Institute for Environmental Solutions

Framework Partnership Agreement for Copernicus User Uptake

"Use of Earth Observation data products in the context of spatial planning activities" - a survey report

User Uptake of Copernicus Services for Landscape and Spatial Planning Stakeholders, FPCUP Nr. 2021-2-38

September 2023

1. Introduction

The survey "Use of Earth Observation data products in the context of spatial planning activities" was carried out by the Institute for Environmental Solutions (IES) as part of the Framework Partnership Agreement on Copernicus User Uptake (FP CUP) activity "User Uptake of Copernicus Services for Landscape and Spatial Planning Stakeholders, FPCUP Nr. 2021-2-38". The survey took place in August and September 2023.

The aim of the survey was to comprehend the current state of Copernicus (and other) geospatial product usage among spatial development planners in Latvian municipalities and planning regions, identify the challenges in satellite data product usage and explore the geospatial data needs of spatial planning specialists.

98 spatial planning specialists, spatial development specialists, GIS specialists and cartography specialists from 43 (36 counties and 7 state cities) municipalities and 5 planning regions were directly invited to take part in the survey via e-mail. Invitation was also disseminated through IES's social media (LinkedIn and Facebook) channels. In total, 28 answers were received from spatial planning stakeholders in 14 counties, 3 state cities and 2 planning regions and 1 answer was received from a private sector company SIA "Aerones". Municipalities and planning regions represented in the survey are shown in Fig. 1.1, 1.1 and 1.1.

Aizraukles	**Cēsu**	Krāslavas	Madonas	Rēzeknes	Talsu
Alūksnes	Dienvidkurzemes	**Kuldīgas**	Mārupes	**Salaspils**	Tukuma
Augšdaugavas	Dobeles	**Ķekavas**	Ogres	**Saldus**	Valkas
Ādažu	Gulbenes	**Limbažu**	Olaines	Saulkrastu	**Valmieras**
Balvu	Jelgavas	Ludzas	Preiļu	**Siguldas**	Varakļānu
Bauskas	**Jēkabpils**	Līvānu	**Ropažu**	**Smiltenes**	Ventspils

Fig. 1.1, *List of 36 counties in Latvia, those represented in the survey answers in bold*

Daugavpils	Jelgavas	Rēzeknes	***Ventspils***
Jūrmalas	**Liepājas**	**Rīgas**	

Fig. 2.1. *List of 7 state cities in Latvia, those represented in the survey answers in bold*

Kurzemes	Latgales	**Vidzemes**	Zemgales	Rīgas

Fig. 3.1. *List of 5 planning regions in Latvia, those represented in the survey answers in bold*

2. Results

2.1. Knowledge of available data products

The question "Which of the following data products do you know?" was included in the survey to assess the overall awareness of available products that could be useful in the day-to-day work of spatial planning specialists. The question was presented as a multiple choice with the option to add open answers. Among 29 respondents, a total of 99 answers were received.

