INNOVATION CLUSTER ACCELERATING
REMOTE SENSING

# D 1.3.5

*Report with analyses of questionnaires received from SMEs*

## 2S02-032 ICAReS

# Contents

# ICAReS

## Common challenges

Within the 2 Seas area the three major sectors (agriculture, nature and water) constantly face important challenges which require innovation to help tackle them. Greater use and development of remote sensing (RS) and data processing methods will help provide this innovation, and both will create and support new solutions to face these challenges. Moreover, it will greatly improve the efficiency of these sectors.

However, there are obstacles in the way when looking at remote sensing. For example, there is a lack of knowledge and awareness of the possibilities remote sensing can bring; there is a lack of suitable testing and demonstration locations for companies to further innovations; and the policy on legislation and the use of drones for remote sensing is unclear.

From this the following challenges need to be addressed: the aggregation of sector demands, communication with RS companies and knowledge institutions, creation and advertisement of sites for demonstrating new remote sensing applications, harmonisation of legislation and regulations and finally the formation of a durable cluster to work together on these issues.

## Overall Objective

The overall object of the ICAReS project is:

*To develop a cross-border innovation cluster and create the necessary conditions for innovation in the field of remote-sensing and advanced data-communication and -processing, based on the needs of the priority sectors: nature, agriculture and water & infrastructure.*

A durable cluster will result in some key benefits. There will be cross-border collaboration within the sectors allowing the demands to be aggregated and jointly tackled. The innovation of remote sensing products and services will accelerate.  This will allow business operations to improve through the increased use of remote sensing. Finally, the cluster will bring clarification of different national legislations and a joint lobby for better regulations to create business opportunities.

## Summary Work package 1

An important framework condition for innovation is the optimisation of the innovation chain of remote sensing. In work package 1 (WP1) the relevant stakeholders within the 2Seas area will be identified and contacted by the project partners. The stakeholders are considered to be

- personnel within the innovation chain and demanding sectors,
- end users of remote-sensing technology,
- suppliers of technology and knowledge institutions,
- product and services SMEs,
- branch organisations,
- and relevant government bodies.

Cross border networks of end-users will be enlarged or established to aggregate and formulate their demands regarding the desired use of RS applications. This will be stimulated and promoted by masterclasses and demonstration days. Also, RS branch organisations and the relevant government bodies in regulation and legislation will be brought together to identify and discuss the opportunities and obstacles of using RS applications in practice. WP1 will establish networks of knowledge (academia) and technology suppliers (SME) to formulate innovation and knowledge needs (e.g. data processing, lightweight materials, sensors, energy packs) to be validated and delivered in future products and projects. From those networks a cross border RS innovation cluster will be developed, which will lead to aggregation of demands, increased technology

transfer, cooperation with governmental organisations on legislation and regulation and possibilities for SMEs to engage in international activities.

## Activity A 1.3

One of the activities in ICAReS was to enlarge the cross-border networks of SMEs. To achieve this, a report of the results of the questionnaire send out to the selected RS SMEs has been made. The short list of SMEs willing to give demonstrations and to participate in the RS innovation cluster is part of this report but attached separately.

# Research setup

In order to gain insight in the small- and medium-sized remote sensing enterprises in the 2 Seas region, the ICAReS partners have chosen to develop a questionnaire.

## Population

Together with the project partners, a longlist of 244 SMEs was created consisting of companies in the 2Seas area. The companies on the longlist were sent a questionnaire consisting of 20 questions about Remote Sensing. The questionnaire can be found in appendix A that will be attached to this report separately. Of the 244 questionnaires sent out, 55 individual companies have responded, which makes a response rate of almost 23%.

## Methodology

The questionnaire was created with the expertise of all the ICAReS project partners and reviewed thoroughly. Surveymonkey was used as means of distributing the questionnaire and to gain the summary of results. In the next chapter we have outlined the results of the questionnaire.

