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Public investments in space: Executive Summary

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Executive Summary

The best method to assess the impacts of space investments is a combination of social cost-benefit analysis (SCBA) and multi-criteria analysis, which we term "SCBA-plus". By collecting more and better data, the cost-benefit part of the analysis may become larger over time.

The impacts of investments in space can be substantial. Directly or indirectly, space-related activities affect all or nearly all countries, industries, firms and individuals. Space research has brought the world new materials, new technologies and new ways of communication. Applications are used in a wide range across the economy and society in general: in consumer products, in manufacturing industries, in the development and delivery of professional services, in government services, in intelligence and in defence. Space programmes take place on the edge of knowledge. As with all innovative activities, it is often unclear what the outcomes will be, and how firms will apply these possibilities. Knowledge generation and sharing increase the pace of innovation and decrease production costs.

Public investment decisions depend to a large extent on expected economic, societal and environmental effects. This goes *a fortiori* for public investments in space related activities. The European Space Agency (ESA) aims to identify the economic, societal and environmental effects of public investments in space (related) activities in Europe. The focus in this research is on ex post analysis: analysing the effects of space programmes that have been implemented in the past. Before launching studies to assess the effects of public investments in space, the Agency seeks the most suitable, academically satisfactory methodology or methodologies to do so. In order to grasp the impact of a wide range of (potential) effects, a research methodology is needed which is both systematic and flexible. ESA has commissioned SEO Economic Research, with support from the Dutch National Aerospace Laboratory NLR, to design such a methodology.

Space investments, actors and effects

Three basic units in this report are space investments, effects and actors. A methodology for establishing the impact of space programmes should include all three concepts. An essential first step to identify the effects of space programmes is the establishment of a typology of investments in space (related) programmes. The typology consists of a list of investments, in which each type of investment is described in terms of its main characteristics. An important characteristic is the distance to markets. The main characteristics of investments in space (related) programmes have been listed and classified. Also, a typology of space (related) economic activities and sectors is presented. These activities have been linked to statistical classifications of economic activities.

In assessing the effects of space programmes, it is important to clearly define the policies (projects) involved, and also the base case: the situation without the policy. Appraisal of policies may take place after they have been implemented (ex post) or before (ex-ante). A core concept in appraisal is causality: are certain changes which occur caused by space programmes or not? Causality is not only an important issue in the effects of space programmes on firms and individuals, but also within space programmes themselves, as these are typically a combination of

investments aimed at different firms. Moreover, these synergetic investments may be made by different parties.
Space investments affect many actors. The actors most affected by space activities are firms in the space sector itself (upstream and downstream). However, also sectors which are suppliers or clients of firms and organisations in space sectors, may be influenced indirectly. Finally, individuals are important actors, as employees of the space sector, consumers of space related goods and services, or as citizens. Countries represent the collective interests of individuals, both in their role as citizens and consumers, and firms. The interests of groups within society are represented by organisations such as political parties, trade unions or lobby groups.

The effects of space investments can be classified by type of effect and by type of actor. Many effects are quantifiable. Quantifiable effects can be direct economic effects for the sector where the investment is made, indirect economic effects for other sectors or induced effects on spending, and external effects which are not (fully) reflected in prices. Direct effects in the space sector can be classified further into upstream and downstream effects. Among indirect effects we may distinguish backward and forward linkages, induced effects and other effects. Analysis of indirect effects shows which actors experience the final impacts of the investments. Moreover, the analysis of these linkages is very important to avoid the risk of double-counting of benefits. Finally, spin-offs may be direct, indirect or external effects. These are positive effects of research and innovation which are partly reaped by the innovators themselves, but also by other actors.

Unquantifiable effects can be strategic, societal or environmental. Strategic effects occur in defence, but may also consist of increased influence in international politics and science. Furthermore, space exploration offers a venue for countries to cooperate. Finally, there may be long term effects on the position of countries and continents, including effects on innovation, capital intensity and labour productivity, the competitiveness of sectors among countries and on the standing and reputation of countries or continents in the world. Effects on competitiveness and on the standing and reputation of countries are difficult to measure because they occur in the long term and are influenced by many other factors than space investments. Combining the distinctions by types of actors and types of effects leads to a full classification of effects, shown in Table S.1.

Methodologies
In the scientific literature, many methodologies can be found. Most of these, however, are alternative names, specific subtypes, or combinations of a limited number of methodologies. Some of these methodologies are of a monetary nature, such as Financial Analysis, Input-Output Analysis, Computable General Equilibrium Analysis, Cost Effectiveness Analysis, Cost Benefit Analysis and Social Return on Investment. Non-monetary methodologies are Impact Assessment and Multi Criteria Analysis.