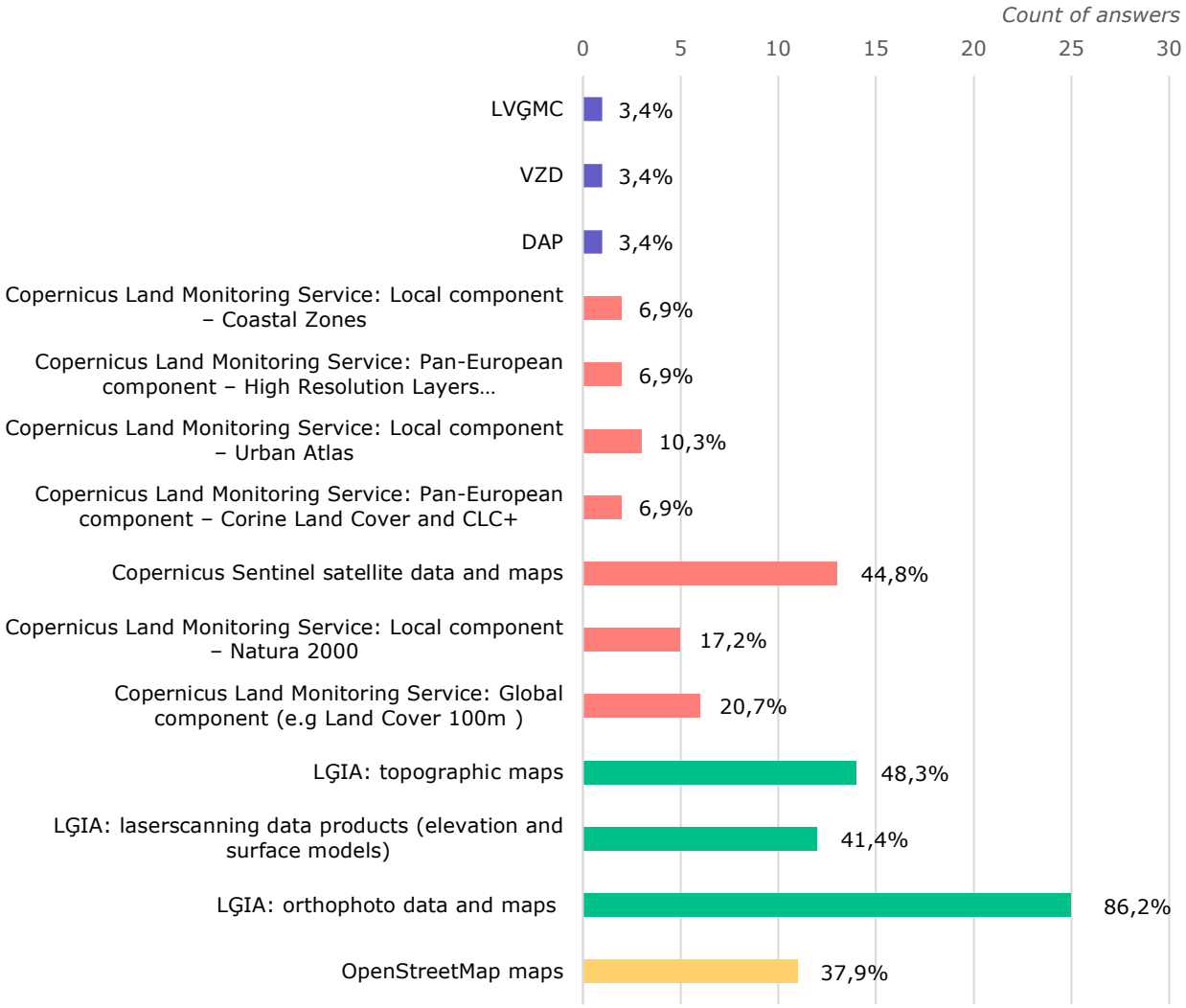

Fig. 2.1. *Knowledge of data products among respondents*

The most popular data products among the respondents were the ones provided by the Latvian Geospatial Information Agency (LGIA or LĢIA in Latvian), with their orthophoto data and maps being the absolute frontrunner (25 respondents), followed by their topographical maps (14 respondents) and laser scanning data products (12 respondents). Among the Copernicus data product suite, the satellite data and maps are acknowledged by 13 respondents, corresponding to 44,8% of the total count. The rest of the mentioned Copernicus products show less popularity. The Global component is marked by a fifth of the respondents, the Local component–Natura 2000 is marked by 17,2% of respondents and the Local Component–Urban Atlas by a tenth of all respondents. The rest of the Copernicus products offered in the survey

are marked by 2 out of 19 respondents. These results clearly indicate that awareness raising on the possibilities offered by Copernicus products for spatial planning is needed. Another popular data product option is the OpenStreet maps, marked by 11 respondents. The DAP stands for Nature Conservation Agency data products, the VZD stands for the State Land Service and the LVĢMC stands for Latvian Environment, Geology and Meteorology Centre.

2.2. Usage and planned usage of the available data products

The aim of the question "Which of the following data products do you use or plan to use" showcased the practical applicability of the products, as assessed by the spatial planning stakeholders.