# Results

## Importance of RS for SMEs

80% of the respondents is already working with remote sensing, and of the respondents not yet using remote sensing, 43% plans to do so in the near future. The respondents that are neither yet working with RS (Remote Sensing), nor have plans to do it in the future, indicated that it was either too expensive (33%), don't know about the possibilities (30%), or did not h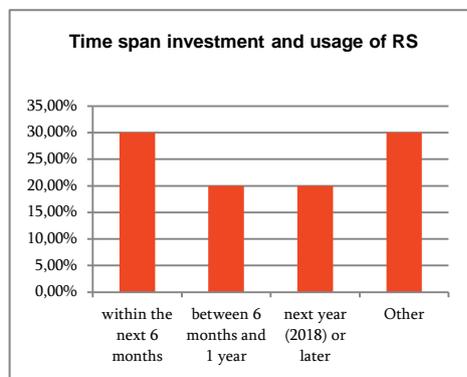ave the required knowledge or capabilities (33%). Of the respondents not yet working with RS, but with interest in remote sensing/UAV technology, 31% already have concrete plans to invest and start using RS. Figure 1 depicts the time span in which those respondents are planning to invest and start using RS. The respondents that checked the box 'other', indicated that it depended on rules and legislation whether they would start to invest and use RS.



**Time span investment and usage of RS**

Figure 1 Time span investment and usage of RS

## Products & Services in Remote Sensing

The most frequently used platform used for remote sensing is an unmanned aerial vehicle, illustrating the belief of the respondents in the potential of this relatively new technology. Unmanned aerial vehicles are significantly more used for remote sensing then the traditional platforms, as aeroplanes and satellites as table 1 depicts.

| Remote Sensing platform | % |
|---|---|
| Unmanned Aerial Vehicles | 96% |
| Satellite | 20% |
| Aeroplane | 18% |
| Helicopter | 6% |
| Other | 8% |

Table 1: platform used for RS by respondents

When asked about their reason for using remote sensing, most of the respondents (57%) mention delivering (aerial) data to their clients as part of their service offering as their main goal for remote sensing. Another significant part of the respondents (26%) mentions either agricultural monitoring, e.g. crop nutrition, or nature monitoring, e.g. landscape development, as their primary goal for remote sensing.
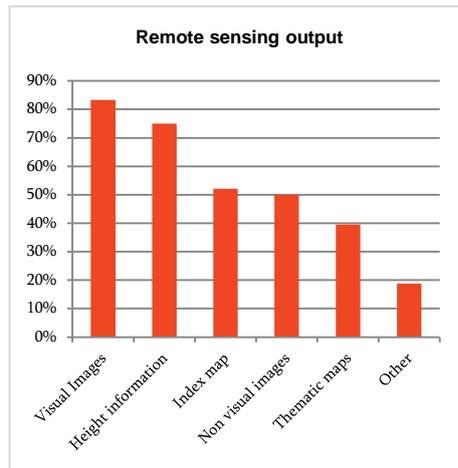


**Figure 2 RS output used by % of respondents**

This is corroborated by the outputs of remote sensing that are being used as figure 2 shows. While unsurprisingly visual images (e.g. aerial images, orthophoto mosaic, satellite image) and height information (Digital Elevation Model or Digital Terrain Model) are most often used - respectively by 83% and 75% of the respondents – index maps (NDVI, yield, other indices) and non-visual images or mosaics (NIR, thermal) are ranked third (52%) and fourth (50%).

The remaining part of the respondents did not collect nor use data themselves but had an interest in remote sensing as being the supplier of either hardware or software that was used for remote sensing.

