU. This finding is consistent with the existence of regulatory barriers between Member States, as no

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<sup>39</sup> To give an example, the German Satellite Data Security Act – SatDSiG (§ 17 (2) 2nd sentence: Die Zusammenschau nach Satz 1 erfolgt in Ansehung der Person des Anfragenden und soll die Personen berücksichtigen, die bestimmungsgemäß mit den Daten in Kontakt kommen, einschließlich deren gewöhnlichen Aufenthaltsortes.) and the respective regulation – SatDSiV. Available at [www.gesetze-im-internet.de/satdsig/](http://www.gesetze-im-internet.de/satdsig/) and [www.gesetze-im-internet.de/satdsiv/](http://www.gesetze-im-internet.de/satdsiv/).

<sup>40</sup> See Euroconsult, Satellite-Based Earth Observation, p. 110.

<sup>41</sup> Cf. EARSC report, p. 69.

stakeholder argued that the current infrastructure capacities would constitute a bottleneck for the growth of the downstream sector.

An additional obstacle to cross border activities derives from the fact that HRSD transactions and further distribution of HRSD products and services that have been controlled in one Member State can nevertheless be subject to additional controls or interdictions in another Member State. This problem of potential double checks is aggravated by the fact, that in contrast to the existing HRSD-control systems in the three respective Member States focussed on the first dissemination from the data-provider to its customers the additional controls and restrictions can occur on every level of the value chain and are based on not HRSD specific legislation, e.g. on export controls, on classified information or general penal law.

For the data providers and, even more important for the VAS/data resellers and their customers it is not clear, which different rules are applicable in different Member States in case of trans- border dissemination of HRSD or distribution of HRS-products and –services. The negative consequences are that double checks are possible, incl. doubling of time-consuming procedures, but most of all, uncertainty for all businesses involved (incl. penal consequences up to prison sentence). Therefore, the idea of a “one-stop-shop” was raised by a stakeholder who currently meets these problems, in order to avoid them and to have the legal certainty that the HRSD products can be sold freely wherever he wants. In addition, there was a broad consensus among stakeholders during the consultation that any kind of double check has to be strictly avoided, as it would have a negative impact on the business conduct and business growth.

Overall, the currently limited cross-border activities have been paraphrased by one of the participants to the public hearing as follows: There is no such thing as a common market for high resolution satellite data today.

Cross border data exchange is, however, vital for the prospects of the business and the internal market, as availability of timely data has been identified as a key factor for success. Therefore the need for a framework dealing with cross border activities increases quickly and that framework should be transparent, predictable and fair in terms of equal treatment. The multitude of today's national frameworks does not satisfy these requirements.

#### *3.1.4. Limited competition at data provider level*

At present, the competition among EU data providers is relatively low, due to the fragmentation of the market along national jurisdiction lines, the legal frameworks in Member States which do not allow setting up a data provider business outside the respective Member State (see 2.3.) and the fact, that at present, it is not possible for data resellers/VAS to become data providers. The result is a very small number of market actors on data provider level (only two companies within EU, see 2.4.1) and a section of the value chain which is set up by the regulatory frameworks, possibly neglecting market demands and consisting of one satellite system, one satellite operator and one data provider.

The lack of transparency vis-à-vis potential operators in this market is an issue. The online consultation of data resellers has revealed that 65% of the respondents would like to get into the data provision business. This consultation was followed up with bilateral discussions which revealed that there is lack of transparency at national level regarding the conditions (such as facility security requirements for handling and storing data, technology standards and qualifications and security clearance requirement for personnel) to become a data provider.

### *3.1.5. Influence of security interests*

The current situation can be described as the consequence of path dependency without coordination. It should be noted that Member States have already understood that also for security reasons, it is in their interest to cooperate more (see below).

The existing differences in the regulatory frameworks in place cannot be explained by the differences in the Member States' security interests, as these are closely connected and to a large extent similar taking into account in particular the Specific Provisions of the Common Foreign and Security Policy (Chapter 2 TEU) and especially the principles of loyalty and mutual solidarity of Art. 24 (3) TEU. The reasons for the observed differences are rather the independent development of these regulatory frameworks without any coordination, the strong focus on security aspects, the focus on the national businesses, in particular the space sector, and the different national traditions in terms of administrative systems and of relations between government and industry.

At first sight, there seems to be a possible trade-off between security and commercial activity. But taking into account the fundamental importance of (national) security issues, it is becoming evident, that these are not made for trade-offs. The challenge is to have a good and efficient framework that fully respects the security interests and allows nevertheless a maximum of commercial use in order to have a system that allows the young industry to grow without hitting obstacles at the national borders within the EU.

The present Impact Assessment does not directly explore the security issues related to the fragmented regulatory framework as these are beyond market concerns. However, it should be mentioned that the European External Action Service (**EEAS**) and Member States are concerned that fragmentation leads to a loss in the security dimension. According to their analysis, divergent definitions of HRSD across Member States and divergent criteria to determine the security sensitiveness of HRSD could lead to a different treatment of HRSD in different Member States of the EU and might even create security loopholes. In addition, it is obvious, that a system, where every Member State defines its own security interests without synchronising them with other Member States and the EU, would have negative effects. Taking this into consideration, EEAS has started a parallel process to get Member States' advice on the handling of the security aspects and stated readiness to support the Commission in analysing the security implications of the proposed initiative.

To summarise, there is no trade-off between security and internal market objectives, but there is a need for a solution which provides for the proper functioning of the internal market on HRSD, while at the same time leaving Member States room to define their proper security interests and to translate them into the regulatory framework.

## **3.2. Underlying drivers of the problem**

The problems derive from the fact, that the Member States have up to now acted on their own and thus have developed regulatory frameworks designed to enable commercial activity in the respective Member States only.

Due to the structure of the HRSD value chain on the upstream levels (one Member State, one satellite operator, one data provider) and these Member States having a clear focus on the space sector, the lack of transparency for data resellers, VAS and customer businesses and the cross-border exchange of HRSD were not considered as being of vital interest. While

focusing on security aspects and public policy considerations, regulators have neglected the commercial potential of remote sensing information services<sup>42</sup>.

In addition, there are two factors that will increase the significance of the problem: the fast growing private demand for HRSD and the strong trend to establish respective services in the “non-spacefaring” Member States. In fact, the market analysis shows that more and more companies are springing up that are located in Member States without capacities. Therefore the need for a framework dealing with cross border activities increases quickly.

### **3.3. Who is affected, in what ways and to what extent?**

**HRSD-providers:** The existing data providers are today on the one hand in a comfortable position. While they perceive market development as an opportunity, a more transparent framework that opens the possibility for others to enter the data provision business could be a threat. But on the other hand, their business is affected by the regulatory barriers as these mainly occur at the stage of dissemination of HRSD from data providers to data resellers and VAS.

**Data resellers/VAS providers:** Their business is constrained by the effects of a fragmented regulatory framework for HRSD. By far the majority among them (99%) are SMEs/micros, who innovate on the basis of the raw data and provide a wide range of products and services based on the HRSD. At the same time however, due to their relatively small capital bases they are particularly vulnerable to any disturbances of their businesses. This is substantiated in the present Impact Assessment. By way of illustration, one data reselling company has stated that it could double its turnover if the regulatory conditions were uniform across the EU and access to data becomes more reliable.

**End user businesses:** They are affected by the constraints experienced by data resellers/VAS providers. Due to the problems that data resellers encounter today in obtaining HRSD, end-users have no guarantee that they will get a reliable service from data resellers/VAS providers and therefore need to acquire reliable services directly from the data providers, if offered and available. This is a considerable loss in terms of number of possible business partners and variety of products and services and a significant loss of competition on the supply side.

### **3.4. Evolution of the problem**

The problems explained above are the ones the market faces today. But the situation will become even more problematic in the future, as there will be (i) more Member States having HRSD capabilities and developing their own legal framework (at least two more Member States, the UK and Spain, will develop HRSD technological capabilities in the nearest future<sup>43</sup>), (ii) a quick growth of the market leading to more business and the need for more cross border activities and (iii) a change in the market towards more activities driven by the private sector, creating a higher demand for high quality products and services and leading to a higher need for transparency and predictability. The increasing number of Member States, the quick growth and the change in the market also create a demand for action at EU level, as

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<sup>42</sup> See European Space Policy Institute (ESPI), Report 36 “Economic and Policy Aspects of Space Regulations in Europe” (2011), p. 36, (available at [http://www.espi.or.at/images/stories/dokumente/studies/ESPI\\_Report\\_36.pdf](http://www.espi.or.at/images/stories/dokumente/studies/ESPI_Report_36.pdf)).

<sup>43</sup> See Booz&Co, p. 73.

action limited to the some Member States could not address these issues, in particular taking into account the obstacles to cross-border activities (see 3.1.3).

In addition, as the European External Action Service (EEAS) and Member States are concerned that fragmentation leads to a loss in the security dimension, it is likely that the problems will need to be addressed somehow. Taking into account the drivers and the development of the regulatory systems so far putting a strong focus on security aspects and on the national businesses (see 3.1.5), the internal market on HRSD could face even more problems.

In consequence, there is a need to act rather sooner than later and not to wait until the existing problems have slowed down the emerging EU-market to the benefit of the international competitors.

### **3.5. EU right to act**

The problems identified hinder the development of an EU internal market in the domain of HRSD. Consultations lead to the conclusion that a functioning internal market does not exist today. The basis for EU action is Article 114 TFEU, which deals with the approximation of laws of the Member States in order to achieve the objectives of Article 26 TFEU, namely, the proper functioning of the internal market.

The choice of Article 114 TFEU is justified by the need to delimit the internal market in HRSD and ensure the free circulation of HRSD based products and services across EU. For that purpose, it is necessary to overcome the fragmentation characterising the current market situation, which affects the market operators and results in barriers to trade.

Article 189 TFEU states that “To promote scientific and technical progress, industrial competitiveness and the implementation of its policies, the Union shall draw up a European space policy”. However, it does not provide an adequate legal basis for the approximation of the provisions laid down in Member States affecting the establishment and functioning of the internal market for HRSD goods and services i.e. the commercial aspects of trade of goods and services deriving from space applications, but not being space activities in themselves. This falls within the scope of Article 114 of the TFEU.

The Union action envisaged in this report complies also with the subsidiarity principle for the following reasons:

- Action by individual Member States alone will not ensure a coherent legal framework for HRSD distribution and address the above problems. A coherent framework can only be achieved by concerted action by Member States within the EU or action at EU level.
- An EU approach is the only way that will allow private businesses in the HRSD value chain to benefit from the opportunities offered by the EU internal market by creating a transparent, predictable and fair legal framework guaranteeing the principle of free circulation.

It should be noted that all Member States having expressed a view on this topic were in favour of EU action. The UK position is that an EU approach can be supported but that a non-binding approach would be preferred.



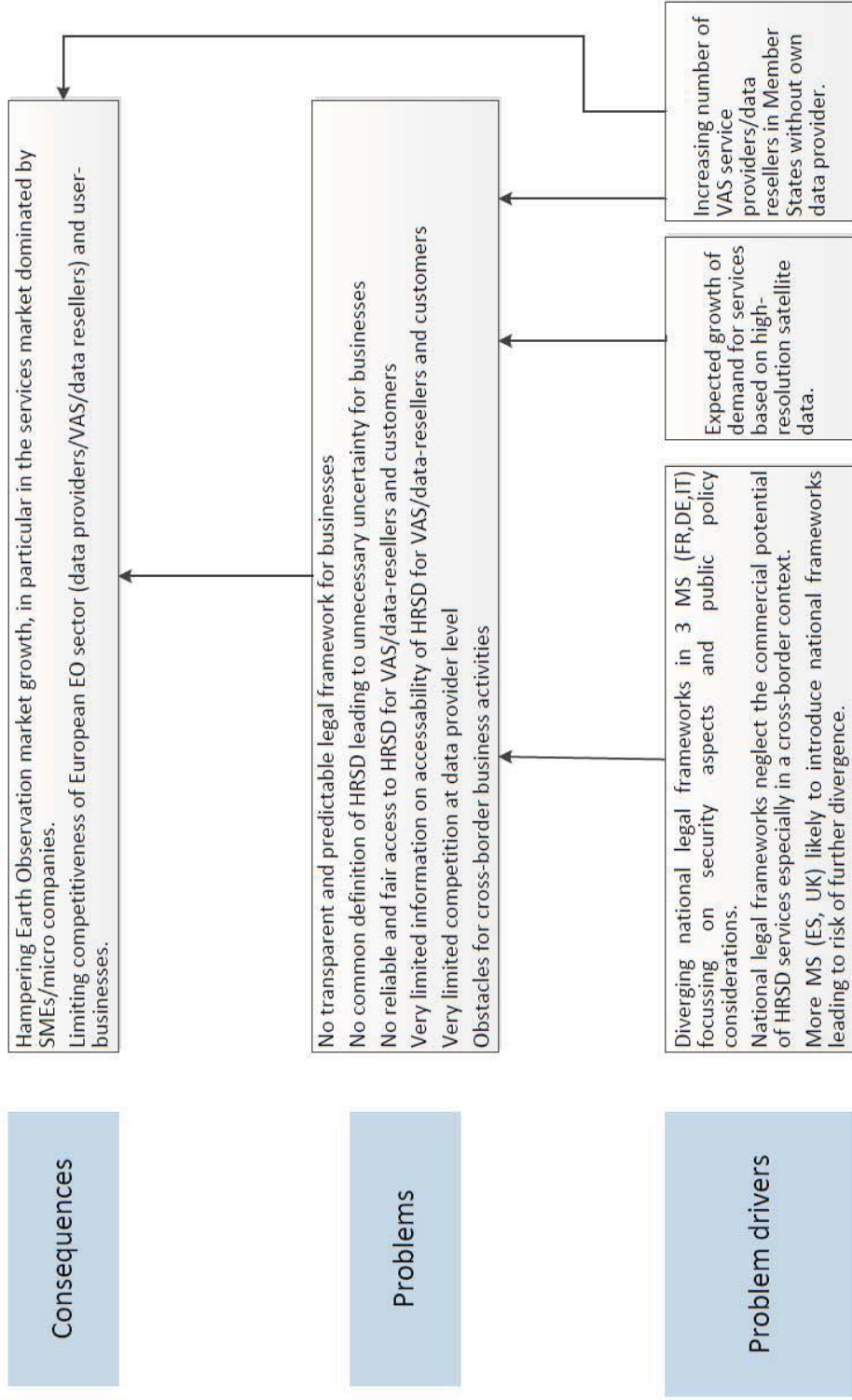
As explained in section 5, the options envisaged in this report do not go beyond what is strictly necessary to attain the goal of the initiative and, therefore, respect the principle of proportionality.

