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Final Report

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Contents

Introduction

In April 2023 Latvia received Eurostat call SMP-ESS-2023-NA-BOP-IBA-H1-6438 for grants in the field of ESA2010 and BPM6 implementation, quality improvements, and execution of the GNI control cycle. Among mentioned there 12 activities that can be funded by EC, the call contained also activity number 5 - Experimental statistics on Space Economy Satellite Accounts (Supply and Use Tables). This activity was found interesting to participate in, and in May 2023 Latvia applied for the grant in the activity number 5. In October 2023 an agreement was signed between Eurostat and Central Statistical Bureau of Latvia. Starting from November 2023 Latvia started to work actively on the activity number 5 - Experimental statistics on Space Economy Satellite Accounts (Supply and Use Tables).

Experimental statistics on Space Economy Satellite Accounts (Supply and Use Tables) is innovative and challenging project in Latvia. Domestically, there is strong interest from the Ministry of Economy and from the Ministry of Education and Science. Internationally, different countries, Eurostat, JRC, ESA, and, possibly, some other organisations, including BEA, are interested to see the results of this project.

Data is provided for the year 2021, as at the moment of implementation of this project it was the latest year completed in the SUT framework and simultaneously the starting year of the current Space Strategy of Latvia 2021-2027.

1. General organisation

Project was started on 01.11.2023. SUT data, having share of space economy separately, was prepared and sent on 31.01.2025. And it is planned to send current final report before the end of February 2025.

In general, the project is planned and implemented by Central Statistical Bureau of Latvia, and in its core by the employees working in the section of Annual National Accounts. The direct support to the project is provided by Strategic Planning and Resources Management Department, which supervises standard project planning frameworks including finances and timing, and direct support is provided by the whole Macroeconomic Statistics Department.

Contacts between CSB, Ministry of Economics, Ministry of Education and Science, representatives of Space Industry in Latvia were established. These contacts are bilaterally beneficial, they help to fulfil both needs of the project and needs of mentioned organisations as well. Valuable comments also were provided by Eurostat, ESA, BEA and JRC colleagues.

Each participant included in the project team has instructions and tasks. In case of questions internal meetings are held. According to the agreement there are also 4 internal meetings planned, all of which happened (kick-off meeting - first meeting to communicate regarding the results to be achieved, and all 3 progress meetings - evaluation of the progress done).

Timely delivery of the results and assessment of project progress according to the agreement have been made on continuous basis.

2. Investigation of principles of delimiting of space economy

Principles of delimiting of space economy were investigated. Useful information was found in, e.g., Eurostat publication "Developing a space economy thematic account for Europe", in OECD "Handbook on Measuring the Space Economy", in materials available at BEA portal, in materials spread by Eurostat, and during discussions with space sector experts. Project team got acquainted with the methodology on delimiting of the space economy being developed by ESA, JRC and Eurostat, and with BEA materials.

Space sector as usual is not highlighted separately in the statistics. At the same time the contribution of the space sector in the economy is of interest. Current classifications of economic activities (NACE) and products (CPA) do not provide, with some exceptions, clear indications whether particular economic activity or product is space related or not. In April 2023 Eurostat spread deliverables containing the list of space relevant NACE and CPA codes, and presentation containing valuable descriptions of how space economy should be delimited, in particular in the framework of the supply and use tables. This list, including its most recent update (from 18.10.2024) and description, which represents common work of Eurostat, JRC, ESA with large BEA input, were taken as basis for works done in this project.

One of the aspects, which appears to be a key aspect in the whole project, mentioned in the presentation spread by Eurostat, states that national specific should be taken into account. In practice it means that list of space relevant NACE and CPA codes can vary in different countries. It can both shrink or expand adding new records in it. Developing this idea further it becomes clear that even very detailed lists of NACE and CPA codes do not solve this issue, because e.g. a company can be partially involved into space sector, and even the same CPA product, disregard of its level of details, can be either used in space sector or not.

In November 2023 the document containing the first results for the space economy thematic account was received from Eurostat. It was indicated that for Latvia share of space related products is 6.53% in its exports and 4.85 % in its imports (data for 2021). These values are considered to be too high to attach

all of them to the space sector. Later, in December 2023 Eurostat spread the document containing the second results for the space economy thematic account. This time only CPA code 30.30.40 "spacecrafts (including satellites) and spacecraft launch vehicles" was left as space related. This category is 100% space related, however, this approach (to leave only CPA 30.30.40) does not cover all space related products. The further ideas, e.g., to leave particular space related NACE activities, e.g., NACE 5223 (Service activities incidental to air transportation (incl. space)), also are arguable. In Latvia NACE 5223 represents only civil aviation, not space sector.