Where indexes are obtained for agricultural use, the Normalized Difference Vegetation Index (NDVI) is the most used index by the respondents (85%). Other much less frequently used indexes are the Weighted Difference Vegetation Index (21%) and the Leaf Area Index (7%). Other - unknown - vegetation indexes are also used by 39% of the respondents who use vegetation indexes.

| Data processing software | % |
|---|---|
| Pix4D | 56% |
| Agisoft Photoscan | 33% |
| Self-developed software | 25% |
| ERDAS Imagine | 8% |
| ENVI | 4% |
| **GIS Software** | **%** |
| QGIS | 42% |
| ESRI | 13% |
| SMS management Software | 4% |

Table 2 RS software used by % of respondents

The frequent use of unmanned aerial vehicles by the respondents translates itself into the software used for data processing: accessible and relatively low cost software specialized for mapping and photogrammetry, such as Pix4D (56%) and Agisoft Photoscan (33% ), is most often used by the respondents, while more extensive and expensive software packages, such as ERDAS Imagine (8%) are much less frequently used. This also holds true for GIS software, where QGIS (42%) is favoured over ESRI (13%) by the respondents. A reason for this could be the high entry barrier to these software packages in terms of required training and price. 40% of the respondents also indicate the use of other software packages as to the ones listed in Table 2, such as Global Mapper, or Drone portal software packages as Dronedeploy.

The use of UAVs as a platform for visual images, height images and index maps, is reflected in the sensor technology that is used as depicted in figure 3. 75% of the respondents mention RGB as the sensor technology that is used, with Near Infra Red (NIR) (52%) and Thermal (46%) ranked second and third. These technologies are all readily available for use with UAVs. More surprisingly is that LIDAR, which needs heavy investment and has not matured yet for use with UAVs, is ranked fourth by the respondents. 40% of the respondents state they are already using LIDAR.
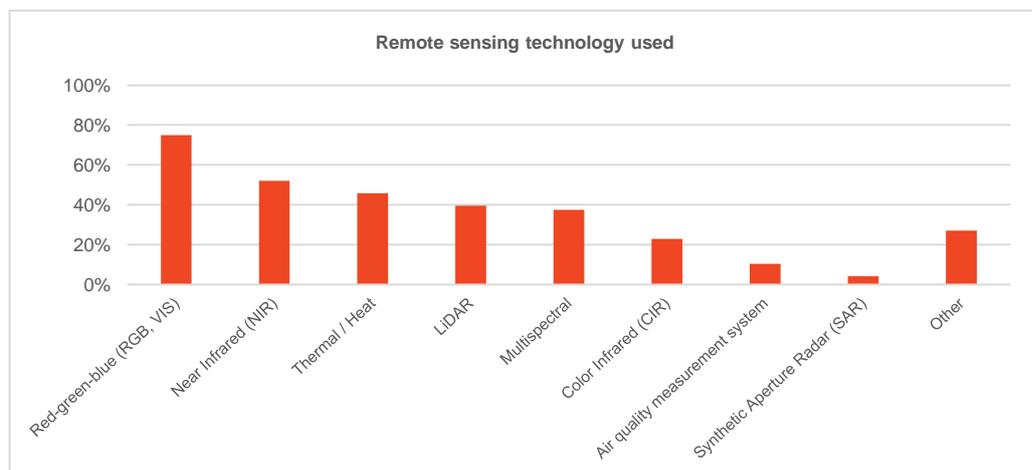


Figure 3 RS technology used by % of respondents

## Challenges in the development of RS using UAVs

Challenges for the development of remote sensing using UAVs are mainly in the area of regulation and law, according to the respondents, while development in technology can also play a significant part.

The restrictive regulations regarding the use of unmanned aerial vehicles is the most often mentioned hurdle (mentioned by 39 respondents) for further use of UAVs for remote sensing, followed by technology (24 respondents), acceptance of the public (20 respondents), pricing (17 respondents) and other restrictions



Figure 4 relative size of hurdle for using UAVs in RS

or hurdles (12 respondents). Figure 4 shows the relative % of the hurdle in the development of RS using UAVs according to the respondents. The relative % is measured as the frequency the hurdle is mentioned divided by the total hurdles mentioned by the respondents