The present impact assessment also contemplates the possibility of tackling the problems identified in the problem definition through the open method of coordination, which leaves to Member States the responsibility of ensuring the approximation of their regulatory frameworks through a coordination process in Council.

### **3.6. Problem tree**

See next page.

# Problem Tree



## **4. OBJECTIVES**

### **4.1. General policy objectives**

The general policy objective of this initiative is to foster growth of the Earth observation (EO) markets in Europe, in particular the services market, to foster competitiveness of the EU EO-sector and to foster the competitiveness of EO-user-businesses in Europe.

### **4.2. Specific policy objectives**

The specific policy objectives are to facilitate the dissemination of HRSD in Europe while fully safeguarding security interests, to establish a more reliable access to HRSD, a good and sufficient level of information on accessibility of HRSD for VAS/data-resellers and customer businesses, and to facilitate competition at data provider level. These objectives all aim to foster the internal market on HRSD.

### **4.3. Operational policy objectives**

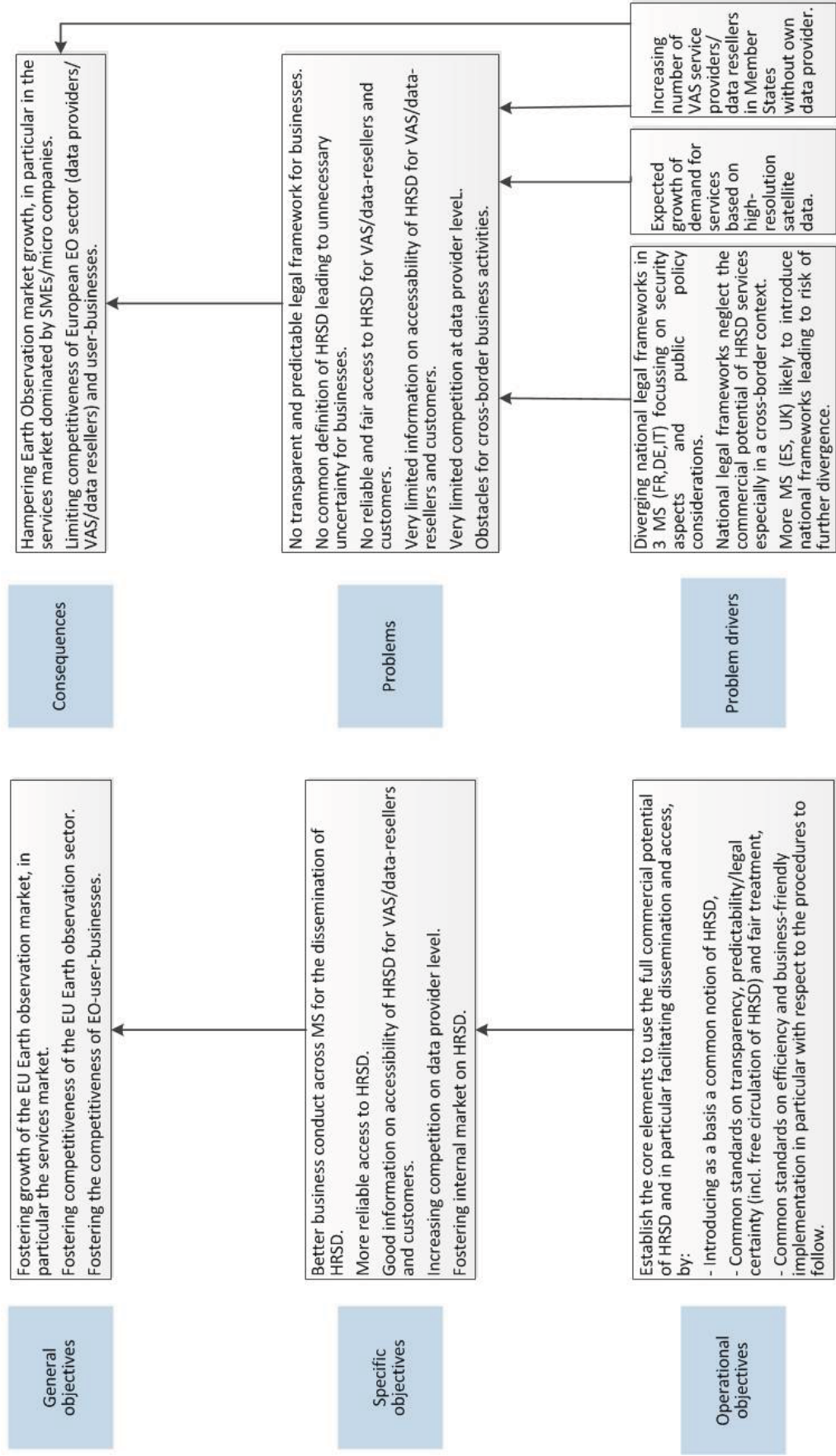
The operational objective is to establish the core elements needed for the realization of the full commercial potential of HRSD and in particular to facilitate the dissemination and access to HRSD:

- by introducing a common notion of HRSD, defining which satellite data could be security relevant and which is “business-ready”,
- by introducing common standards on transparency, predictability/legal certainty (incl. free circulation of HRSD) and fair treatment and;
- by introducing common standards on efficiency and business-friendly implementation in particular with respect to the procedures to follow.

### **4.4. Graph on problems and objectives**

See next page.

**Link between objectives and problems**



#### 4.5. Consistency with other policies and objectives

Space is a driver for growth and innovation, and contributes directly to the objectives of the Europe 2020 Strategy, Europe's growth strategy for a smart, sustainable and inclusive economy. The space sector is a driver to scientific progress and enables systems and services with growth potential in areas such as telecommunications, navigation and Earth observation. These systems and services guarantee independence and security for the EU. They help us address major societal challenges such as climate change, scarce resources or health, where remote sensing satellite data is an important source for acquiring up to date and precise information. They provide us with strategically important knowledge underpinning the EU's external relations in areas such as development-assistance and humanitarian aid. They stimulate innovation and competitiveness well beyond the space sector, and contribute to economic growth and job creation in almost all economic areas.

The Commission Communication on the EU Space Industrial Policy from February 2013 lays down a number of objectives and suggests measures to achieve these objectives. One key objective is to improve the framework conditions for space-related activities and one of the measures envisaged refers to HRSD distribution for commercial purposes.

The present initiative is fully consistent with the above broader policy objectives.

### 5. POLICY OPTIONS

This impact assessment identifies three options – in addition to the baseline scenario – that seek to achieve the objectives by setting up a framework for the handling and dissemination of high-resolution Earth observation data in the European Union. The following options are examined:

Option 1: Baseline scenario

Option 2: Recommendations and guidelines

Option 3: Basic legislative instrument

Option 4: Extended legislative instrument

Any of these options, except the baseline scenario, will seek to address the issues identified under the problem definition. The difference between options 3 and 4 concerns the scope, with option 4 including a licensing element that option 3 leaves to Member States.

The various options will seek to establish the following:

- (1) *technical parameters defining HRSD* establishing as a common definition of HRSD. These technical parameters will be established in accordance with the latest developments in the technological state-of-the-art (e.g. spectral resolution, spectral

coverage, spatial resolution, radiometric resolution, temporal resolution and any additional information to be gained by the sensor)<sup>44</sup>.

- (2) a *screening procedure, including common criteria* to determine whether HRSD requested can be immediately released or needs to undergo the authorisation procedure described below. The common criteria and their combination in the procedure will be further specified by Member States<sup>45</sup>. These specifications of the criteria should be factual, transparent and should not allow for any margin of discretion. The process should be fast and semi-automatic.<sup>46</sup>
- (3) an *authorisation procedure* for requests flagged as being security sensitive following the screening procedure, before being delivered to the customer. This procedure should identify the competent authority and set a target deadline for deciding on releasing or withholding the HRSD. The precise criteria to be applied under the authorisation procedure do not fall under the scope of this initiative and would be defined by Member States.
- (4) a *principle of free circulation of HRSD controlled at first dissemination* to foster the internal market by safeguarding the free circulation of HRSD based products and services that have undergone the proper control mechanism at the first dissemination set up by the respective Member State.

In addition, option 4 would address the establishment of *common criteria for licensing* of HRSD providers. Common criteria would include meeting specific conditions regarding security of installations for storage of data prior to dissemination and proper data handling, technological standards and security procedures (incl. security clearance for certain staff members). The licence should be issued by a competent authority at national level that would be responsible for ensuring that providers comply with the common criteria. Licences would be mutually recognised in all Member States. This would facilitate access to the data provision business allowing more competition at this level of the value chain.

### **5.1. Option 1: Baseline scenario – No EU intervention**

In the absence of EU intervention no common framework would be established and the Member States would eventually establish their own national ones. The consequences and likely evolution are described above in more detail in section 3.1, 3.2, 3.3 and 6.1.

### **5.2. Option 2: Recommendations and guidelines**

As HRSD has a strong security component, an area which falls under the exclusive competence of Member States, the Open Method of Coordination (OMC) could be used to coordinate national policies in the field of HRSD in order to achieve common objectives.

This option aims at establishing a coherent legal framework for HRSD in each Member State, while the Commission would have a coordination role.

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<sup>44</sup> Examples for influence of these technical parameters on use of data and products given in annex II (technical background).

<sup>45</sup> For example: one of the common criteria would be the target area. The identification of the specific target area/s will be the responsibility of Member States.

<sup>46</sup> See as an illustration of these criteria and procedure example given in annex II (technical background).

Member States could set as an objective the setting of common technical parameters defining HRSD, similar criteria for licencing, and similar screening and an authorisation procedures, to be then implemented at national level. Member States could also envisage a mutual recognition mechanism for nationally issued licences for the dissemination of HRSD. However this would be a very complex process requiring a high degree of commitment from Member States and therefore it is not considered a likely element of this option.

Once Member States have reached an agreement on the common objectives, they would need to be adopted by the Council. Then, Member States would transpose these objectives into their national policies. In addition, indicators for measuring the systems' efficiency and effectiveness would need to be jointly agreed. Such indicators could be the time lag between a data request being submitted to a provider and the moment the requested data is distributed, the number of rejected data requests, number of complaints introduced by entities whose data requests have been rejected, etc.

Finally, results would be monitored and evaluated. Following the evaluation, recommendations could be formulated for those Member States whose systems have been negatively ranked/scored in order to mitigate and improve the situation. If several Member States were ranked below the European average, new common objectives could be formulated. As opposed to the baseline scenario, the European Commission could have a supervisory and monitoring role, but this would remain limited.

While monitoring the efficiency of the national systems and by exchanging best practices and lessons learned, Member States might tend to adjust their own systems which over time might lead towards more uniformity across Europe. However, this process might take a long time before producing its effects.

While this option is a realistic one, the vast majority of Member States have explicitly stated during the consultation process their lack of confidence in this option, which is considered cumbersome and inefficient.

In contrast to the OMC, a Commission recommendation has been considered as not being an effective measure, as Member States would not be reassured that their security interests and the commercial interests of their businesses would be respected to an appropriate degree by every Member State, due to the non-binding nature of a Commission recommendation. Taking this into consideration, the risk that the Member State would still apply diverging legislation or only very slowly follow the recommendations would be high. For these reasons, a Commission recommendation was discarded from the options.

### **5.3. Option 3: Basic legislative instrument**

#### *5.3.1. Core substantive features of the option*

This option creates at EU level a legal framework with basic conditions on the commercialisation of HRSD.

This legislative approach would cover at the EU level:

##### **5.3.1.1. The establishment of common technical parameters of HRSD**

These technical parameters will be established in accordance with the latest developments in the technological state-of-the-art (e.g. spectral resolution, spectral coverage, radiometric

resolution, spatial resolution, temporal resolution and any additional information to be gained by the sensor).<sup>47</sup> The legislative instrument would foresee a mechanism for updating the HRSD definition.

This first element defines which kind or quality of satellite data could possibly harm security interests and therefore needs to be disseminated with respect to certain conditions. Any data falling outside the definition can be freely disseminated without delay. This common definition sets up a common scope of application. Member States would not have the flexibility to set up another definition.

The common definition of HRSD will have the positive effect that any data with lower resolution would not be subject to any restriction due to security reasons. At present, the legal definitions (in FR and DE) are not identical, but to a large extent similar. As they are also designed taking into account the existing systems, it would not be justified to say that one of them is generally more restrictive and the other one is less restrictive. That is why a common definition of HRSD drafted as described above would not have direct implications for the existing operational HRS-systems and for the Member States already having a legal definition of HRSD (FR, DE).

On the international level there is no definition of HRSD as such, but a regulation of existing HRS-systems is done on a case-by-case basis by the respective countries.

To give some orientation or illustration, a definition, based on the existing current legal definitions in Member States (FR<sup>48</sup>, DE<sup>49</sup>), would look as follows<sup>50</sup>:

The notion of HRSD depends on the capabilities of the earth observation system, its sensors and sensor modes which are used to generate the Earth observation data. This is the case if

- data is generated in any spectral range (among others UV, VIR, NIR) with a geometric resolution of 2.5 metres or less in at least one spatial direction, or
- in the 8 to 12 micrometre spectral range (thermal infrared) with a geometric resolution of 5 metres or less in at least one spatial direction, or
- in the 1 millimetre to 1 metre spectral range (microwave) with a geometric resolution of 3 metres or less in at least one spatial direction, or
- with a number of spectral channels > 10 (super and hyperspectral sensors) and a geometric resolution of 8 metres or less in at least one spatial direction, or
- with an inherent positional accuracy of 10 metres or less.

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<sup>47</sup> More detail on the technical criteria and processes and their effects on the use of data see annex II.

<sup>48</sup> Décret no 2013-653 du 19 juillet 2013 modifiant le décret no 2009-640 du 9 juin 2009 portant application des dispositions prévues au titre VII de la loi no 2008-518 du 3 juin 2008 relative aux opérations spatiales.

<sup>49</sup> Satellitendatensicherheitsverordnung vom 26. März 2008 (BGBl. I S. 508).