Thus, this challenging task, to delimit space economy, seems cannot be directly solved applying just classification of economic activities (NACE) and products (CPA). In practice it means that actual contribution of space sector should be estimated based on active units, which are doing something in space sector, adjusting their aggregates applying estimated space related products share. This approach was approbated during discussions about contribution of space sector both domestically and internationally.

Further analysis showed that even list of active space units is not exhaustive to represent the whole space economy, e.g., because units included, though not always, but in Latvia mainly focuses on production side of the space economy. Production side, i.e. mainly output is not the only indicator under the interest. E.g., use side and all other indicators of the SUT framework can be space related. Investigating this complexity, employing the best efforts possible, some replicable methodological options were created for further development, discussions, experiments and, nevertheless remembering the experimental nature of these estimations, but still trying to get numerical evaluation and answer the data users question: "How big is the space economy in Latvia?".

3. Space Strategy of Latvia 2021-2027

There are several users of the results of this project. And part of them is represented by domestic organizations. In Latvia there are two ministries which are directly involved and responsible for the space sector, i.e. Ministry of Education and Science and Ministry of Economics. Under the roof of these two ministries The Space Strategy of Latvia 2021-2027 was prepared in 2020.

The Strategy:

- has been reviewed and adapted by the Latvian Space Policy Working Group, and its aim is to structure and coordinate the space policy related matters in Latvia as well as to demonstrate the willingness of the stakeholders to work together for the development of the space sector.

- was designed in 2020 following Latvia's accession as an associate member of the European Space Agency, and it establishes a focused framework for the cooperation of Latvia with the European Space Agency.
- contributes to the achievement of the objectives, priorities and actions defined in the Latvian National Development Plan 2021-2027, the National Industrial Policy Guidelines 2021-2027 and the Science, Technological Development and Innovation Guidelines 2021-2027.

Strategy has four categories of activities: education and development of skills, development of space related products with high export potential (in cooperation with ESA), research and development and governmental services (e.g., satellite services providing space images).

Strategy needs to be monitored, therefore contribution is supposed to be made obtaining final results of this project.

4. Plan for identification of relevant space economy-related commodities in SUTs

The final numerical deliverable according to project task should be expansion of the national SUTs to include space economy and non-space economy related NACE and CPA codes at the 2-digit level. Currently Latvia is publishing SUTs at A64 level of details, thus “space” SUTs were supposed to be at A64 level. Initially, this level of details was considered as not to be compatible with confidentiality requirements, however final level of details was not reduced, because tracing back from the published data to the company level data is not feasible.

Initially, the most suitable approach, which takes the country situation into account, and allows to fulfil the project tasks was concluded to be the following plan:

1. Identify organisations which are participating in space sector.

2. Estimate shares of space relevant products in their output.

3. Using available data sources, find what are the NACE codes of these organisations and CPA codes of the products they are producing.

4. Estimate value and structure of intermediate consumption, which is needed to produce space relevant products. This would enable the possibility to estimate senseful value added.

5. Estimate value and structure of exports and imports for organisations which are relevant for the space sector. In case of exports, it should be space relevant. In case of imports, it should represent inputs needed to produce space relevant products.

6. Estimate number of employees which are working in space sector and compensation of employees as well.

7. Make necessary adjustments to ensure more complete coverage of space economy in SUTs.

While working according to this plan, and during the analysis and evaluation of the first numerical provisional results, making also brainstorming discussions with the colleagues in the Central Statistical Bureau of Latvia, it was concluded that it is not sufficient to base estimations only on the active space units. Therefore, more complex approach, which has also some estimations based on active space units, was developed later. This new improved approach is described further (for details see Chapter 9).

5. Collecting data for identification of relevant space economy related commodities in SUTs

Space economy related commodities dominantly are circulating between organisations. To identify organisations, which are participating in space sector, and gather qualitative and quantitative information about them, several data sources were used:

- data from Ministry of Economics and Ministry of Education and Science;

- information available at https://www.latviaspace.gov.lv/en/directory/all/;

- annual reports of organisations;

- resources publicly available in the internet, mainly, webpages of companies;

- data needed for compilation of regular national accounts indicators (data from surveys 1-year and 1-costs; data from R&D surveys, FTS data, BoP data, PRODCOM data, State Revenue Service data, Structural Business Statistics data and State Treasury data).