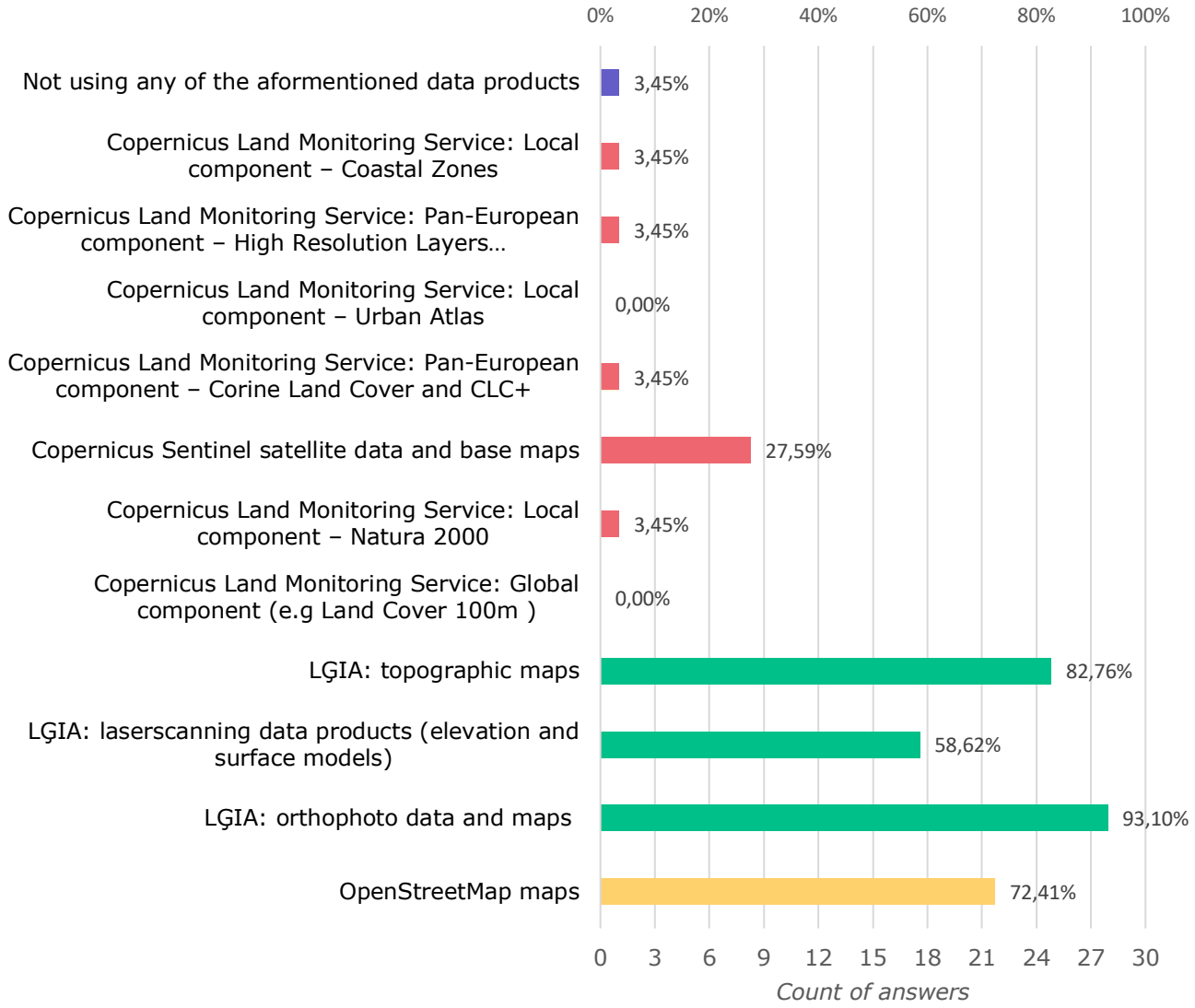

Fig. 2.2. *Usage and planned usage of the available data products*

In total, 102 answers were gathered - interestingly, three more than the previous question. Similarly, the most used products come from the LĢIA suite, the orthophoto data and maps being used by 27 out of 29 respondents. This product is followed by LĢIA topographic maps, and the OpenStreet maps come in third with the usage of more than 70% among the respondents. The usage of Copernicus data is fairly low. The most popular options - satellite data and maps - are used by one-fourth of the respondents (27,6%), and the rest of the products are either used or planned to be used by one or no respondents. This signifies that the Copernicus products are fairly well-known among the spatial planning stakeholders but are not actually put into practice by them. Moreover, a lack of understanding of the term "landscape metrics" was observed during the communication with the respondents regarding the survey.

2.3. Reasons for using the data products

To inspect the habits of data product usage, a multiple-choice question "For what purposes do you use the data products?" was asked. In total, 54 answers were gathered and out of them, browsing and studying data (24 out of 29 respondents) along with the need to inspect changes (19 out of 29 respondents) were the most popular options.