<sup>50</sup> Differences between FR and DE legal definitions where solved by using the definition (for illustration purposes here) which is more restrictive.



### 5.3.1.2. The obligation to introduce a screening procedure for the dissemination of HRSD

The screening procedure will identify whether HRSD needs to undergo an authorisation procedure. In the screening procedure the different steps and decisions to be taken would be defined without leaving any room for discretion to avoid any mistakes and to allow a semi-automatic implementation.

The common criteria for the screening procedure take into account all relevant factors of the dissemination of high resolution satellite data. The aim is to ensure that the Member States can, on basis of these general characteristics, set up the most appropriate conditions by specifying these criteria and by combining the resulting standards in the best suitable procedure. In particular due to its transparency and its capacity to deliver clear results allowing a fast and automatic implementation, making it an efficient filtering system, the screening procedure allows fostering the commercial use of high resolution satellite data.

The common criteria would include technical characteristics of the satellite, sensed area or region, the delay between data acquisition and delivery, the ground segments to which the data are to be transmitted and the end customer. No other criteria may be used for the screening procedure.

The concrete specification of these criteria would be done by the Member States individually, i.e. they can decide on how every single criterion would be applied. For example for the criterion “spatial resolution” they would specify a certain threshold (e.g. 0.5 m) and how this would be combined in a procedure with other criteria to be specified the same way (which type of sensor, which sensed area or region, which delay between data acquisition and delivery). All of this will be defined by Member States according to what is needed for safeguarding the security interests.

In practical terms, the screening procedure would be carried out prior to the dissemination of HRSD by the data provider to his customer (e.g. a VAS or an end user business). Member States can decide who should be responsible for operating the screening procedure. Theoretically, there are at least three possibilities: The data provider, an independent (licensed) private entity or an administrative authority. As the screening procedure will be implemented in a way which makes possible its fast and semi-automatic operation it could be the most efficient approach, to leave it under the responsibility of the data provider (who operates under an effective licensing and monitoring scheme). This would be also in line with experiences made with some of the existing systems in Member States.

### 5.3.1.3. The obligation to introduce an authorisation procedure for the dissemination of HRSD

While appropriate conditions for the screening procedure should enable the dissemination of high resolution satellite data in the vast majority of cases, there will still be for the rest of the cases (those flagged as “sensitive” in the screening procedure) a need for an authorisation procedure during which an in-depth assessment will be carried out considering all circumstances of the individual case, in order to safeguard the access to high resolution satellite data.

This option foresees to introduce an authorisation procedure for the dissemination of HRSD respecting of some procedural standards. The authorisation procedure would be carried out by the respective Member State.

For data providers, the right to apply for authorisation for the dissemination of HRSD at the competent national authority would be created, to be followed by a transparent administrative procedure, legally defined reasons for denial and possibility for appeal. In addition, a short target deadline (e.g. one week) for deciding and possibilities for multi-case authorisations (for grouped or repetitive requests) should be created in order to speed up the process for the benefit of the businesses. The other details of the procedure and in particular the security assessments on which the decisions will be based would remain within the responsibility of Member States.

#### 5.3.1.4. Introducing the principle of free circulation of HRSD controlled at first dissemination

The internal market logic requires explicit safeguards for the free circulation of HRSD based products and services that have undergone the proper control mechanism at the first dissemination set up by the respective Member State. A subsequent national control with the same object by another Member State will be prevented. So Member States will be obliged not to restrict the dissemination from other Member States, where that dissemination has been approved in accordance with the due procedures and as far as the scope of the screening/authorization is respected. This regulatory element is of high importance for businesses from Member States exercising jurisdiction over HRSD capabilities, and for businesses from Member States not having jurisdiction over similar capabilities, being on the receiving end.

By introducing the principle of free circulation, additional controls or interdictions in another Member State will be prevented, and the focus of the security check will be laid on the first dissemination from the data-provider to its customers (mainly VAS/data resellers). This will eliminate additional controls and restrictions affecting subsequent levels of the value chain and deriving from not HRSD-specific legislation thus fostering legal certainty.

#### 5.3.1.5. Implementation

This option would put in place the necessary mechanisms to ensure the proper implementation of the foreseen measures and in particular it would:

- ensure the *non-discriminatory access* to HRSD by creating an obligation to make publicly available criteria and procedures and specify and establish them in a non-discriminatory manner;
- set up a *notification mechanism* whereby competent national authorities need to inform the European Commission of any measure adopted in this respect;
- define *indicators* to measure the degree of achievement of the objectives.

By defining the technical specifications of HRSD, the legislative instrument will establish the data subject to the regulatory framework and therefore only the data that could be subject to Member States restrictions, while exempting the (“business ready”) data with lower technical characteristics from these national restrictions. So a common definition of HRSD will have the positive effect that any data with lower resolution would not be subject to any restriction due to security. The definition of HRSD will be part of the legislative instrument. The initial definition should be given by the co-legislators, so Member States are involved via the Council. As the definition should be open to changes due to technological developments, a flexible legal mechanism is needed to allow the adaptation of the definition – the primary

solution for that need is the possibility for the adaptation to be introduced through delegated acts. That solution would ensure the involvement of the Member States as well.

The control of the dissemination of HRSD would be implemented by Member States individually, allowing them to safeguard their particular security interests, but doing this according to common standards. The standards concern the elements controlled, the transparency, the efficiency and the reporting. This creates a transparent, predictable and fair legal framework. In addition it is expected that the reporting on the results of the controls and possibilities to compare the results and the efficiency of the controlling-systems implemented can stimulate a process of optimising and harmonising the systems.

Member States will be given enough room to address their specific security interests in the specification of the screening procedure and the set-up and implementation of the authorisation procedure.

With this approach no trade-off between security and internal market will be required, but instead an instrument is created, which allows the proper functioning of the internal market on HRSD while at the time leaving Member States room to define their proper security interests and to translate them into the given mechanism.

### 5.3.2. *Legal instrument (delivery mechanism)*

In determining the most appropriate legal instrument, the following considerations must be taken into account into account:

- The fact that the legislative initiative aims at the emergence of an internal market approximation;
- The respect of the subsidiarity principle, which implies that Member States should remain responsible for the implementation of mechanisms for the control of HRSD distribution;
- The respect of proportionality, which implies that the initiative only addresses issues that have been identified as indispensable for a coherent approach at EU level, and for the emergence of an internal market for HRSD products and services.

On the grounds specified above, the different options available for a binding legal instrument, as provided in Art. 288 TFEU, are the following:

#### 5.3.2.1. Regulation

A regulation is directly and generally applicable. It provides a uniform comprehensive regulatory solution, replacing any existing national legal arrangements that fall within its scope.

Therefore, it is generally associated with a requirement for a very high level of detail of the normative prescriptions, and, in view of the absence of other sectoral regulation for HRSD treatment at EU level, it would have to be in terms of scope of exhaustive nature. Part of the possible problems with such an intensive regulatory intervention in an emerging market segment can be countered with flexible arrangements for implementation and further elaboration/update of the regulatory framework (through implementing acts in accordance

with Art. 291(2) TFEU, in case of need to ensure uniform implementation; or/and delegated acts under Art. 290 TFEU, in case the aim is to supplement or amend non-essential elements of the regulation).

5.3.2.2. Directive

A directive leaves to Member States the choice of form and methods for achieving the regulatory goal. The legal certainty requires that the differentiated legal regime established for dissemination of HRSD, will be introduced as a generally applicable one. It should be binding not only for the Member States having HRSD capabilities, but for all Member States in order to ensure the realization of the internal market effect of the legislative measure and to contribute to the market development. For that purpose, the directive would define HRSD, the constitutive elements of the screening and authorisation procedures and enshrine the principles of non-discrimination and of free circulation of HRSD controlled at first dissemination. It would also contain provisions providing for flexible mechanisms for the monitoring of its implementation, and for its adaptation to technical progress (through a mandate for a Delegated Act under Art. 290 TFEU).

**5.4. Option 4: Extended legislative instrument**

This option is based on the same elements as option 3 (definition of HRSD, screening system, authorisation procedure, principle of free circulation) but also includes the establishment of common criteria for licensing for HRSD providers (licences to be issued by national authorities) which is part of the problem identified during consultation with stakeholders.

The common criteria shall include:

- technical and organisational measures to prevent access to unauthorised third parties to the installations used for receiving, processing or storing data produced by a high-grade earth remote sensing system;
- measures to protect the inadvertent disclosure of HRSD to unauthorised parties when a data provider transmits data between different facilities under its control or to another data provider;
- measures to secure dissemination of the data generated by a high-grade earth remote sensing system;
- security clearance requirements for personnel having access to command facilities used for receiving, processing, storing and delivering HRSD.

In terms of delivery mechanism, the same considerations as those laid out in section 5.3.2 apply, as the additional substantive element of licensing can be achieved through a directive.

**5.5. Synoptic view on policy options**

Possible elements for a legal framework	Option 1:	Option 2:	Option 3:	Option 4:
	Baseline scenario	Recommendations and guidelines	Basic legislative instrument	Extended legislative instrument
Technical parameters defining HRSD	N/A	possible	X	X
Establishment of a screening procedure and	N/A	possible	X	X

criteria for the definition of “sensitivity” of HRSD				
Basic standards for authorisation procedure on sensitive data requests	N/A	possible	X	X
Principle of free circulation of HRSD controlled at first dissemination	N/A	possible	X	X
Licensing system for the dissemination of HRSD, incl. Provisions on security of installations for handling HRSD	N/A	N/A	N/A	X

## 6. ANALYSIS OF IMPACTS

The following impacts are deemed the most relevant for this initiative and will be assessed in this chapter:

- *Economic impacts:* This section focuses on the effects of transparency, predictability/legal certainty, free circulation of HRSD and fair treatment on HRSD businesses and on the administrative burden stemming from the implementation of the various options. It should be noted that, in general, costs involved in implementing the various options will be limited and proportionate to the cost of existing frameworks.
- *Social impacts:* the availability of data for different applications and impacts on employment will be considered in this section.
- *Other impacts (incl. political and strategic impacts)* of the initiative are to be addressed in a third section, since dissemination of HRSD raises security considerations for both the EU and countries producing it, countries represented by the satellite imagery, and countries which see their security and foreign policy interest exposed.

For options 3 and 4, the impacts of implementing different legal instruments will also be examined.

### 6.1. Impacts of option 1: baseline scenario

#### 6.1.1. Economic impact

In order to illustrate the administrative costs of the existing frameworks, it should be noted that for example, in Germany, the competent authority for the implementation of the national regulation on HRSD (the Federal Office of Economics and Export Control) allocates approx. 200.000 € per year for this responsibility.

Concerning the administrative burden, stakeholders indicated that for data provider businesses, the initial costs (i.e. implementing the licensing requirements) are approx. 200.000

€<sup>51</sup>, while the annual operating costs are approx. 300.000 € (2-3 full-time equivalents (FTE)<sup>52</sup>, technical equipment, and administrative fees).

From the interviews and meetings with Member States, it is clear that they do not envisage at the moment to start a process<sup>53</sup> that would lead to overcoming the obstacles identified in the problem definition. This will have the following impacts on the market:

- HRSD distribution procedures will vary from one Member State to another adding to the lack of transparency for the economic operators. Divergences between dissemination procedures (restrictions, timing or administrative phases) are expected to influence HRSD availability, generate undue delays and overall introduce inefficiency in the dissemination of HRSD;
- inefficient and diverse procedures lead to different treatment of what is considered sensitive (different permissibility thresholds) in each country reducing predictability for businesses;
- applicable procedures may not be made public everywhere adding to a lack of business predictability.

The negative impacts on the market are considerable even if the consultation process has brought to light the difficulty in quantifying market losses or potential business losses for data resellers/VAS. But, but one of them estimates that his turnover could double if the regulatory conditions were uniform across the EU and access to data becomes more reliable. There is consensus that a more reliable access to data can be achieved by addressing the lack of transparency, predictability and equal treatment.

More important than the actual losses (<5 % of turnover) are the potential business losses or losses of promising business opportunities. On one hand, the fact that data availability cannot be guaranteed may deter customers. On the other hand, the delays in obtaining data generally results in higher costs.

For the data provider level, Booz&Co reports of one of the data-providers having assumed losses for one specific product in the order of € 1.5 to 2 million per year. It is clear, that the effect on sales on all products of all data providers and including the other levels of the value chain would be several times higher.

In a nutshell, while this sector of the internal market is expected to see an increase in its short-term revenue, under the baseline, the emergence of an internal market for HRSD products and services faces serious obstacles.

A number of the present investors in the sector might reassess their intention to build their business models on HRSD based products. As specified in section 3.1.2, the consultation has revealed such considerations from certain VAS/data resellers trying to limit their reliance on HRSD in favour of utilisation of lower resolution data, even if that has negative impacts on the quality of the data products and services.

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<sup>51</sup> See Booz&Co, p. 33.

<sup>52</sup> Id., p. 36.

<sup>53</sup> NB: The above mentioned (see 3.1.5) parallel process started by EEAS is at a very early stage and focusses on security issues.

### 6.1.2. *Social Impact*

The absence of some form of common approach to dealing with HRSD will have a negative impact on the availability of data that could be used for environmental and other applications, such as agriculture, education or research.

Furthermore, the full potential of an internal market for HRSD will not be developed and the job creation potential will be limited.

### 6.1.3. *Other Impacts (incl. Political and strategic impact)*

The absence of a common approach and therefore the persistence of divergent definitions of HRSD across Member States and divergent criteria to determine the security sensitiveness of HRSD could lead to a different treatment of HRSD in different Member States of the EU and might even create security loopholes.

### 6.1.4. *Stakeholder views*

There is a common understanding among the Member States about the problems.

The consultation of stakeholders, consisting of an online questionnaire targeted to data resellers, and a public hearing to solicit the views of data providers and data resellers, carried out in June and July 2013 confirmed the public perceptions regarding the identified problems. The responses collected revealed that data resellers do encounter difficulties in accessing data, that they experience lack of transparency and that they are aware of the fact that there is no equal treatment of data resellers when it comes to releasing HRSD. Data resellers expressed the view that anyone in this market knows its constraints and overwhelmingly supported that it is necessary to improve the existing framework as a means to create conducive business environment.

## **6.2. Impacts of option 2: recommendations and guidelines**

Option 2, could in principle deliver on the objectives. The impact analysis considers the impacts this option would have in the ideal situation where Member States would agree to adopting common measures for the purpose of regulating HRSD.