The data sources are shown in the Annex 1.

Data received from www.latviaspace.gov.lv and data received from Ministries gave the dominant basis for the list of space units in Latvia. It was slightly complemented employing NACE classification itself, i.e. by NACE codes which are assumed to be definitely space related: 6130 - Satellite telecommunications and 5122 - Space transport, and evaluation was made employing R&D data sources.

Data in R&D data sources have space record, but values were already covered before, except one very little case.

List of 92 units representing S11, S13 and S15, having relation to space industry of Latvia was obtained. Qualitative and quantitative information were gathered for each of them and were analysed.

Mentioned list of 92 units was reduced to 48 units. It was concluded that only 48 units were relevant for the *basic list of space companies* (See Step 1 and Step 2 in Chapter 9).

6. Processing data for identification of relevant space economy related commodities in SUTs.

One of the best data sources which is directly related to space economy in Latvia appeared to be the portal run by the Latvian Space Industry Association under a service contract with the Ministry of Education and Science of the Republic of Latvia: www.latviaspace.gov.lv

This portal among other information has the list of organisations which are participating in space sector. And what is very important, in majority of cases the number of employees which are involved in space sector in particular organisation is shown. These data were extracted and processed further.

Portal www.latviaspace.gov.lv gave the majority of data for identification of the organisations and shares of spaces economy (based on estimated shares of employees involved in space sector activities to total number of employees). Other, mentioned above data sources were used to complement data in mentioned portal in case of need. Some working qualitative descriptions, e.g. laconic conclusions from annual reports or webpages, were made and scrutinized.

In order to complement the list of organisations additionally, the list of NACE/CPA space relevant codes provided by Eurostat was processed applying it to PRODCOM and FTS data in 4-digit level for NACE and 6-digit level for CPA. Further, to reduce the number of units under scrutiny, search for words having "space" or "satel" was employed. Obtained list of 20 companies was scrutinized on a case-by-case basis, 19 companies were excluded (in majority they are connected to civil aviation), but 1 company already existed in the previously constructed list.

R&D surveys also were processed. In Latvia they contain particular record about expenditures on space research activities. 10 organisations were detected there to have space research activities. 9 companies already were in the list, 1 company was added.

Space-related coefficients were calculated for each organisation. Space-related coefficients are estimated as one coefficient per company, i.e. it is the same for output, intermediate consumption, export and import.

While estimating national accounts indicators, guidelines of European System of Accounts were followed.

7. Assession of data gaps. Identification of possible inputs that could complement SUTs information.

In general, quality of estimations and results obtained for the *basic list of space companies* (See Step 1 and Step 2 in Chapter 9) are considered to be adequate, and are considered to be representing actual contribution of space sector in Latvia, including, e.g., the adequacy of value added of space sector. However, this list seems to be representing dominantly production side of the space economy of Latvia, and some challenges were detected as well:

1. NACE / CPA structure alone cannot be used to delimit space sector, because space sector is spread across different NACE / CPA and the shares of space products are fluctuating for a particular company, place etc.

2. NACE / CPA codes with multiple activities and products, having among them space sector activities and products, can give misleading conclusions. There is no guarantee that there will be relations to space sector.

3. The main data source for identification of space sector organisations - www.latviaspace.gov.lv, though is well structured and well informative, but is not complete, and is not created for the purposes of national accounts. It creates necessity to scrutinize on a case-by-case basis a lot of information with little chances to obtain data which is relevant to space sector.

4. Data used for compiling of official national accounts is not directly available for delimiting of the space sector, therefore there is a need of additional custom estimations, e.g., to estimate output, intermediate consumption, imports, exports, compensation of employees and number of employees. There is a need to employ data sources, which are at the disposal of CSB of Latvia, but are not usually used, e.g., specific breakdowns of State Revenue Service or State Treasury data.

5. Mentioned limitations created the necessity to make arbitrary decisions, e.g., on shares of space related products and their structure for particular company or activity. Assumptions made are supposed to be made employing the best efforts possible.

Possible inputs to increase the quality of the final results could be specific survey about space economy, however it would make burden on the respondents, and will require additional administrative capacity. Anyway, specialized survey currently is not available now. Feasible for the realisation and moving forward to the more adequate evaluation of the space economy appeared to be the idea to combine the *basic list of space companies* with space NACE/CPA list elaborated by Eurostat, BEA, ESA and JRC. This idea employed also the use of data sources, which are at the disposal of the Central Statistical Bureau of Latvia, thus actual compilation could happen.