The respondents consider regulations and laws as the most restrictive factor in the further use of UAVs for remote sensing. When asked what factors cause the restrictions, most often the restrictions in flying with UAVs - such as the requirement to fly within visual line of sight or abstain from congested areas are mentioned. Other restrictive factors in regulations are law that are mentioned is the sizeable amount of times it can take to obtain a permit for UAV operations within the 2Seas area.
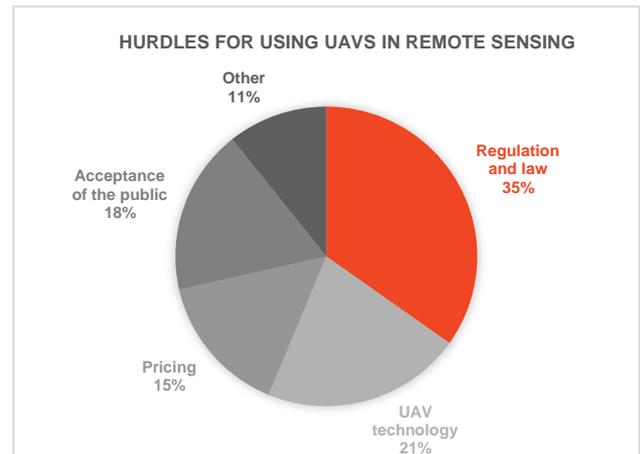
The restrictions in technology are mostly caused by unreliable UAVs, short battery endurance, and inadequate sensors for UAVs, according to the respondents. Acceptance of the public issues are not only caused by the abovementioned unreliability in UAVs, but also by the lack of knowledge of what can be done with the data, according to the respondents. This especially holds true when the collected data is used for agricultural analysis purposes.

The pricing issues derive from the high rates of depreciation in technology caused by rapid technological developments, as well as sizeable time investments that need to be made due to user-unfriendly software and technology.

### Interest in the ICAReS innovation cluster

Of the respondents that indicated their reason for their interest in ICAReS, most respondents hope to be informed about related companies and their activities (50%), and/or hope to encounter new contacts and extend their network (50%). Figure 5 depicts the full distribution of reasons.
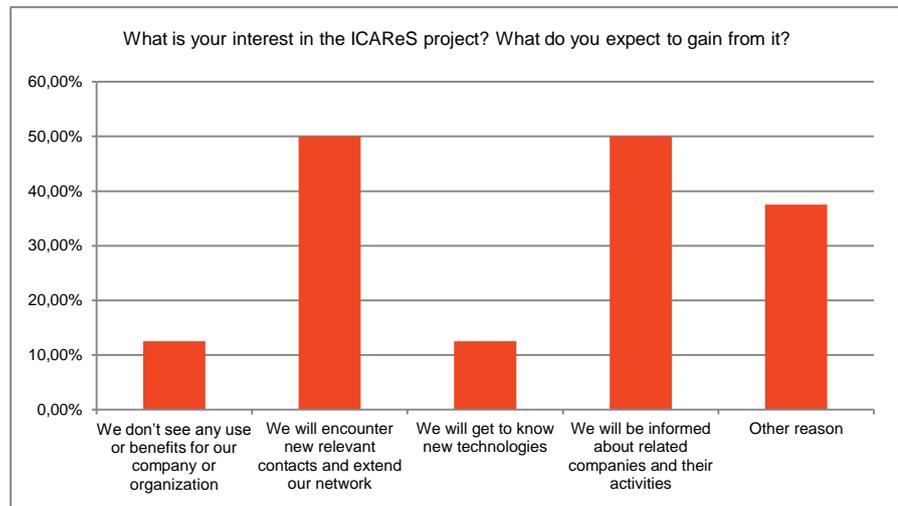
Figure 5 Reason for interest in ICAReS

Of the SMEs already active in RS, 69% is interested and available to give demonstrations and lectures about RS, which is a total of 34 SMEs. A high percentage of 88% is interested in joining a future remote sensing innovation cluster and would like to cooperate with the (inter)national research institutes. Finally, 15 respondents provided us with additional contacts for the ICAReS cluster to contact.

Appendix B (provided separately due confidentiality) shows the shortlist of respondents, which concludes this report.