However, the serious drawback of this option is that Member States may fail to agree and therefore the option may be ineffective. Member States have explicitly stated at Space Policy Expert Group meetings their lack of confidence in this option, which is considered cumbersome and inefficient. This type of considerations reflects the core problem of recommendations or any other form of non-binding guidelines – the lack of a mechanism to ensure reciprocal compliance, critical for an area with such a public intervention and security repercussions.

### 6.2.1. *Economic impact*

The adaptation of existing national legislation or establishment of new legislation will lead to limited expenses for Member States, comparable to the expense occurred today in Member States where regulations are in place. There would be limited costs linked to the workload, travel and logistics inherent to the implementation of the open method of coordination itself.

For Member States, the additional administrative costs linked directly to an EU initiative (i.e. the result of the OMC) would be negligible.

A coherent legal framework leaving no room for interpretation of rules to follow, would help reducing bureaucratic barriers for industry and ease the effort necessary to comply with diverging regulations. There would be obligations for notifications and reporting as an administrative burden, but the administrative burden due to the EU initiative itself, i.e. compared to the administrative burden resulting of the Member States regulatory framework would be very minor.

Business predictability would be improved as there will be clearer conditions for the set up and the operation of businesses. Especially for the operations it is vital, that there is an effective response to meet the user market demand and that this is easy to plan, even for long term user agreements<sup>54</sup>. It would be possible to give long term service guarantees to customers, which is indispensable for the success of the business.

For the VAS/data resellers, the benefits of a **common definition of HRSD** would be to know exactly which satellite data is subject to regulation due to security reasons and, perhaps even more important for them, which kind of satellite data is not subject to it and therefore being considered directly and immediately available ("business ready"). There is no information source available about how their business would develop in quantitative terms on the basis of this common standard. But following general considerations on the benefits of fostered business predictability and more transparency on products and services for customers it is expected that there will be a significant positive effect. The consultation has also confirmed these significant positive effects on the businesses of VAS/data resellers, as 60 % of them consider a common definition helpful for their businesses.

A **transparent and predictable legal framework** creating legal certainty and ensuring free circulation of HRSD within the limits of the screening/authorisation would have a significant positive economic impact for businesses of VAS/data resellers. Even if we cannot provide a quantitative analysis of the positive effect as there are no data-sources available, an improvement of the framework conditions for business conduct will have a positive effect for the businesses. In this light, for example, one of the stakeholders (data reseller) indicated, that his business suffered severe losses due the lack of transparent, clear and predictable conditions for the data acquisition. Further information on what the VAS/data reseller businesses consider helpful for their business development have been given more in detail in section 3.1.2.

The establishment of coherent legal frameworks for HRSD in each Member State would bring about transparency and legal certainty among data providers and data resellers/VAS and would consequently translate into progressive gains in business predictability. This will have a positive impact on the competitiveness of EU businesses in the sector leading to a higher quality of services and more competitive prices. This development will have a positive effect on the businesses which use HRSD products and services (see 2.4.2, e.g. oil and gas, agriculture, mining and forestry).

This option contributes to reinforcing the trend of economic growth and job creation referred to in section 3.1.2. Clarifying the conditions for handling of HRSD for commercial use will foster the supply of HRSD and should stimulate the demand and open new business opportunities for European data providers to prosper, benefiting from a more "level playing field".

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<sup>54</sup> According to Booz&Co, p. 66.



Altogether, there would be significant positive effects for the establishment and operation of data providing businesses and on data sales.

It can also be argued that the development of HRSD market will have an indirect impact on the satellite industry as manufacturer of high resolution satellites. The increased demand for HRSD products and services is likely to result in an increased demand for satellites in the longer term.

Those positive impacts depend on a comprehensive and timely implementation of a common policy, given the dynamic nature of the emerging HRSD market structure. As the effectiveness and efficiency of the process under the open method of coordination is uncertain, the economic impacts will only materialise in the best case scenario for the open coordination method. It would require a timely reaction of the European regulators to capture the full potential of the HRSD, which cannot be guaranteed under this option, or any other variants of non-binding orientations from the Commission (for example recommendations), where the final result remains uncertain.

### 6.2.2. *Social impacts*

The introduction of a coherent legal framework across Member States in a timely manner is likely to generate jobs. For example, since the establishment of the legal framework for HRSD, there were created approx. 170 new jobs at the primary data provider level in Germany.

Besides direct job growth in the data providing businesses, additional job growth at other levels of the production chain (i.e. data resellers/VAS and satellite manufacturer and operators) would be expected, due to the possibilities of a higher quality of services.

Furthermore additional indirect job growth would be expected under this option, as industries do not only generate their own revenue but also drive value generation in adjacent sectors or value chains<sup>55</sup>. Although this effect is difficult to quantify due to the many interdependencies, recent studies estimated the impact of the space industry on the UK economy. A study by the British Department for Business Innovation & Skills, for example, concluded that the space industry has a very high productivity, several times higher than the overall economy in the UK. Since the space industry relies on other sectors, each employee drives the employment of several workers in these adjacent industries. The UK BIS study estimates a 4.2 multiplier for downstream services (like satellite operators)<sup>56</sup>. This means that, for every 10 employees in the satellite industry, an additional 32 jobs are created in other sectors. For upstream services (like manufacturing) this factor is 3.6. Similar studies for the US economy mention a factor of up to 6 for the overall space industry.

Another issue that should be highlighted in particular in terms of impacts is the importance of a coherent HRSD policy for improvements in policy areas, where HRSD products and services are heavily in use, e.g. security and defence, local and regional planning, environmental and climate monitoring or emergency services. To give an example discussed

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<sup>55</sup> See Booz&Co - *Why satellites matter? The relevance of commercial satellites in the 21st century – a perspective 2012-2020*, p. 64  
(<http://www.esoa.net/upload/files/news/Why%20Satellites%20Matter%20-%20Full%20Report.pdf>).

<sup>56</sup> See UK Space Agency - *The Size and Health of the UK Space Industry*, p. 5  
(<http://www.bis.gov.uk/assets/ukspaceagency/docs/industry/size-and-health-report-oct-2012.pdf>).

during the consultation, a considerable share of the HRSD products and services is used for environmental monitoring. Therefore any improvement as to the quality of these services could foster the achievement for example of the ambitious EU climate change goals by providing cost-efficient and precise worldwide monitoring of greenhouse gases and biomass.

A proper functioning of the EU internal market for HRSD will also have a positive impact on the availability of data that may be used for other socially commendable objectives for example, educational or research applications.

### 6.2.3. *Other impacts (incl. political and strategic impact)*

Through the monitoring mechanism for the efficiency and effectiveness of the national systems and by exchanging best practices and lessons learned, Member States might adjust their own legislations, which in the long run might lead towards more uniform rules across Europe. In this context of flexible coordination, one could also anticipate that strategic interests of the Union will feed the dialogue among the Member States and that there will be an improvement in the degree of protection of such interests compared to the situation described in the baseline scenario, where security interests are addressed by Member States individually. How much the interests of the EU as a whole would be reflected in the national legislations is difficult to assess. Due to the limited EU coordination and monitoring role in this approach, it is likely that the impact would be minor.

However, the political impact of this option is difficult to measure, since the outcome will depend on the degree of engagement of Member States in the open method of coordination and their willingness to align their regulatory systems. Therefore, the process might take a long time before producing any effects.

### 6.2.4. *Stakeholder views*

Overall there is a broad consensus on the need for targeted action in the field of European HRSD.

After addressing the issue several times in the meetings of the SPEG<sup>57</sup>, it became clear that Member States are concerned about security standards and about preventing a possible race to the bottom, but also about national industries' interests, i.e. creating favourable conditions for their own businesses. The three Member States having HRSD capabilities at present (FR, DE, IT) have realised that this is not in their mutual interest in the longer term and have expressed their interest in creating a **level playing field** in the EU guaranteeing the same conditions for businesses and thus making sure that everybody follows the same rules.

As regards of the OMC, during the consultation process Member States have explicitly stated their lack of confidence in this option, which is considered cumbersome and inefficient, as its efficiency depends on the time necessary for the OMC to deliver results, which is very difficult to predict. The OMC is by definition a voluntary process with no pre-defined outcome and it can produce in the best case non-binding "soft" law. An OMC is unlikely to deliver sufficiently compelling results. That opinion has been largely shared by the Member States that have taken part in the consultation process, with the exception of the UK which

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<sup>57</sup> Space Policy Expert Group, see 1.4.

stated that an EU approach can be supported but that a non-binding approach would be preferred.

Industry stakeholders were more interested in the final results than in the way to achieve them. The discussions with industry did therefore concentrate on the substance. But as this option will not be able to guarantee the improvement of the framework conditions for HRSD based services (see section 3.1), we consider this option not to be supported by industry stakeholders.

### **6.3. Impacts of Option 3: creation of a basic legislative instrument**

The analysis of the impacts of this option refers to the impacts of option 2 as outlined in the previous section. However, option 3, which involves a binding measure, can guarantee results while option 2 cannot.

#### *6.3.1. Economic impact*

Economic impacts are similar to the best case scenario of option 2. Improvement of the framework conditions for the dissemination of HRSD by data providers will stimulate the supply of HRSD. This increases the opportunities for VAS businesses to enrich and innovate the range of products proposed and improve the supply, allowing them to cover a wider range of societal interests, and consequentially will provide an incentive for further expansion of demand for HRSD based products.

Under option 2 achieving positive results is a possibility. Under option 3 achieving these results can be guaranteed. In addition, in comparison with option 2, option 3 is likely to deliver economic impacts within a shorter period of time and to enable businesses to adapt their planning sufficiently long in advance, which will have positive impacts for the sector.

This means in particular:

- A clear legal framework leaving no room for interpretation of rules to follow would help reducing bureaucratic barriers for industry and ease the effort necessary to comply with diverging regulations.
- Business predictability/legal certainty would be improved as there will be clearer conditions for the set up and the operation of businesses and free circulation of HRSD.
- Business losses due the lack of transparent, clear and predictable conditions for the data acquisition would be reduced and new business opportunities could be better seized.
- There would be significant positive effects for the establishment and operation of data providing businesses and on data sales.

The administrative burden for businesses under option 3 would be comparable to the best case scenario of option 2. Only data providers will be affected in terms of administrative burden by an adaption of the respective national regulations to the EU initiative. VAS/data resellers and HRSD user businesses will not be affected at all. As the administrative burden directly created by the EU legislation will be related to reporting only, it will be very minor or even not existing, depending on the administrative burden linked to the existing national regulations related to reporting. The vast majority of administrative burden for data providers will still be

a consequence of the national regulatory systems, as the initiative sets up only the core elements and even the administrative burden created by these core elements depends massively on the implementation by the Member States. In addition, it is likely that the introduction of the principle of free circulation of HRSD will reduce the administrative burden, at least for those players who have larger cross-border business activities.

As a consequence of these facts and due to a lack of available data in this respect, a quantitative assessment of the administrative burden is not possible with the due reliability.

The administrative costs for Member States (beyond the adaption of the national laws to the EU legislation) depend to a large extent on the manner, how the Member States will implement the core elements given by the EU legislation and in particular how they will set up their administrative processes around these core elements. For example as regards of the screening procedure, Member States could decide to delegate the responsibility to an administrative body or to the data provider himself. Depending on the decision, the administrative costs will differ considerably. In addition, the specification of the common criteria (cf. 5.3.1.2) is very likely to have a strong influence on the number of authorisation procedures (cf. 5.3.1.3). So at the end, the administrative costs directly linked to EU-legislation will be very minor and negligible compared to the administrative costs resulting from national decisions and procedures.

The European Commission will monitor the implementation of the legal instrument. For the European Commission, this will have no budgetary implications as the monitoring can be done with existing resources.

#### 6.3.2. *Social impacts*

Identical to option 2, if best results for OMC delivered.

#### 6.3.3. *Other impacts (incl. political and strategic impact)*

In comparison with option 2, this option will provide the guarantee that the legal framework will be effectively and efficiently implemented in the short term. Therefore, the gains will not only be at the level of efficiency and effectiveness (since the implementation will no longer depend on the Member States' willingness and commitment), but also in the timing since it will produce its effects in a shorter period of time.

In terms of protection of personal data, the initiative does not foresee the creation of new databases with personal data. In addition, as all EU data providers or satellite operators are under the scope of the national data protection rules, the initiative does not affect their respective obligations (for further details see end of section 2.1).

#### 6.3.4. *Stakeholder views*

Stakeholders from industry are in general favourable to a coherent but light framework for HRSD at European level. They indicated support for an overhaul of the framework conditions via the online consultation and confirmed this at the public hearing. Option 3 corresponds to industry demands that creation of additional administrative burden should be avoided. In particular the data resellers/VAS expressed the view that anyone in this market knows its constraints and overwhelmingly supported that it is necessary to improve the existing framework as a means to create conducive business environment. Furthermore, there was a broad consensus among stakeholders that any kind of double check has to be strictly avoided.

The three Member States (FR, DE, IT) exercising control over HRSS capabilities share the understanding that there is a need for a transparent, predictable and fair legal framework allowing more cross-border activities within the EU. The initiative to tackle the problem was in fact raised by one of these Member States and reported to European Commission. Moreover, there is a common understanding among the Member States about the problem.

The last meeting of the Space Policy Expert Group (held on 30 October 2013), demonstrated that this conclusion is not questioned by any other Member State, including the UK, that had been the only Member State that has had prior reservations regarding the need for an EU initiative in the domain.

The vast majority of Member States favour a limited approach led by the European Commission as described in option 3 and option 4. They have indicated a preference for option 3 as licensing conditions for data providers are not identified as an immediate problem at the national level, and concerns have been raised that such a move would be too intrusive.

Both, Member States and industry, have expressed the concern that EU legislation should ensure that no additional layers of bureaucracy are introduced which would make access to HRSD more difficult than it is already.

#### 6.3.5. *Impacts of the different legal instruments (delivery mechanisms)*

A **regulation** must be implemented by Member States from its entry into force. A regulation would only cover a set of core issues which need to be integrated within existing or future HRSD regulatory regimes which contain or may contain in the future also other features. Member States which already have a regulatory framework will have to remove existing national provisions which are covered by the regulation. It is possible that other national arrangements within existing regulatory frameworks need to be adapted to accommodate the elements of the regulation. This would generate unnecessary additional cost and administrative burden. A regulation requires a far greater level of detail than a directive, which given the early state of market development for HRSD is deemed to be counterproductive.