9. Development of the methodology and description of the final results

In order to include space economy as far as possible exhaustively in the SUT framework and in order to make senseful approbation of provided space NACE/CPA list, initial idea to include only companies, which are actually (almost definitely) doing something in the space sector of Latvia, was modified, adding new elements to it.

Taking into consideration limitations in the data sources and methodological uncertainty with the idea of application of space NACE/CPA (even if it would be possible to break all the goods and services into 6-digit level, it would not give the correct share of the space economy without having something like additional dimension space/non space anyway) and potential problem with obtained company list (with some exceptions, the list is focused on production side, and there are no guarantees that the list is exhaustive, however it is assumed as to be quite complete), and simultaneously respecting interest of potential users of the data, which are interested in the adequate final values of the space economy of Latvia, the following solution was introduced:

Solution: Use obtained *basic list of space companies* (see Step 1 and Step 2 further) as a reference point by value for another estimations, which are based on space NACE/CPA list. Make some other moderate assumptions. As far as reasonable, make it in a balanced way, i.e. for both supply and use sides.

Practical implementation of this solution in the boundaries of the Supply and Use table is described in the following 9 Steps below:

Step 1. In the first step actual companies of space sector in Latvia were added into the SUT framework. There are two conditions: 1) to be included in the list of space sector companies in Latvia (*basic list of space companies*) and 2) to have export. This method was named *see-export-first*. The output of such companies is equal to 29.2 million EUR. It was assumed that all output of such companies went to

export, thus export is equal to output here, and it is equal to 29.2 million EUR as well. Only space share of output was used. Space share of output was estimated as output times share of employees in space (if available) or times arbitrary assigned space share. Space share is only one value per company, equal for all flows. Main data sources employed: latviaspace.gov.lv, data from the Ministries, FTS, BoP, 1-year.

Step 2. In this step actual companies of space sector in Latvia were added into the SUT framework as well. The difference between this and previous step is that export for this particular group of the companies was not detected. The output of such companies is equal to 9.1 million EUR. Only space share of output was used. Space share of output was estimated as output times share of employees in space (if available) or times arbitrary assigned space share. Space share is only one value per company, equal for all flows. Only previously not included companies were added in this step. Main data sources employed: latviaspace.gov.lv, data from the Ministries, FTS, BoP, 1-year. FTS and BoP shown no values for export side here.

Output Estimated in Step 1 and Step 2 creates **reference point by value**: 29.2+9.1=38.3 million EUR

Step 3. In this step import (18.0 million EUR) and intermediate consumption (22.6 million EUR) for companies imputed in Step 1 and Step 2 were added. It is what we can call *needed-to-produce* (not the space products as such, however space products can be in it as well). The same space shares on a company level were used as in Step 1 and Step 2. Main data sources employed: FTS, BoP, 1-costs.

Step 4. In this step companies having match between PRODCOM 6-digit data and space CPA 6-digit list were added to the output. Only CPA matches were checked here. Reference point by value is used in a way not to exceed ~75-80% of output detected in Step 1 and Step 2. Only previously not included companies were added in this step. Output was detected to be 29.4 million EUR. Main data sources employed: 1-production (PRODCOM data), space CPA list.

Step 5. In this step companies having match between NACE 4-digit data and space NACE 4-digit list were added to the output. Only NACE matches were checked here. Reference point by value is used in a way not to exceed ~20% of output detected in Step 1 and Step 2. Only previously not included companies were added in this step. Output was detected to be 7.7 million EUR. Main data sources employed: 1-year, space NACE list.

Step 6. In this step import (9.6 million EUR), intermediate consumption (23.8 million EUR) and export (10.1 million EUR) for companies imputed in Step 4 and Step 5 were added. For import and intermediate consumption it is what we can call *needed-to-produce* (not the space products as such, however space products can be in it as well). Shares of space part are used here, initially they were estimated on a

company level while “compressing” total values to ~75-80% (see Step 4) and ~20% (see Step 5) respectively, it means that space share here follows the company, it is not just one share for the whole aggregated flow, and it consecutively means that the structure of the flows is preserving correctness, as far as it is feasible here. Main data sources employed: FTS, BoP, 1-costs.

Step 7. In this step import (13.7 million EUR) and export (13.2 million EUR) of space CPA were added. FTS 6-digit CPA data and BoP 2-digit CPA data were used. Additional multipliers equal to 1% for detected FTS data and 0,25% for BoP data were applied. Only previously not included companies were added in this step.