Several methodologies, such as Input-Output Analysis and Computable General Equilibrium Analysis, focus on sector effects. A necessary assumption in applying these methodologies is that we can identify a space sector. However, statistical data do not readily specify such a sector. In principle there are possibilities to extract specific space activities from different sectors and put them in a separate space sector. However, this requires some assumptions on the relation between the space activities and other sectors.

Table S.1 Classification of actors and effects (examples in capital letters)

	Quantifiable effects		Unquantifiable effects		
	Direct / Indirect effects	External effects	Strategic	Societal	Environmental
Space sector	*Upstream (direct effect) REVENUES LAUNCHER FIRMS* / *Downstream (direct effect) REVENUES COMMUNI-CATION FIRMS*	COST SAVINGS THROUGH SPIN-IN (NOT PAID FOR)	INDEPEN-DENCE OF OTHER COUNTRIES		RISK CAUSED BY SPACE DEBRIS
Other sectors	*Indirect Back-ward linkage REVENUES MATERIALS FIRM* / *Indirect For-ward linkage REVENUES IN BROAD-CASTING*	COST SAVINGS THROUGH SPIN-OFF (NOT PAID FOR)	COMPETITIVE ADVANTAGES		EFFECTS OF CLIMATE CHANGE ON PRODUCTION COSTS
Individuals	Induced indirect effects: EQUITY PRICES* / Other indirect effects: EMPLOY-MENT	CO2 EMISSIONS	LOWER RISK OF INTERUPTED SERVICES SUCH AS GPS	PRIDE IN SPACE ACHIEVEMENTS HEALTH IMPROVE-MENTS USING SPACE TECHNOLOGY	BETTER ENVIRONMENT THROUGH SPACE MONITORING

* higher equity prices caused by higher spending in the economy

The impacts of space investments are very often investigated using Economic Effect Analysis, which shows economic effects which are considered important. Often these are direct effects in the upstream and/or downstream sectors or indirect effects for the end-users of space technologies. Social Cost Benefit analysis has been mainly applied to GMES (Global Monitoring for Environment and Security). Some studies perform a Multi Criteria Analysis for various types of space investments. Only a few studies use Input-Output analysis. Research applying Computed General Equilibrium analysis was not found, probably because of the complex nature of the calculations and the extensive data needs of this methodology. Financial Analysis has hardly been done for space investments, probably because computing only the financial effects for one actor is not acceptable to other stakeholders.

Relevant criteria for the aptness of methodologies to assess these effects are completeness, feasibility, objectivity, clarity of calculations, clear advice, and acceptability. Each of these criteria has been specified further in terms of specific questions. For instance, one of the questions with respect to completeness of a methodology is whether quantifiable and unquantifiable effects are both included. Table S.2 provides the data requirements of the different methodologies. There is

no 'ideal' methodology: Each approach has its own advantages and disadvantages, summarised in table S.2.

Data requirements, availability and quality

Several types of data are required for (almost) all methodologies. Examples are investments within space programmes, investments related to space programmes, the size of the markets the investments are aimed at, and statistics on the economy. Other types of data are only needed for specific methodologies, such as Input-Output tables for Input-Output analysis, detailed statistical data for Computed General Equilibrium analysis, a discount rate for Social Cost Benefit Analysis, weights used in a Multi Criteria Analysis and societal and environmental effects for Social Cost Benefit Analysis, Impact Analysis and Multi Criteria Analysis.

Table S.3 shows, for each methodology/data source combination, whether the data source is either not needed, needed but not available or needed and available. Generally, we see that a lot of information is available on the space programmes themselves, but much less on related investments and on the impacts of investments on the economy. Some methodology-specific inputs such as discount rates are relatively easy to obtain, but other data are much harder to find. Data available within ESA can be used to complement macroeconomic data with specific data on investments and on the companies within space industries which work on ESA contracts.

A very important data limitation is the absence of an explicit space sector in economic data. Also, the input-output relations between sectors are only available at an aggregated level. This makes it hard to measure direct and indirect impacts of space programmes.

Given these data limitations, we see two viable roads of assessing the impacts of space programmes which are close to markets:

- Research into the direct effects of space investments in specific industries. Such research should then collect its own data, complementing the (well-known) characteristics of the investments with e.g. surveys.
- Research into wider economic effects. This would necessarily be rather aggregated, looking at broad economic sectors and the whole economy.

Efforts to obtain better data may also be in order. This could consist of contacting Eurostat and other statistics bureaus about possibilities to compile 'tailor-made' data which more explicitly shows the space sector and its relations with other economic sectors. Also, efforts to collect societal and environmental data are in order. These effects may be measured through many indicators. Examples of indicators for societal effects are the income distribution and unemployment. Knowledge spill-overs could to some extent be measured through patent citations or scientific publicationsbut these are not ideal indicators. Environmental effects may be measured using for instance CO_2 emissions or ecological footprints.