A **directive** leaves to Member States the choice of the most cost-effective form and methods to achieve its regulatory objective: It allows for an easy integration of its constitutive elements within existing regulatory frameworks. A directive can also minimise cost and administrative burden by obliging those Member States where HRSD capacities already exist to implement all administrative and operational measures and obliging others to legal transposition and administrative preparedness. It is thus a cost effective legislative option. It also fares better in terms of proportionality as it allows for differentiated application taking into due account the situation on the ground. Translated to the level of concrete operational requirements, that would mean that the full set of institutional arrangements required by the directive will be immediately applicable only for those Member States who exercise jurisdiction over HRSD data providers. For the other Member States, only a minimum preparedness would be required, namely:

- transposing the definitional elements of HRSD
  - allowing for the identification of HRSD,
  - confirming the status of "business ready" of data products with lower resolution,

- providing the required legal certainty, needed to strengthen the market mechanisms in the domain;
- Introducing the principle of free circulation of HRSD based products and services, preventing subsequent national control on the use of HRSD, when the first dissemination of that HRSD has been cleared by a Member State of the EU in accordance with the applicable procedures;
- Designating a contact point;
- Adopting a basic obligation that dissemination of HRSD needs to be subject to a screening procedure. The exact definition of the screening procedure and its operational preparedness will be needed only at a later stage, when a data provider starts operational activities in that Member State.

The analysis of the regulatory needs addressed by the initiative does not appear to justify a heavy regulatory approach, as only a set of core issues in existing regulatory frameworks have been identified as being critical to the emergence of an internal market for HRSD. These issues need to be integrated within existing or future HRSD regulatory regimes which contain or may contain in the future numerous other features. This requires a flexible approach for which a regulation is not the ideal instrument. So it can be concluded that a directive is overall a better and most cost-effective legislative instrument than a regulation.

#### **6.4. Impacts of option 4: creation of an extended legislative instrument**

This option is built on the previous one. In addition to option 3, it foresees the establishment of common criteria for licensing for HRSD providers (licences to be issued by national authorities).

##### *6.4.1. Economic impact*

A common licencing for HRSD providers will entail that the data provision business will be more open for new entrants which could be data resellers/VAS expanding their businesses, due to the higher transparency and visibility of the conditions for compliance. There are no data available on the possible number of new entrants nor on the development of businesses, so it is not possible to describe the economic effects in quantitative terms. But looking at the high percentage of VAS/data reseller businesses (65% of the respondents to the online questionnaire), who replied that it would be interesting for their businesses to act also as a data-provider, there is a strong indication for considerable positive economic effects.

Having more businesses at data provider level would enhance competition, which should strengthen the existing EU data providers for the challenge presented by non-EU competitors.

In addition, data providing businesses benefit from similar requirements to be fulfilled in different Member States (such as facility security requirements for handling and storing data, technology standards and qualifications and security clearance requirement for personnel). If one data provider would set up businesses in different Member States, the economic benefit would be considerable. Stakeholders indicated that for data provider businesses, the estimation for the initial costs (i.e. implementing the licensing requirements) in one Member State was approx. 200.000 €, while the annual operating costs are approx. 300.000 € (2 -3 full-time equivalents (FTE), technical equipment, and administrative fees). It is likely that

with similar requirements in different Member States these cost would not double or triple if business activities were set up in two or three Member States.

But the administrative costs for Member States for this option will most likely be considerably higher than the one described in option 2 and 3 as the implementation of the requirements and the adaptation of national regulatory frameworks to introduce a common licensing system and supervising the compliance with it will imply significant costs for Member States. In addition, given the early stage of development of the HRSD market, there is a certain danger that the complex process of establishment of common licencing criteria may generate unforeseen administrative difficulties.

#### 6.4.2. *Social Impacts*

The social impacts are similar to options 2 and 3 except for the effects of the common licensing element. This is expected to increase the number of data providers, thus enhancing the supply of HRSD and boosting the data reseller/VAS sector, which should boost employment and the utilisation of HRSD for the implementation of social and environmental policies.

#### 6.4.3. *Other impacts*

Same as for option 3.

#### 6.4.4. *Stakeholder views*

Member States favour option 3 over option 4.

The industry views are mixed. Data providers have taken a very cautious position during the public hearing, most probably due to the concerns of enhanced competition and the possible need to adapt to regulatory changes (one-off costs). Data resellers/VAS providers have in their majority expressed support for opening the data provider's business due to their ambitions to move to that level in the value chain, but have also shared the concerns about compliance costs and administrative burden.

#### 6.4.5. *Impacts of the different legal instruments (delivery mechanisms)*

Same as for option 3.

### 6.5. **Impacts on SMEs and micros**

As explained in section 2.4, the predominant types of companies in the value adding service providers' segment of the HRSD market are **SMEs and micros (99%)**. Combined with the fact, that any new (but small) administrative costs would only affect Member States or data providers, one can say that this initiative is first of all an initiative to support SMEs and micros.

Their inherent business flexibility, dynamic and high investments in R&D<sup>58</sup> ensure the steady expansion of the business in HRSD, and consequently the viability of the sector. Improvement of the regulatory framework in terms of transparency, predictability and fairness (non-

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<sup>58</sup> See EARSC, report, p.88.

discriminatory) will foster the business development and help to increase investors' interest in the sector.

Yet the fact that the companies operating at that level of the value chain are almost exclusively SMEs/micros, explains why the typical weakness for SMEs (in particular budget and resources constraints and lack of market power) is even more acute in this sector – vulnerability of the operators towards any disturbances of their business cycles that could squeeze them out of business. Among those, the most important ones are that the SMEs have very little possibilities to face extra compliance costs or losses/damages from blocked or cancelled contracts with end users and that they cannot afford to deal with complex procedures to buy the necessary data or invest to cope with administrative burden.

This is reflected in the options that are limited to a light regulatory instrument addressing obstacles to trade and avoid the creation of new significant administrative burden for operators. SMEs/micros need a **stable, transparent and predictable environment** to sustain the innovation drive and ensure that such efforts pay off. This type of operators is central for job creation and diversification of the products and services range in the sector and therefore crucial for the expected positive effect that the development of HRSD should have on other sectors of the EU economy using the data and services.

**6.6. Impacts on competitiveness**

It has been demonstrated that the sector has a growth potential which allows a "win-win" scenario as everybody in the sector (satellite operators, data providers, VAS/data resellers and end users) stand to win from an improvement of the regulatory conditions leading to further cost efficiency and enhanced innovation drive.

This should translate in a needed improvement of the competitiveness of EU businesses in the sector, a point especially relevant for data providers who are the most exposed to international competitive pressures. In addition this initiative contributes to enhancing even further the cutting edge innovative potential of European VAS/data resellers, allowing them to sustain and improve further their position on HRSD markets.

The regulation of the sector at EU level contributes to a more level playing field in geographic and organisational terms (irrespective of the proximity to data providers) strengthening intra-EU businesses at the data provider and especially data reseller/VAS level. Transparency and legal certainty among data providers and data resellers/VAS and would consequently translate into progressive gains in business predictability in the long run. This will have a positive impact on the competitiveness of EU businesses in the sector leading to a higher quality of services and more competitive prices, ensuring the future of the sector as such.

**6.7. Overview of impacts**

	<b>Economic</b>	<b>Administrative cost/burden</b>	<b>Strategic and political</b>	<b>Social</b>
<b>Option 1: Baseline scenario</b>	Obstacles to economic development of the sector due to: - lack of transparency - barriers to trade - lack of business	No additional administrative burden.	Different approaches could have negative impact on security.	Job creation potential not fully exploited. Limited data availability for use and applications.



	predictability - lack of competition			
<b>Option 2: Recommendations and guidelines<sup>59</sup></b>	Positive economic impact due to higher level of transparency, business predictability and legal certainty (free circulation of HRSD). Positive effects for the establishment and exercise of businesses. Emergence of an HRSD internal market.	For Businesses: Less bureaucratic barriers for industry and less effort necessary to deal with national regulations. For Member States: There would be negligible additional administrative costs.	MS would align their legislations, strategic interests of the Union will feed this dialogue and there will be an improvement in the degree of protection of such interests.	Potential for considerable job creation. Better availability of HRSD for applications.
<b>Option 3: Basic legislative instrument</b>	Similar as in option 2. In addition, option 3 likely to deliver solutions faster and would have an earlier impact on market than option 2 (even assuming that option 2 delivers best results).	For businesses, similar to option 2 but effects would be felt earlier. For Member States there would be limited administrative costs due to the transposition of the directive into national legislation.	Positive impact would be achieved faster and more certain than in option 2.	As option 2, but earlier impact.
<b>Option 4: Extended legislative instrument</b>	As option 2, plus more competition on data provider level of value chain. However, danger that the establishment of common but complex licencing criteria may generate unforeseen administrative difficulties as the market develops.	For businesses lower administrative burden if activities in more than one MS. As the directive would contain a further element, the cost of transposition would be higher than in option 3. It would also generate extra administrative costs for those MSs which have to adjust their mechanisms for controlling the activity of data providers	As option 3.	Enhanced supply of HRSD would boost utilisation of HRSD for the implementation of social and environmental policies.

## 7. COMPARING THE OPTIONS

### 7.1. Summary of strengths and weaknesses of the options

	Strengths	Weaknesses
<b>Option 1: Baseline scenario</b>	There would be no immediate change, no adaptation needed.	Fragmentation of regulatory frameworks and of markets would remain and likely increase if more MS establish their own regulations.  Deficits in transparency and predictability of different legal frameworks will remain.
<b>Option 2: Recommendations and guidelines (OMC)</b>	Positive economic impact due to a higher level of transparency, legal certainty and business predictability.	Most Member States do not support this option and therefore it is unlikely to deliver the expected results.
<b>Option 3:</b>	In addition to the strengths of option 2, this option can guarantee	Administrative costs (limited) due to the transposition of the directive

<sup>59</sup> However as the effectiveness and efficiency of the process under open method of coordination is uncertain, any outlook on the economic impact remains unclear.

<b>Basic legislative instrument</b>	its results which are also likely to be delivered earlier than in option 2.	into national legislation.
<b>Option 4: Extended legislative instrument</b>	In addition to the strengths of option 3, this option would bring about more competition on data provider market.	The introduction of a common licensing system would be complex and given the early stage of market development could present unforeseen difficulties.

## 7.2. Comparison in terms of effectiveness, efficiency and coherence with agreed policies

	<b>Effectiveness</b>	<b>Efficiency</b>	<b>Coherence</b>
<b>Option 1: Baseline scenario</b>	This option would not achieve any of the specific objectives of this action.	No change needed in MS that have already enacted legislation on HRSD but no improvement of the situation.	This option would not be in line with the Commission's Communication EU Space Industrial Policy which argues for the improvement of legal framework conditions for space-related businesses.
<b>Option 2: Recommendations and guidelines (OMC)</b>	Potentially this option could achieve the objectives, but there is no certainty that it will do so.	Efficiency depends on the time necessary for the OMC to deliver results, which is very difficult to predict. It can be assumed that, like for other options, the resources needed would be in any case limited given the limited scope of the initiative.	The general approach of an OMC to solve the existing problems would be in line with the Commission industrial policy communication. But there would be no guarantee for the success of the OMC.
<b>Option 3: Basic legislative instrument</b>	This option would achieve the objectives, and it is likely to do so earlier than option 2.	Compared to option 1, little additional resources needed at EU level, very little additional resources needed at MS level and for businesses less resources needed in mid- and long-term.	This option would be fully in line with the Commission's Communication on the EU Space Industrial Policy.
<b>Option 4: Extended legislative instrument</b>	This option would achieve the objectives going a step further than option 2 (more competition at data provider level).	Compared to option 3, little additional resources needed at EU level, but considerable additional resources needed at MS level. In addition, given the early stage of development of the HRSD market, there is a certain danger that the complex process of establishment of common licencing criteria may generate unforeseen administrative difficulties.	Same as for option 3.

### 7.3. Preferred option

Option 3 is the preferred option combining a good level in terms of economic, strategic and social benefits with a very high level of effectiveness and efficiency while at the same time leaving as much room as possible for Member States for controlling the data-providing businesses in their territory.

## 8. MONITORING AND EVALUATION

Objectives		Indicators
General objective	<p>Fostering growth of the EU Earth observation market, in particular the services market.</p> <p>Fostering competitiveness of the EU Earth observation sector.</p> <p>Fostering the competitiveness of EO-user-businesses.</p>	<p>Evolution of EU Earth observation market turnover.</p> <p>Evolution in the number and size of business operators.</p> <p>Positive/negative business perception on HRSD internal market performance.</p>
Specific objective	<p>Better business conduct across MS for the dissemination of HRSD.</p> <p>More reliable access to HRSD.</p> <p>Good information on accessibility of HRSD for VAS/data-resellers and customers.</p> <p>Increasing competition on data provider level.</p> <p>Fostering internal market on HRSD.</p>	<p>Level of transparency and predictability of existing/evolving regulations.</p> <p>Monitor quota of finally rejected HRSD requests due to security reasons.</p> <p>Level of transparency and publicity of existing/evolving regulations</p> <p>Number of competitors, HRSD pricing</p> <p>Monitor quota of HRSD transactions to customers/VAS/data resellers with reference to their respective location: domestic, EU, third country.</p>
Operational objective	<p>Establish the core elements to use the full commercial potential of HRSD and in particular facilitating dissemination and access, by:</p> <ul style="list-style-type: none"> <li>- Introducing as a basis a common notion of HRSD,</li> <li>- Common standards on transparency, predictability/legal certainty (incl. free circulation of HRSD) and fair treatment,</li> <li>- Common standards on efficiency</li> </ul>	<p>Chosen operational objectives allow monitoring by checking if the elements have been introduced in national law.</p>

	and business friendly implementation in particular with respect to the procedures to follow.	
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The legislative instrument will provide for the regular monitoring of the implementation of the proposed initiative, especially as regards the operation of the procedures developed by the national authorities on the basis of the criteria/normative orientations prescribed in the draft directive. The monitoring would require regular update by the national authorities (e.g. on an annual basis) through the submission to the Commission of aggregated statistics, allowing certain indicators to be followed:

- Number of businesses acting as data provider in different Member States;
- the overall number of the data transactions screened (allowing to assess the market interest in HRSD);
- the percentage of "non-sensitive" and "sensitive" requests allowing to draw conclusions about the overall effectiveness of the screening (the percentage of "sensitive" transactions can be used as an indicator for the efficiency of the filters applied by the data providers and can indicate the degree to which business needs are accommodated);
- percentage of domestic, cross-border (within EU) and worldwide business activities at data provider level;
- number of sensitive requests that are submitted for subsequent authorisation;
- percentage of denials of authorisation (allowing conclusions to be drawn on how efficient business needs are taken into consideration in the screening procedure).