# Appendix A: ICAReS – Questionnaire SME Remote Sensing and Data Processing

*1. General / contact information*

Person Name

Company Name

*Tick the best answer(s), multiple answers possible*

*2. Is your company or organization working with remote sensing?*

○  Yes (Go to question 8)

○  No

*3. Does your company or organization have any interest or plans to start using remote sensing/UAV technology in the near future?*

○  Yes (Go to question 6)

○  No

*4. If you don't have any interest or plans to start using remote sensing/UAV technology. What is the reason?*

☐  We don't see any use or benefits for our company or organization

☐  It is too expensive for our company or organization

☐  We don't know about the possibilities

☐  We don't have the required knowledge/capabilities

Other reason (please specify)

[text box]

### 5. What is your interest in the ICAReS project? What do you expect to gain from it?

☐   We don't see any use or benefits for our company or organization

☐   We will encounter new relevant contacts and extend our network

☐   We will get to know new technologies

☐   We will be informed about related companies and their activities

☐   Other reason (please specify)

[text box]

### 6. Your company or organization has interest or plans to start using remote sensing. How concrete are your plans?

○   We are interested, but have no concrete plans. And we like to be informed by ICAReS and be invited for your activities. (Go to the end of the questionnaire)

○   We have concrete plans to invest and start with using remote sensing.

### 7. Your company or organization plans to invest and start using remote sensing:

○   within the next 6 months

○   between 6 months and 1 year

○   next year (2018) or later

○ Other, …………………..

Please, fill in the following questions as if your company or organization already started using remote sensing

**8.  What is the goal to use remote sensing for your company or organization?**

**9. What carrier do you use for remote sensing?**

☐ Unmanned Aircraft System (UAV) or drone

☐ Aeroplane (manned Aircraft)

☐ Helicopter (manned)

☐ Satellite

☐ Other ……………………………………………………

**10. Which technology do you use for remote sensing?**

☐ Red-green-blue (RGB, VIS)

☐ Near Infrared (NIR)

☐ Color Infrared (CIR)

☐ Thermal / Heat

☐ LiDAR

☐ Synthetic Aperture Radar (SAR)

☐ Air quality measurement system

☐ Other, ……………………………………………

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### 11. 1) What software do you use to translate the data to information?

☐ We write our own software (python, .NET, java, …)

☐ SMS Management software (Ag Leader)

☐ Erdas Imagine

☐ Agisoft Photoscan

☐ Pix4D

☐ ENVI

☐ ESRI (Arcmap, ArcGIS)

☐ QGis

☐ Other(s), please specify

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*12. What is the output of the data?*

☐ Visual Images (e.g. aerial images, orthophoto mosaic, satellite image, )

☐ Height information (Digital Elevation Model or Digital Surface Model or Digital Terrain Model)

☐ Non visual images or mosaics (NIR, thermal, …)

☐ Thematic maps (habitat, vegetation or water, classifications, …)

☐ Index map (NDVI, yield, other indices)

☐ Other(s), ……………………………………………

*13. If used in the sectors 'Agriculture' or 'Nature', which vegetation indexes are presented?*

☐ Normalized Difference Vegetation Index (NDVI)

☐ Weighed Difference Vegetation Index (WDVI)

☐ Leaf Area Index (LAI)

☐ Other(s), please specify

*14. What are the main problems or challenges when using remote sensing?*

*15. What are the restrictions and hurdles that need to be tackled to facilitate more use of UAV's for remote sensing?*

☐ Regulation and law

☐ UAV technology (e.g. not mature yet)

☐ Pricing

☐ Acceptance of the public

☐ Other(s), please specify

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*16. Is your company interested and available to give demonstrations and lectures?*

○ No

○ Yes, Please specify

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*17. Are you interested in joining a future remote sensing innovation cluster*

○ No

○ Yes, why

[ text area ]

*18. Are you interested to cooperate with the (inter)national research institutes?*

○ No

○ Yes, why

[ text area ]

*19. Do you know about other relevant companies for us to contact?*

[ text area ]

*20. Do you have any additional remarks or suggestions?*

[ text area ]

*Thank you very much for your time! You efforts are appreciated by the Icares team! Please feel free to contact us if you require more information! icares@woensdrecht.nl*

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