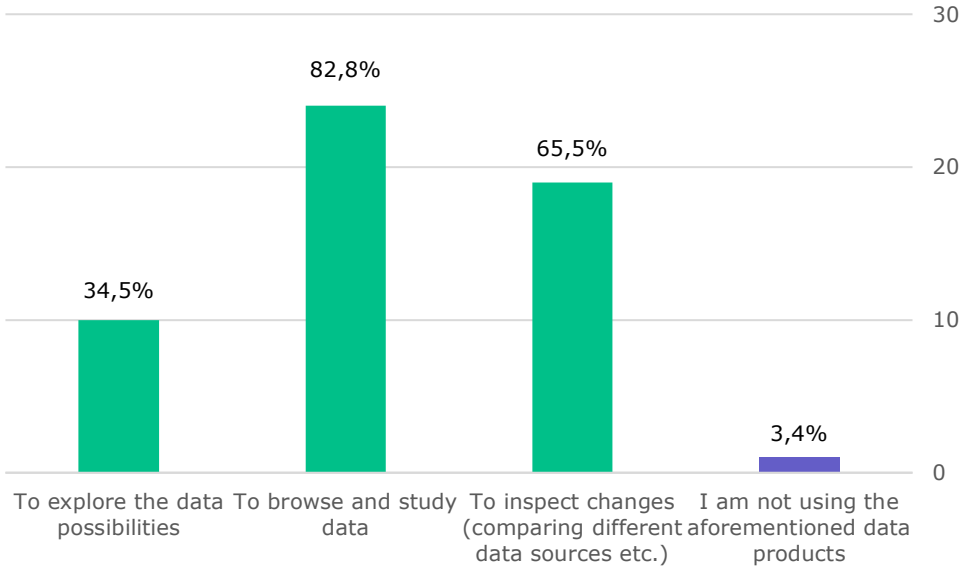

Fig. 2.3. *Reasons for using the data products*

One third (10 respondents) use the data to explore its possibilities and one respondent admits to not using the data at all.

2.4. Critical issues related to data availability

To evaluate existing data products and build on the existing experience while creating new pilot products, designed for use by spatial planning stakeholders, important data availability gaps were assessed. The question "What issues have you faced while using the data" offered multiple answer choices as well as an open answer. In total, 68 answers were submitted. Almost two-thirds of the respondents criticized the spatial resolution of the available data. More than 40% of respondents are not satisfied with both the temporal resolution of the data products, as well as the access to the data.

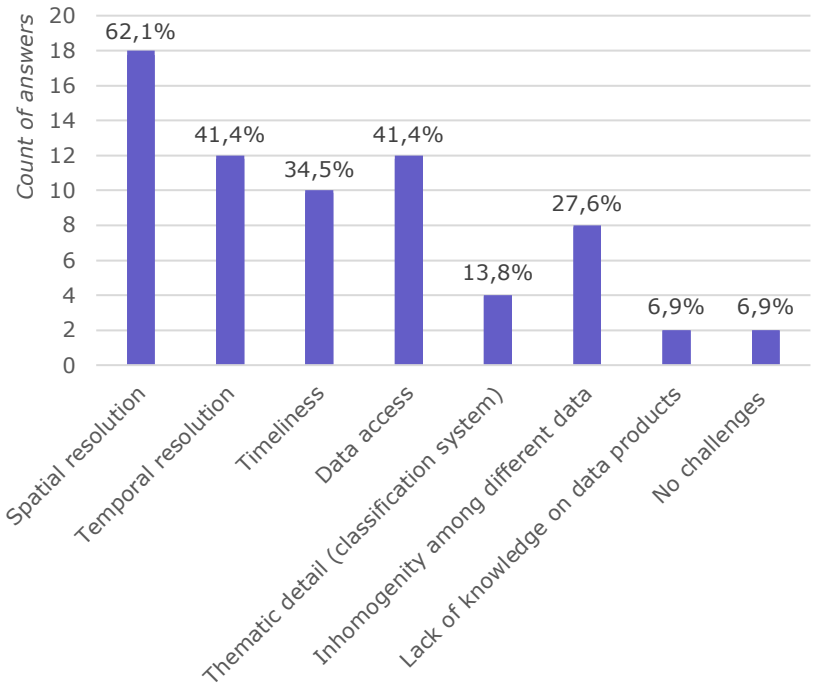

Fig. 2.4. *Critical issues related to data availability*

More than one-third (10) of respondents wished that the data was timelier, meaning that the time between the capturing of the data and its availability in the form of a product, is too long. 8 respondents also admit that they have difficulties combining the outputs of different data products - thus the data is inhomogeneous.