The Commission will inform regularly the European Parliament and Council on the implementation of the directive.

An evaluation of the new instrument would be carried out 5 years after its entry into force. The evaluation would be based on the indicators in the table above and would seek to establish to what extent the instrument has fulfilled the objectives and whether there is a need for revision.

Annexes

## ANNEX I: GLOSSARY

EO	Earth Observation
Geospatial technology	All tools and techniques used in land surveying, remote sensing, cartography, global navigation satellite systems, photogrammetry, geography and related forms of earth mapping.
GSD	Ground Sampling Distance, → Spatial resolution
HRSD	High Resolution Satellite Data. In the sense of the initiative: Earth observation data for commercial purposes generated by high-performance remote sensing satellites.
HRS systems	High resolution remote sensing satellite systems
Radiometric resolution	Determines how finely a system can represent or distinguish differences of intensity. The higher the radiometric resolution, the better subtle differences of intensity or reflectivity can be represented.
RS	Remote Sensing: Use of spatial sensor technologies (usually on satellites) to detect and classify objects on earth.
Satellite system	In contrast to a single satellite the satellite system can comprise several satellites and the ground segment on earth, where the satellites are operated from and the received data is processed.
Spatial resolution	The size of the smallest geometric structure or detail that can be detected and differentiated in any spatial direction on the data generated by the sensor. For optical images, it is defined by the area represented by each pixel (i.e.: ground area represented by a pixel). Typically expressed in terms of Ground Sample Distance, or GSD. In the case of radar images, the GSD is usually half the resolution.
Spectral coverage	Spectral range that can be collected by the sensor, for example UV (ultra-violet), VIS

	(visible light), NIR (near infrared), SWIR (short-wavelength infrared), TIR (thermal infrared) or microwaves.
Spectral resolution	Determined by the specific wavelength intervals described by the minimum and maximum thresholds between which a sensor is sensitive (refer to a specific wavelength range of the electromagnetic spectrum that sensor can record). Wide ranges of the electromagnetic spectrum correspond to a so-called gross/raw spectral resolution and narrow bands of fine spectral resolution. When spectral range is narrower the power of discrimination is bigger, but the number of identifiable objects decreases.
Temporal resolution	Minimum time between the sensing and the re-sensing of the same target area by the satellite system

## ANNEX II: TECHNICAL BACKGROUND

### I. Technical characteristics of Earth observation satellites

Satellite-based remote sensing (RS) provides a whole range of information regarding the Earth's land masses, the oceans, the atmosphere and, in general, the environment and situational awareness, based on imagery or measurements.

RS-satellite data is the basis for generating products allowing decision-makers to directly access crucial information, to support their policies and to influence the conduct of other actors or competitors. This paradigm is applicable to both the civil and military domains. RS-imagery, whether optical or in other wavelength bands, is a unique capability as it enables the repeated observation of specific regions, at different scales and without the need to access the territory or the respective air space. Depending on their orbit and intended function, different satellite instruments have different spectral, spatial and temporal resolutions. Their output is subsequently processed and translated into information fulfilling the user requirements.

As soon as the remote sensing capability is of high-performance, Earth observation also has implications for security and defence. The information provided by satellites can help in shaping the security decisions of a nation, or a community of nations, through the evaluation of the economic, geographic and military situation of a given region of interest anywhere in the world, and the corresponding evolution over time.

To illustrate the capabilities of high-performing earth observation satellites a few examples will be given in the following section according to the different technical characteristics.

In general satellite earth observation is highly suited, when you need information:

- on large areas
- at multiple/regular times and enabling fast access
- on remote areas or areas difficult or impossible to access (e.g. after natural disasters)
- on a global scale or on any place in the world

#### 1. Spatial resolution

Spatial resolution is the ability of the sensor to detect and differentiate geometric structures or details in any spatial direction. It can be noticed on sensor recorded image and is, for optical reasons, defined by the area represented by each pixel (i.e.: ground area represented by a pixel) and is typically expressed in terms of Ground Sample Distance, or GSD. In the case of radar images, the GSD is usually half the resolution. As pointed out in the study of Booz&Co<sup>60</sup>, EO satellite data of 2.5 or 3-meter resolution can enable gross observation of sensitive targets such as surface ships, troop units, aircraft, and missile sites, etc., but it is not

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<sup>60</sup> See Booz&Co, p. 6 et seq.

yet refined enough to enable the actual identification (i.e. precise identification) of these target interests.

Detection and general identification (also referred to in some documents as recognition) is in general the ability to identify the type of object of interest between different target group categories (i.e. it is possible to start seeing that something specific is there, e.g. an airplane).

The next sensitivity level involves the more precise identification of the type of object (e.g. distinguish the type of aircraft, such as US F 22 Raptor or a Russian MIG 29). The ability to precisely identify an object and be able to describe its features or component parts is then essential for any further operational consideration.

In this context, in addition to being a technical hurdle in the design and development of EO satellite sensors, the 2.5-meter resolution level also defines the point at which National Governments start to become concerned about commercial EO satellite data. This is where an initial fine-line of sensitivity may be drawn.

The table below which is derived from a NATO standard (STANAG 80/15), provides an illustration of how one organization relates information sensitivity to satellite data resolution capabilities. More specifically, the table illustrates the enabled activities (e.g. detection) per target (e.g. troops), grouped based on level of satellite resolution capability (e.g. 2.5 m in yellow) considering the minimum level of resolution required to perform an activity (e.g. 6 m for detection of troops).

Target	Detection (m)	Identification (m)	Precise Id. (m)	Description (m)	Tech. Analysis (m)
Urban Areas	60	30	3	3	0.75
Ports and harbours	30	15	6	3	0.3
Railroads, yards	15-30	15	6	1.5	0.4
Coasts, beaches	15-30	4.5	3	1.5	0.15
Bridges	6	4.5	1.5	1	0.3
Submarines	7.5-30	4.5-6	1.5	1	0.03
Surface ships	7.5-15	4.5	0.6	0.3	0.045
Troop units	6	2	1.2	0.3	0.15
Aircrafts	4.5	1.5	1	0.15	0.045
Missiles	3	1.5	0.6	0.3	0.045
Radars install.	3	1	0.3	0.15	0.015
Rockets, artilleries	1	0.6	0.15	0.05	0.045

Satellite 2.5 m resolution capability – enabled target activities

Satellite 1 m resolution capability – enabled target activities

Satellite sub-meter capability – bests in class satellites

Outside civil satellites capability

Spatial resolution is widely considered as the most important technical characteristic.

**2. Spectral coverage**

Spectral coverage is the spectral range that can be collected by the sensor, for example UV (ultraviolet), VIS (visible light), NIR (near infrared), SWIR (short-wavelength infrared), TIR



(thermal infrared) or microwaves (radar). Depending on the spectral coverage, the data generated by the satellite system is best suitable for different types of use.

Optical imagery in VIS offers at present the highest resolution, the fastest access due to less time-consuming processing needs and is most easy to handle. It is the best available on the world market and prices per square km are rather low (compared to other sources with same GSD).

Radar imagery offers imaging capabilities independent from daylight at the sensed areas and from weather conditions (clouds), which is for certain areas extremely important. Radar waves can also detect objects under the earth's surface or covered by other objects (e.g. plants, camouflage nets). Radar imagery is also highly suited to produce very precise digital elevation models (DEM).

Infrared imagery offers night vision, thermal analysis or analysis of the material of objects. This is used e.g. in meteorological satellites to determine land surface, water and cloud temperatures. But it can also be used for fire monitoring or to precisely analyse the activities of industrial facilities, power plants, vehicles, aircraft or ships due to the generated thermal emission.

Some satellite systems offer a wide spectral range and often employ several different types of sensors to combine the advantageous of the different spectral coverages.

### **3. Spectral resolution**

Spectral resolution is determined by the specific wavelength intervals described by the minimum and maximum thresholds between which a sensor is sensitive (refer to a specific wavelength range of the electromagnetic spectrum that sensor can record). Wide ranges of the electromagnetic spectrum correspond to a so-called gross/raw spectral resolution and narrow bands of fine spectral resolution. When spectral range is narrower, the power of discrimination is bigger but the number of identifiable objects decreases. To compensate this effect or to combine the advantageous of a fine spectral resolution with a wide range of the spectrum, so called super and hyper-spectral sensors were developed and are operated on satellites.

### **4. Radiometric resolution**

The radiometric resolution determines how finely a system can represent or distinguish differences of intensity. The higher the radiometric resolution, the better subtle differences of intensity or reflectivity can be represented.

### **5. Temporal resolution**

Temporal resolution is the minimum time between the sensing and the re-sensing of the same target area by the satellite system. For the existing satellite systems it varies, from a few minutes (for geostationary meteorological satellites), to 0.5 - 1 day (for a constellation of EO-satellites on a polar orbit), or up to nearly one month for certain regions (for less agile single satellite on a polar orbit). Depending on the purpose of the data use or service, the revisit time can be rather long (e.g. for agricultural monitoring) or needs to be very short (e.g. tactical or strategic reconnaissance).

## **II. Functioning of the regulatory framework**

### **1. Definition of HRSD**

By defining exact thresholds with technical criteria it would be clear which satellite-systems would be within the area of application.

To give an example, the definition could be made in a way, that satellites, that are able to produce optical imagery (VIS) with a resolution (GSD) of 2.5 m or below would be within the area of application and though access to data of these satellite systems would be subject to regulation.

### **2. Screening procedure and criteria**

One central element of this initiative is the establishment of a common screening procedure and criteria for the dissemination of HRSD. Later redistribution of the data by data resellers (or VAS) would not be screened, as this particular data has already gone through the process once.

Every data transaction would be reviewed on a case-by-case basis. If the request is sensitive, the case must then be reviewed by a national government authority, which then decides whether to issue or deny authorization.

The approach would cover at the EU level the definition of common criteria for a screening procedure. These would be used for the screening procedure and would include technical characteristics of the satellite sensors (e.g. spatial resolution, observed spectral/frequency range, spectral resolution etc.), the information content of the data acquired by processing (specification of the data product), the target area surveyed by the data, the time between data acquisition and the processing of the request (time delay between data acquisition and supply to the customer) the ground segments to which the data are to be transmitted and the end customer. The common criteria would be further specified by Member States and combined to the screening procedure.

## ANNEX III: Overview on existing legal frameworks in Member States<sup>61</sup>

### 1. Regulatory regime for satellite operators and data providers

Germany has followed a license-based approach, France a declaratory-based approach, and Italy a contract-based approach to tie the private company acting as a *Primary Data Service Provider* to the regulatory framework.

EO VHR – Upstream value chain	D	F	I
<ul style="list-style-type: none"> <li>Operator (i.e. entity that retains satellite command and control)</li> </ul>	<ul style="list-style-type: none"> <li>License regime by law (incl. national space agency – DLR)</li> <li>In practice, for TerraSarX and TandemX operator is the national space agency</li> </ul>	<ul style="list-style-type: none"> <li>License regime by law (excl. national space agency – CNES)</li> <li>In practice, for Pleiades, operator is the national space agency CNES</li> </ul>	<ul style="list-style-type: none"> <li>Function assigned by law to national space agency (ASI)</li> <li>In practice, for Cosmo operator is a private company under ad hoc delegation of public service/contract from ASI</li> </ul>
<ul style="list-style-type: none"> <li>Primary data service provider (i.e. first entity to distribute the satellite data to commercial market)</li> </ul>	<ul style="list-style-type: none"> <li>License regime by law</li> <li>In practice, for TerraSarX and TandemX, data provider is a private company</li> </ul>	<ul style="list-style-type: none"> <li>Declaratory regime by law</li> <li>In practice, for Pleiades, ad hoc delegation of public services to a private company</li> </ul>	<ul style="list-style-type: none"> <li>Function assigned by law to national space agency (ASI)</li> <li>In practice for Cosmo, ad hoc delegation of public service/contract to a private company</li> </ul>

### 2. Data security check criteria and guidelines for control

All three Member States have defined sets of criteria that enable the *primary data service provider* to conduct a data sensitivity check and to identify those user requests that may be too sensitive to lead to data delivery (and may require a second check by the Government), or cannot be delivered or can only be delivered under limitations. These criteria that can lead to possible restrictions in data distribution are summarized for each Country in the table below.

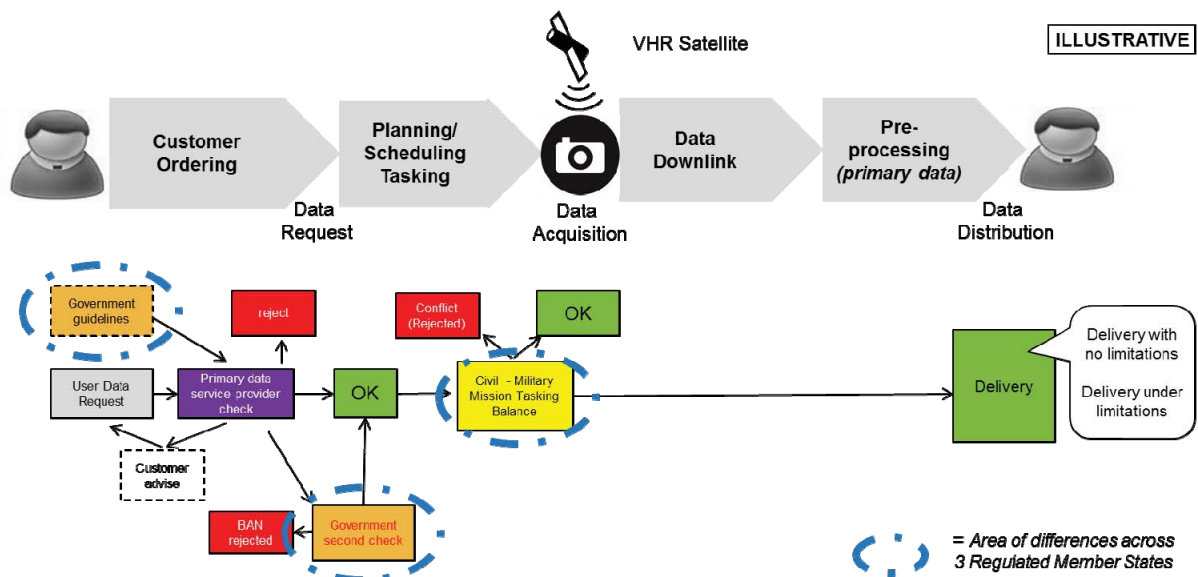
<sup>61</sup> Cf Booz&Co, section 3 (p. 34 et seqq.).