Step 8. Other imputations and SUT derived estimations:
- consumption of GPS signals by households, based on purchased mobile phone equipment times arbitrary share of 1.5%, 1.5% is assumed to be share of value of GPS receiver and related software in mobile phones;
- gross fixed capital formation and changes in inventories for CPA 25, 26 and 27 based on share of space output to total output in each of these CPA;
- government final consumption expenditure for NACE (equal to CPA) 84 and 85. Estimated based on share of space output to total output for NACE 84 and 85.
- taxes, operating surplus and mixed income. Estimations based on space output to total output.

Step 9. In this step the number of space employees (897 employees) was estimated. It is based on the space output divided by total output times total count of employees. Main data source for total number of employees is survey 2-labour.

BoP records used as “space” are available in the Annex 2. “Space” here means that only BoP records associated with space in the essence are included in the Annex 2, it means that BoP records which relates simply to *“needed to produce”* concept are not included in the Annex 2, if any, because *“needed to produce”* represents actually all BoP records possible.

10. Re-aggregation of information and expansion of SUTs

Final results for expanded SUTs were estimated and are represented in the Table 1. Space and non-space components are available in A64 level of details in the data file.

Table.1. Results showing contribution of space economy in Latvia, 2021

Section	Output	Intermediate consumption	Value added	Exports	Imports	Exports minus Imports	Number of employees
Space, million EUR	91 945	46 742	45 203	50 942	41 030	9 912	897
Non-space, million EUR	60 657 505	31 555 610	29 101 895	21 489 547	22 550 467	-1 060 920	903 416
Total economy, million EUR	60 749 450	31 602 352	29 147 098	21 540 489	22 591 497	-1 051 008	904 313
Share of Space, %	0.151	0.148	0.155	0.236	0.182		0.099

11. Approbation, conclusions and future steps

The first methodological aspects of the projects were presented during CSB meeting with space industry experts (both governmental and private sector representatives) in February 2024 and during IGA EG meeting in Prague in March 2024.

Preliminary results were presented during Eurostat, ESA, BEA, JRC and LV meeting in April 2024; during internal meetings in CSB in 2023-2025; during Baltic States (EE, LT, LV) meeting of national accountants in June 2024.

Final results were presented during the Eurostat, JRC and LV meeting in February 2025.

Actual final report is prepared before the end of February 2025.

Work is made according to plan, results provided are considered to be trustable.

It is planned to present and discuss this work during combined event of Space Economy Workshop & Integrated Global Accounts Expert Group in Riga in March 2025.

Annex 1. Data sources

1. ‘Report on manufacturing’ (1-production (PRODCOM)). Company level, CPA 6-digit are available.
2. Foreign Trade Statistics data. Company level, CPA 6-digit are available. Goods.
3. Balance of Payments of Latvia. Mainly company level, dominantly service part of current account was used.
4. Data received from Ministry of Education and Science on funds assigned to companies. Company level.
5. Data received from Ministry of Economics on units participating in space sector in Latvia. Company level.
6. Data available at https://latviaspace.gov.lv/. Company level. Data on employees share “in space” are available.
7. ‘Complex report on activities’ (1-annual) and ‘Consolidated report on activities’ (1-annual consolidated). Company level. Standard regular survey, used mainly to estimate output.
8. ‘Report on costs’ (1-costs). Company level. Standard regular survey, used mainly to estimate intermediate consumption.
9. ‘Report on implementation of scientific work research and development in higher education institutions, scientific institutions under their supervision’ (1-research). Company level. Has expenditures on space separately.
10. ‘Report on implementation of scientific work research and development in business enterprise sector’ (2-research). Company level. Has expenditures on space separately.
11. ‘Report of government sector scientific institutions on implementation of scientific work research and development’ (3-research). Company level. Has expenditures on space separately.
12. ‘Report on labour’ (2-labour). Company level. Data on employment.
13. Annual Report on Central Government Budget Execution and on Local Government Budgets of the Republic of Latvia. Has breakdown by governmental institutions, output and intermediate consumption can be estimated.
14. State Revenue Service data. Data on taxes, and other structured data filled by companies.
15. Annual reports of companies.
16. Web-pages of companies.

Annex 2. “Space” BoP records used

BoP record
Air transport (other)
Construction abroad
Construction in the compiling economy (in Latvia)
Other royalties and license fees
Telecommunications services
Computer services
Research and development
Business and management consulting and public relations services
Advertising, market research, and public opinion polling
Architectural services
Miscellaneous business, professional and technical services