2.5. The usage capacity

The respondents were asked to rate their usage capacity of the Earth Observation data-derived products using one of the following marks: excellent, good, sufficient, or insufficient. 17 out of 29 respondents (58,6%) rated their knowledge and experience as "insufficient" for using the products. A third of the respondents (31%) rate their capacity as "sufficient" and 3 respondents (10,3%) feel like their capacity is good.

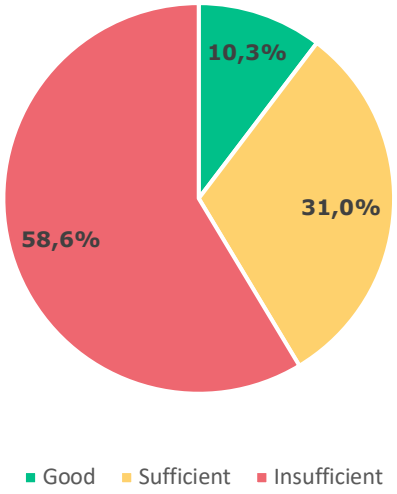

Fig. 2.5. *Usage capacity of the data products among respondents*

2.6. Desired uses of Earth Observation data products

Respondents were asked to share what needs could Earth observation data fulfil for their daily work tasks. In total, 26 answers to this open question were gathered - 3 respondents admitted a lack of knowledge or opinion on the matter. A major stream of answers included the wish to use the data products for change detection in several contexts. E.g., detection of construction works and changes in housing (mentioned several times), detection of vehicles and solar farms. Detection of changes in the riverbed was also mentioned by a representative from the Sigulda municipality, through which the river Gauja (a major water body; the longest river in Latvia) flows. Representatives of another municipality located around Gauja, Valmiera, similarly stressed the importance of flood monitoring, also addressing in monitoring of vegetation. Another fraction of answers focused on the nature and climate aspect - e.g., natural disaster risk assessment, input for decision-making regarding extreme rains and flash floods, and evaluating the climate change impact on the municipality in general. 7 out of 26 expressed the desire to use the data product for development planning and for the creation of the corresponding documentation - territorial plans and development plans. The interest in browsing historical data and comparing it to the current status was also mentioned in several answers. A representative from Mārupe municipality expressed an interest in monitoring, analysing and predicting the urban sprawl. It can be explained that Mārupe is bordering the agglomeration of the capital of Latvia, Rīga. Mārupe, in contrast to the general situation in Latvia, has faced an increase in the count of inhabitants and has become an attractive living space for young families. Together with other municipalities, adjacent to Rīga, Mārupe is a part of the union "Rīgas Metropole".

Other respondents focused on the practical side of the data products, answering that they would like to use (or already use) the aerial images of the territory as base maps or a source of information, data products also help to create inputs for the municipal GIS system or serve as a basis for developing new products.

Detailed information was obtained from the Vidzeme planning region. The representatives would like to see how Copernicus data products could improve the climate resilience of the region and benefit the Energy and Climate plan that is currently being developed. Also, the region would like to explore the data product functionality regarding the planning of the blue-green maritime infrastructure and the planning of cross-border cooperation with Estonia. The representative also pointed out that the needs vary depending on each project or emerging trends.

As mentioned before, one of the respondents (as a result of the dissemination of the survey in social networks), came from the private sector: a company called "Aerones" which specifies in maintenance of wind turbines using UAVs. The representative stated their interest in using the products for assessing object detection in wind farms, creating wind farm topography, air quality monitoring (particulate matter from ground level to 250 m above ground level), monitoring of precipitation and historical data from wind parks.

Several respondents answered the question vaguely - with terms such as "for data analysis" and "for the analysis of the current situation" or simply "agriculture".

2.7. Most useful spatial resolution level

The respondents were asked which spatial resolution level suits their daily tasks the best. A similar number of votes for Object level (15 answers) and Pixel level (13 answers) were received. One respondent stated that grid level is the most useful spatial resolution level for them.