Data sensitivity check criteria	D	F	I
• <b>Thresholds</b> - (i.e. specific levels of resolution of data)	✓	✗	✓
• <b>Requesting Authority</b> (i.e. who ask for the data)	✓	✓	✓
• <b>Target Area</b> (i.e. what territory is represented by the data)	✓	✓	✓
• <b>Receiving Earth station territory</b> (where data are sent)	✓	(p)	✗
• <b>Time between data acquisition and data delivery</b>	✓	✗	✗

Restrictions to data delivery	D	F	I
<b>A) Interdiction (i.e. no data distribution)</b>	✓	✓	✓
<b>B) Distribution under limitations:</b>	✓	✓	(p)
b1) Lower level of resolution (or different product)	✓	✓	(p)
b2) Omission of specific 'hot spots' geographical areas	✓	✓	✗
b3) Time delay in data distribution	✓	✓	✗

✓ Present in regulation      (p) Not in regulation but applied in practice      ✗ Not in regulation and not identified as practice through stakeholders interviews

While there are many common elements of the approach to security screening by the three Member States, there are also differences that have been identified in the course of the study. These **differences relate primarily to three main areas of the data security process**: i) the criteria and guidelines from the Government; ii) the 2nd Government check, and iii) the daily balancing of civil and military plans in dual use systems.



### 3. Licensing conditions for data providers:

Despite several differences, the basic criteria can be grouped in six main areas. The detailed requirements most likely vary from one Country to the other, and we suggest a further validation. Nonetheless, the table below provides an indicative summary of what can be considered as high-level criteria for a company to have the 'right to act' as a *primary data service provider* across the three Regulated Member States. The table specifies the criteria

under German regulation and indicates the main variation identified in at least one of the two other Regulated Member States. However, it should be noted that the non-applicability of certain criteria can be due to actual operational situation (e.g. satellite system architecture).

Primary data service provider – high- level criteria ‘right to act’	D	F or I
• <b>Company organisational set-up</b> (e.g. technical, financial, security mgmt.)	✓	✓
• <b>Technical and organisational measures to prevent unauthorised access to installations/facilities</b> (e.g. receiving and storing data)	✓	N/A
• <b>Measure for protection of data transmission between ground segment installations</b> (e.g. government approval)	✓	N/A
• <b>State of the art system for data distribution</b> (e.g. IT system)	✓	(p)
• <b>Personnel adequate level of authorisation</b> (e.g. simple check or security check) <b>to access installations</b> (e.g. receiving, storing data)	✓	N/A
• <b>Personnel security clearance to receive Government instructions for data security check</b> (i.e. classified information)	N/A	✓

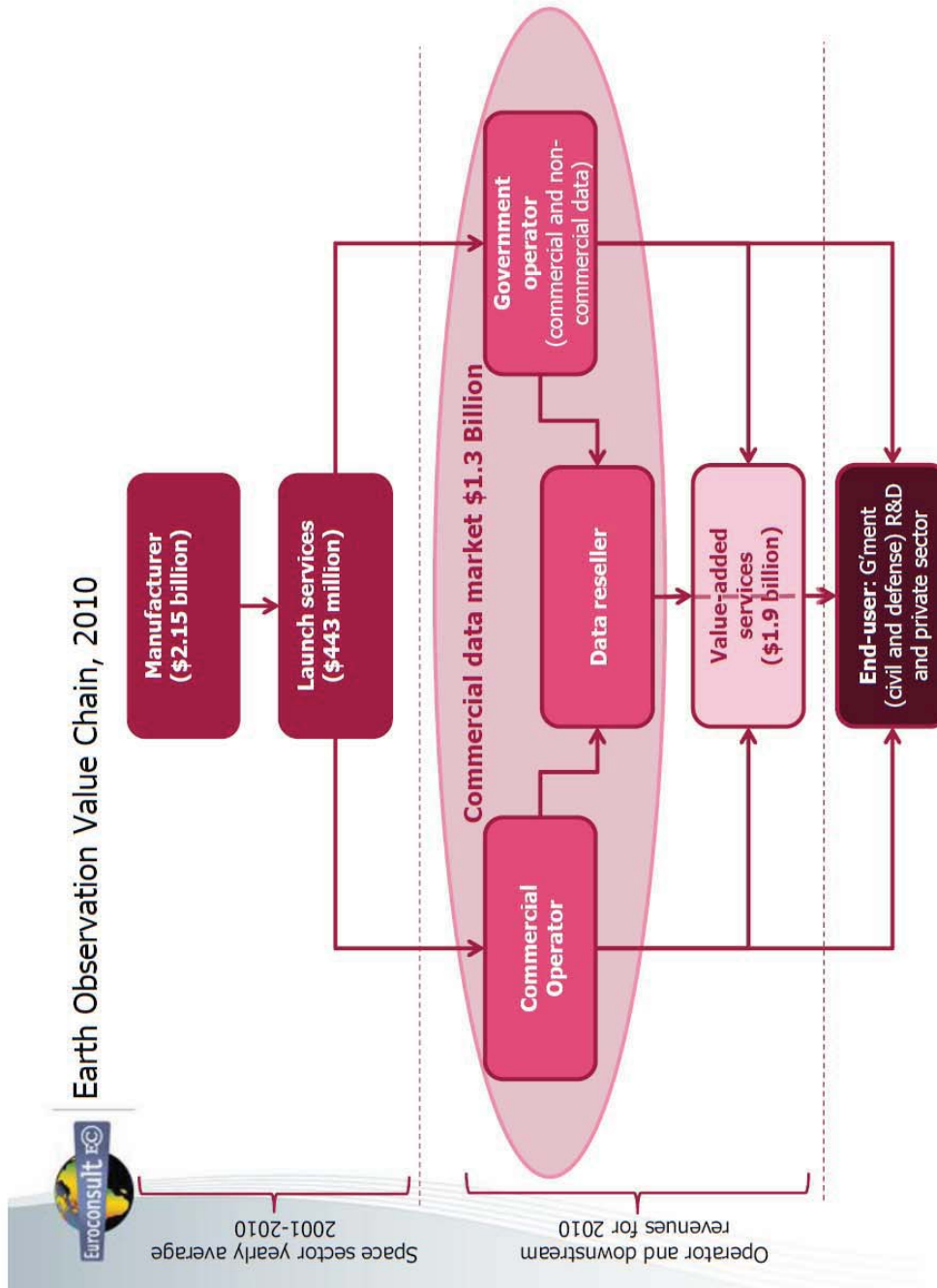
✓ Present in regulation

(p) Not in regulation but applied in practice

N/A Not applicable

## ANNEX IV: Graphs

a) Earth Observation Value Chain, 2010:

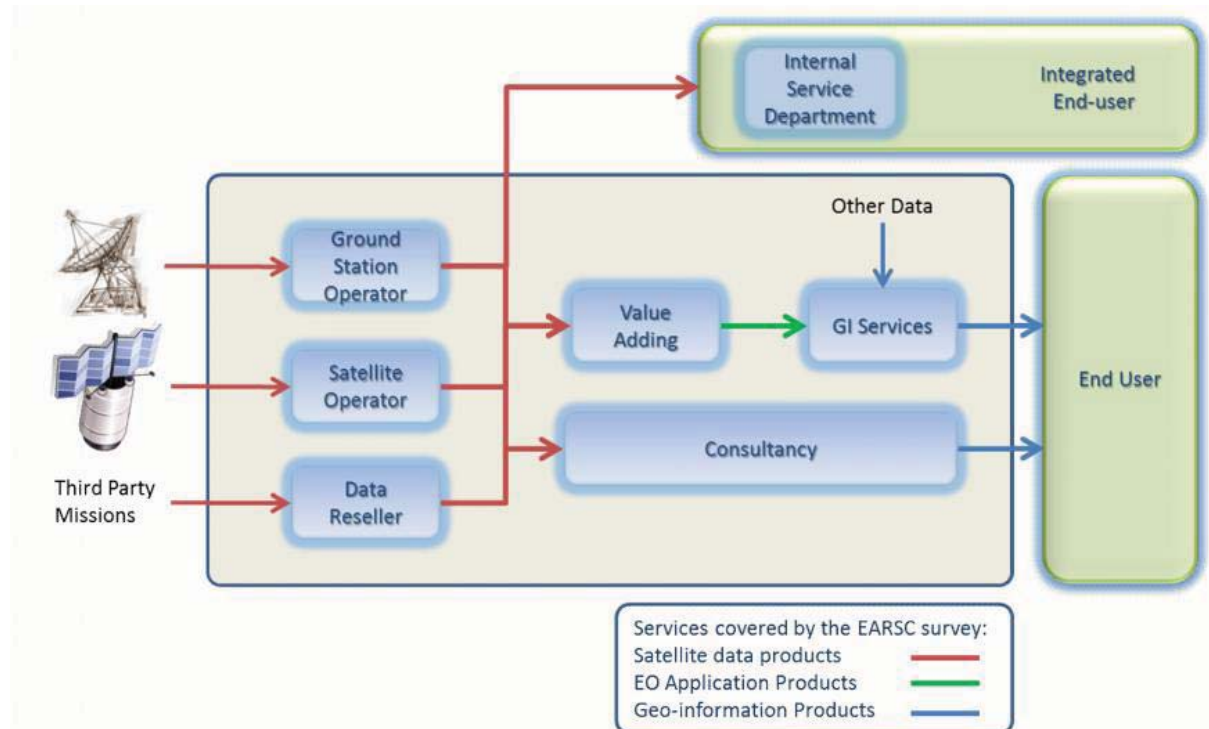


b) Value Chain according to EARSC (final report, p. 112):

For reasons of simplification and to better reflect the situation with a focus on the existing HRSD distribution channels within EU, we decided to sort the market actors into the groups “data provider”, “VAS/data resellers” and “customer businesses”.

Data provider: Ground Station Operators and Satellite Operators. Data resellers are not part of the HRSD value chain, as they do not commercialise data from Member States’ satellites.

VAS/data resellers: Value adding, GI Services and Consultancy.



## **ANNEX V: Examples for the use of HRSD**

### **1. Satellite Crop Monitoring<sup>62</sup>**

Technology based on spectral analysis of high resolution satellite crop images enables monitoring of vegetation developments, soil temperature, humidity and to reveal problem areas on the field. Satellite crop monitoring is also suitable to precise weather forecast based on concrete field coordinates and to recall historical weather data retrospection.

Along with the development of remote sensing applications, satellite monitoring data has become the uppermost data source to monitor large-scale crop condition based on vegetation index analysis. Vegetation images show crop growth from planting through to harvest, changes as the season progresses and abnormalities such as weed patches, soil compaction, watering problems etc. A georeferenced and orthorectified image can locate these problem areas as well as the size of the area affected can be easily determined. Satellite crop monitoring and vegetation control help the farmer make informed decisions about the most feasible solution. In addition to highlighting problematic areas, images will also help monitor the effectiveness of any corrective actions which may be implemented. Images can act as an early indicator of crop yield. This early predictor of yield can aid the farmer in making marketing decisions as well as the allocation of resources.

To gain the benefits from satellite crop monitoring data farmers, managers, consultants and technicians must understand and be able to interpret the image. There are a wide range of enhancement tools available which can help make an image more interpretable for specific applications. Enhancement and classification tools are often used to highlight features. The techniques employed will depend on the type of remote sensed data as well as the objectives of the end user.

The satellite provides imagery data at different spatial, spectral and temporal resolutions for agriculture and crop assessment, crop health, change detection, environmental analysis, irrigated landscape mapping, yield determination and soils analysis. Scheduling and timing of image acquisition is very important and will hinge on the main goals and the type of information that the end user is hoping to gain. Images can show variations in organic matter and drainage patterns. Soils higher in organic matter can be differentiated from lighter sandier soil that has a lower organic matter content. This geospatial information is valuable when used in conjunction with ancillary data to define management zones for a field.

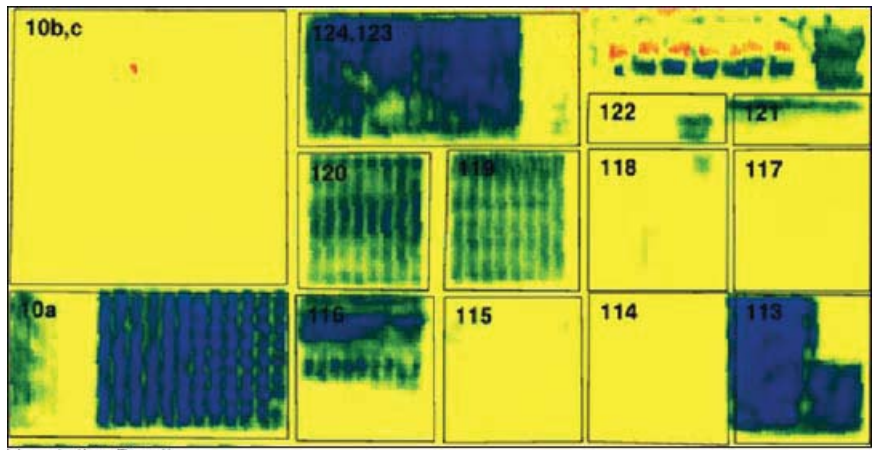
For illustration purposes see the following images, showing vegetation density, water deficit and crop stress<sup>63</sup>:

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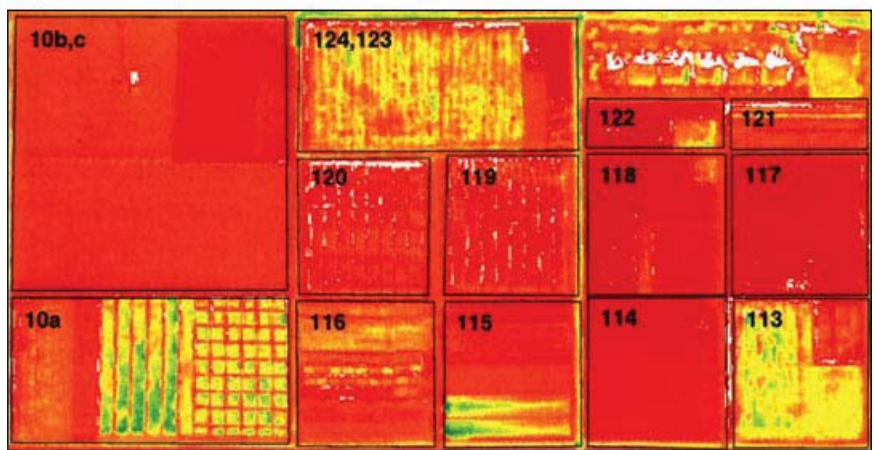
<sup>62</sup> Information taken from the IEASSA-website: <http://ieassa.org/en/satellite-crop-monitoring/>. IEASSA (International Efficient Agriculture Solutions and Standards Association) is a global platform for sharing progressive technologies, expertise in the application of efficient agriculture business methods; elaboration, improvement and implementation of effective farming standards.

<sup>63</sup> Source:  
[http://en.wikipedia.org/wiki/File:Daedelus\\_comparison\\_remote\\_sensing\\_in\\_precision\\_farming.jpg](http://en.wikipedia.org/wiki/File:Daedelus_comparison_remote_sensing_in_precision_farming.jpg).

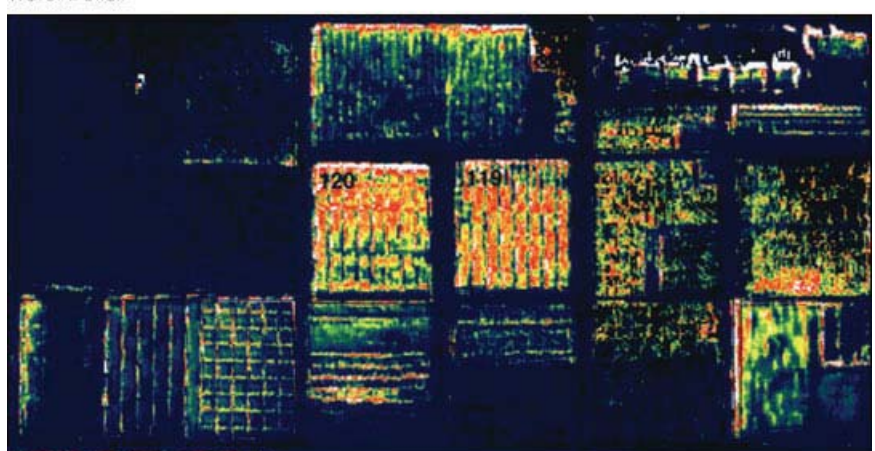




Vegetation Density



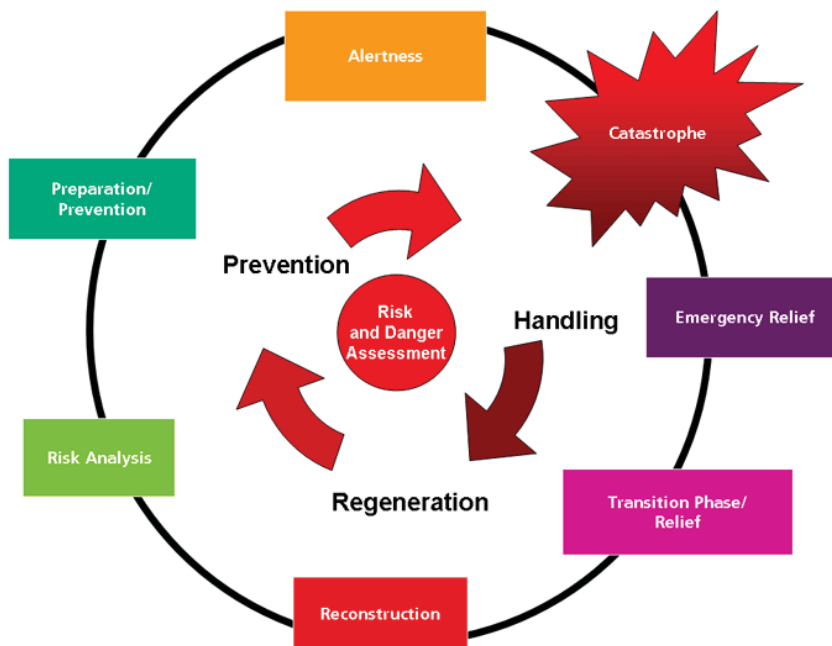
Water Deficit



Crop Stress

## 2. Disaster and Emergency Management

The rising number of natural disasters, humanitarian emergency situations and threats to the civil society increases the demand for timely and precise information on many different types of scenarios and situations. ZKI<sup>64</sup> uses all kinds of satellite imagery for the extraction of relevant crisis information like flood extent, damaged infrastructure, endangered population or evacuation areas, just to name a few examples. Besides response and assessment activities, ZKI derives geoinformation products for the use in medium term rehabilitation, reconstruction and crisis prevention activities.



### *Crisis Cycle and stages after a crisis event*

The disaster management cycle represents the different stages before and after a disaster. Each phase has different demands on the satellite information products and ZKI makes important contributions especially during the emergency relief phase, but also for rehabilitation and recovery actions as well as early warning and disaster prevention. In its function as crisis mapping service, ZKI creates crisis maps immediately after an event with specific information about the disaster extent (e.g. flooded area) and estimated damages (e. g. affected houses, infrastructure, etc.) in order to assist decision making in situation centres and during relief actions in the field. Further analyses and monitoring of the disaster situation can support planning and reconstruction activities as well as the development of vulnerability studies for specific regions. ZKI also supports the development of early warning systems in the domain of natural hazard prevention.

<sup>64</sup> Information taken from the ZKI-website: <http://www.zki.dlr.de/mission>. The Center for Satellite Based Crisis Information (ZKI) presents a service of the German Remotes Sensing Data Center (DFD) at DLR (German Aerospace Center).

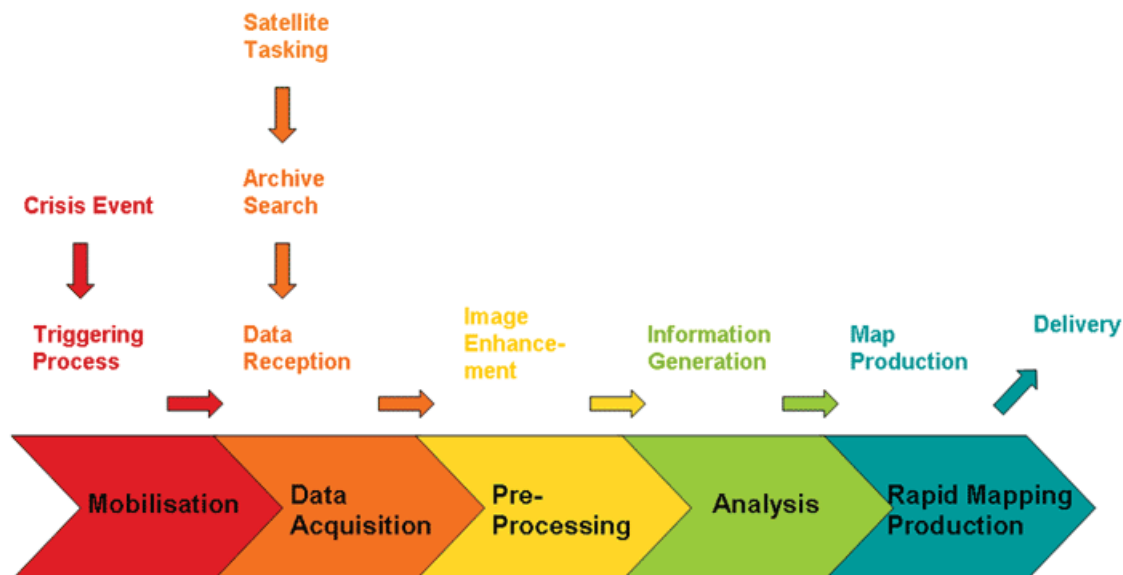
## Humanitarian Aid

In case of humanitarian crises ZKI assists relief efforts in cooperation with international partner organisations and provides user specified information and map products, such as refugee camp and situation maps. These maps can be a valuable contribution for logistic support and operation planning in the respective camps or areas. In the frame of these activities, ZKI closely cooperates with international relief organisations and several UN organisations.

## Civil Security

The increasing importance of the topic “civil security” within the projects of ZKI is leading to research activities with an increased focus on search and rescue work, monitoring of critical infrastructure, natural resources and illegal crops. Also the monitoring of international conflicts and crisis regions is element of the development of methods and concepts for crisis prevention in terms of civil security.

## Rapid Mapping

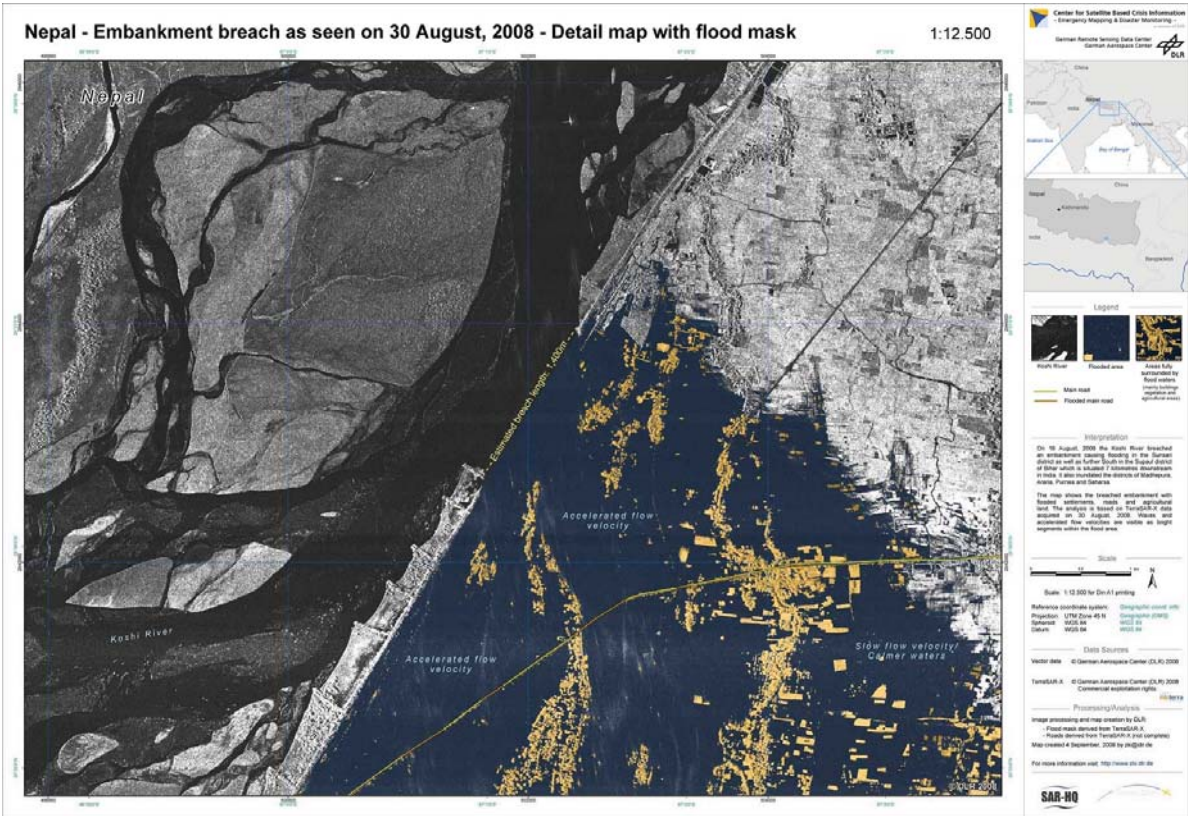


*Rapid Mapping Workflow - from crisis events to the delivery of information*

In the figure the typical rapid mapping workflow of ZKI during crisis situations is illustrated. After the disaster the initial mobilisation phase follows. Civil protection offices, situation centres or decision makers receive information regarding the occurrence of a crisis event and trigger ZKI activities either directly or indirectly through authorised users.

ZKI starts directly its activities by tasking earth observation satellites that may provide relevant crisis data. In addition, the data archive is searched for matching pre-disaster satellite scenes. During the first 6 hours after the activation of ZKI, reference maps based on archive satellite data providing a first overview of the affected area can be made available to relief organisations. The newly acquired post-disaster satellite data is used to assess and monitor the ongoing crisis situation, i.e. delineate the affected areas and estimate the damages caused by the disaster.

After the satellite data has been downlinked and received by ZKI, data pre-processing takes place which includes tasks such as its projection to a coordinate system or its fusion with other data sets. Subsequently, various algorithms and processing chains tailored to the type of catastrophe (e.g. change detection, damage assessment or thematic analyses such as flood or burned area mapping) are employed to extract the requested crisis information. The results are integrated into map products or other product formats. For the purpose of map production, additional interpretation texts, legends and overview maps are generated. Upon completion, the crisis products are transferred to the user free of charge, either through the ZKI website, via ftp-server, email or by providing map print outs.



*Crisis Map of an embankment breach in Nepal in 2008.*

Past rapid mapping activations of ZKI cover a broad range of thematic areas, such as natural and environmental hazards (floods, hurricanes, fires, earthquakes, oil spills) and humanitarian relief activities (e.g. mapping of refugee camps).

The figure shows an example of a ZKI detail map of an embankment breach and related floods in Nepal, August 2008. Data from the German radar satellite TerraSAR-X were used to derive the flood extent. Based on the analysis, the length of the breach could be approximated with 1400m. The map also illustrates flooded road segments (orange) and buildings as well as agricultural areas fully surrounded by water (yellow).

## **ANNEX VI: Consultations**

See separate annexes V.1 - 3:

- V.1: Online questionnaire:
  - Open from 11/06/2013 until 05/07/2013
  - Targeted consultation: 48 invitations sent, 20 replies received
  - Businesses from 11 MS participated
- V.2: Aggregated results to online questionnaire
- V.3: Summary of proceedings of the Open Hearing held on 12/07/2013