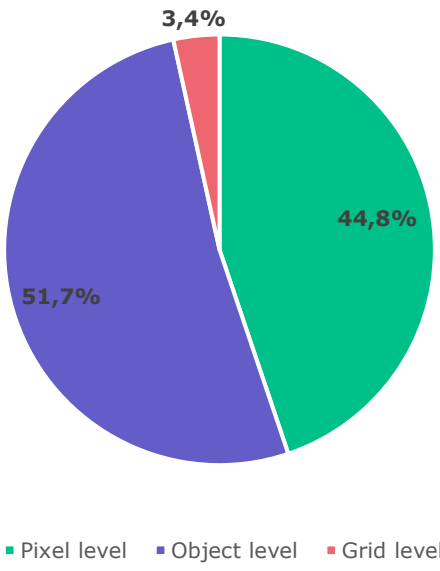

Fig. 2.6. *Usage capacity of the data products among respondents*

2.7. Desires for additional information from satellite data

An open question was asked to gather insights on what additional information spatial planning stakeholders would find beneficial. 8 of the respondents did not answer the question due to either lack of knowledge of the available data products, or lack of thought put into the matter. Some of the respondents took this question as a chance to state the improvements that would like to find in the products. E.g., better spatial resolution to view smaller objects - for instance, fences. Several respondents mentioned better temporal resolution. The example mentioned twice regarding temporal resolution was the orthophoto data and the desired frequency was once per year. It can be deduced that the respondent speaks about the LĢIA orthophoto data that is acquired for all the Latvian territory in 3 year-long cycles. The data is obtained from airborne platforms and is of good sub-meter resolution.

The suggestions that are in line with the questions were:

- depiction and flooded areas and areas that are at risk on a highly detailed level;
- infrastructure and mobility;
- climate indices, exposed mineral covers and mining sites (mentioned twice);
- potential water accumulation sites (after extreme rainfall), areas with dense growth of hogweed (considered a major invasive species in Latvia), identification of degraded areas;
- thermal data for heat island assessment.

2.8. Use of landscape metrics data

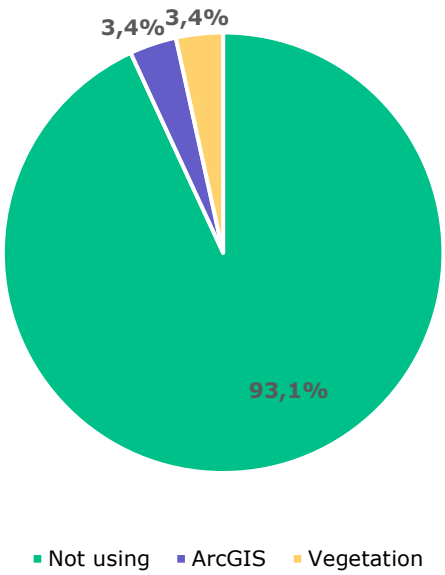

Fig. 2.7. *Use of landscape metrics data among respondents*

When asked, whether the respondents use landscape metrics data in their work (and if yes, which data exactly), most of the spatial planning stakeholders indicated that they not only do not use such data but also are not familiar with the term and the concept of landscape metrics. One respondent answered simply "vegetation", and another one - "ArcGIS". The results indicate either a lack of knowledge in terminology (specialists could

be using the data products, but not labelling them in such a way) or a lack of knowledge of the data availability and possibilities.

3. Conclusions

Spatial planning stakeholders in Latvia mostly rely on local datasets, provided by the Latvian Geospatial Information Agency (LĢIA). It is understandable, as their orthophotos have a high spatial resolution, but their main drawback is the temporal resolution. Often the data is simply too old to make assumptions and decisions about the territory, based on it. Copernicus data is used in the form of satellite data and base maps. Another valuable source of data is the OpenStreet maps. A lack of knowledge and/or experience with Copernicus products can be deducted. To the question " Which of the following data products do you know", 33 answers mentioning Copernicus (out of 99 total) were gathered. However, when asked, which of these products the respondents already use or plan to use, only 12 answers, indicating Copernicus products, were received. That means there is a significant lack of information on the data product uses and capabilities.

Most of the respondents use the data products to browse and study data that is available on the desired territory and to inspect developments and changes that have taken place during that time. Therefore, there is a lot of space for developing products that automatically calculate changes in certain values or indices and bring out changes that have exceeded a fixed threshold.

Regarding critical issues - the biggest problem in the eyes of spatial planning stakeholders is the lack of spatial resolution for the data. While one answer to that might, of course, be the improvement of future satellite hardware, the issue could also be (at least partly) rectified by the introduction of artificial intelligence (AI) tools for enhancing the quality of satellite imagery. An equal share of answers (41,4%) was dedicated to lack of temporal resolution and difficult data access. The data access can be improved by creating tailor-made data products based on the needs of spatial planning stakeholders.

When it comes to the desire for additional information from satellite data, climate-related data was of the utmost interest to spatial planning stakeholders.

As the next step, it is planned to conduct in-depth interviews with the respondents who showed the most dedication to the survey to map out their needs in a more detailed manner.