Table S.2 Advantages & drawbacks of methodologies in terms of criteria

	Methodology features			**Usability in decision process**		
	Completeness	Feasibility	Objectivity	Clarity of calculations	Clear advice	Acceptability
Monetary methodologies						
Financial Analysis	- Only financial effects. Often single actor but can be extended to multiple actors.	+ Standard accounting approach.	+ Causality tested. Effects can be easily compared due to use of standard rules.	+ Process is clear due to use of standard and transparent accounting rules.	+ Ranks policies and distinction between attractive and unattractive policies.	- Limited acceptability for large project due to incompleteness.
Input-Output Analysis	+/- All actors are taken into account but only direct and some indirect effects.	- Limited: IO tables are only available for main activities, space sector has no separate entry.	+/- Causality tested. Objective due to use of standard IO table. But only relevant for short-run and for small projects.	- Insight in parameters from IO tables but not in calculations behind it.	+Ranks policies and seperates attractive from unattractive policies. Clear and detailed advise.	- Strong assumptions needed about state of the economy. Also not all effects are taken into account.
Computable General Equilibrium Analysis	+ All direct and indirect effects, and to some extent external effects, all actors included.	- Limited: based on IO tables, method requires complex calculations.	+ Causality tested. Objective due to basis of IO tables.	- Calculations form black box.	+ Ranks policies and seperates attractive from unattractive policies. Clear and detailed advise.	- Limited acceptability due to complex calculations.
Cost Effectiveness Analysis / Cost Utilty Analysis	+/- Only main effect & costs are counted, all actors included.	+ Limited data and calculations required.	+ Causality tested. Main effect & costs are weighted adequately.	+ Insightfull calculations.	+/- Ranks policies in terms of attractiveness, no distinction between attractive and unattractive.	- Focus on one effect. Not suitable for policies with more than one relevant effect.
Social Cost Benefit Analysis	+ Some effects are hard to monetize but all effects are listed and actors are taken into account.	- Substantial calculations necessary.	+ Based in economic science. Causality tested. Also substantiated estimated parameters are used.	+/- Risk of black box effect.	+ Ranks policies & distinguishes attractive policies from unattractive ones.	- Some assumptions might be hard to accept; high weights of high-income people & business interests.
Social Return on Investment	+/- Aimed at monetizing social and environmental effects as much as possible.	- Substantial calculations necessary.	+/- Based in economic science. Causality tested. But risk of subjective parameters for intangible effects.	+/- Risk of black box effect.	+ Ranks alternatives & distinguishes attractive ones from unattractive ones.	+ High acceptability due to inclusion of stakeholders.
Non-monetary methodologies						
Impact Assessment	+ Can be applied to all effects and actors.	+ Limited data and calculations necessary.	0 Causality not always tested. No weights used.	0 No calculations made except for estimating separate effects.	- No ranking of policies and no attractiveness conclusion.	+/- Every decision maker can draw his/her own conclusions.
Multi Criteria Analysis	+ Can be applied to all effects and actors.	+/- Depends on depth of analysis.	- Causality not always tested. Subjective weights or methods can be used.	+ Process is clear, assuming the study is transparent on the weights used.	+/- Usually ranks policies but no attractiveness conclusion.	+/- Decision makers can apply their own weights.

Table S.3 Summary data requirements & availability

Methodologies	Financial Analysis	Economic Impact Analysis	Input-Output Analysis	Computable General Equilibrium	Cost Effectiveness / Cost Utility Analysis	Social Cost Benefit Analysis / Social Return on Investment	General Impact Analysis	Multi Criteria Analysis
General data sources								
Investments in the space programme								
Investments related to space programme								
Economic statistics – product level								
Economic statistics – space sector								
Economic statistics - all sectors								
Methodology specific data sources								
Input-Output tables								
Economic statistics – detailed level								
Discount rate								
Timeline of investments								
Direct and indirect financial impacts								
Opportunity costs								
Willingness-to-pay								
Relative importance of effects								
Societal and environmental effects								

Data source not applicable for specific methodology

Data source applicable & data largely available

Data source applicable & much data available

Data source applicable & much data unavailable

Data source applicable & data largely unavailable

The proposed evaluation methodology: SCBA-plus

The core of the evaluation methodology we propose for space investments is Social Cost Benefit Analysis (SCBA). This provides a framework that covers all effects that are relevant for society. Effects are weighed, where possible, on the basis of observed market prices or other estimations of monetary values. However, the space sector has a specific nature. For some effects of space investments, putting money values on them may be impossible, or high quality estimations of money values may not be available. Also, if effects cannot be tied to individual investments, for example because they are far from markets, it becomes necessary to replace actual effect estimations by indicators that relate to investment effects. Also, specific data may be unavailable. This is why we combine SCBA with Multi-Criteria Analysis (MCA), a combination which we call "SCBA-plus". The plus indicates that the methodology includes effects that are hard to monetize or even hard to measure, like strategic effects, societal effects and some environmental effects.

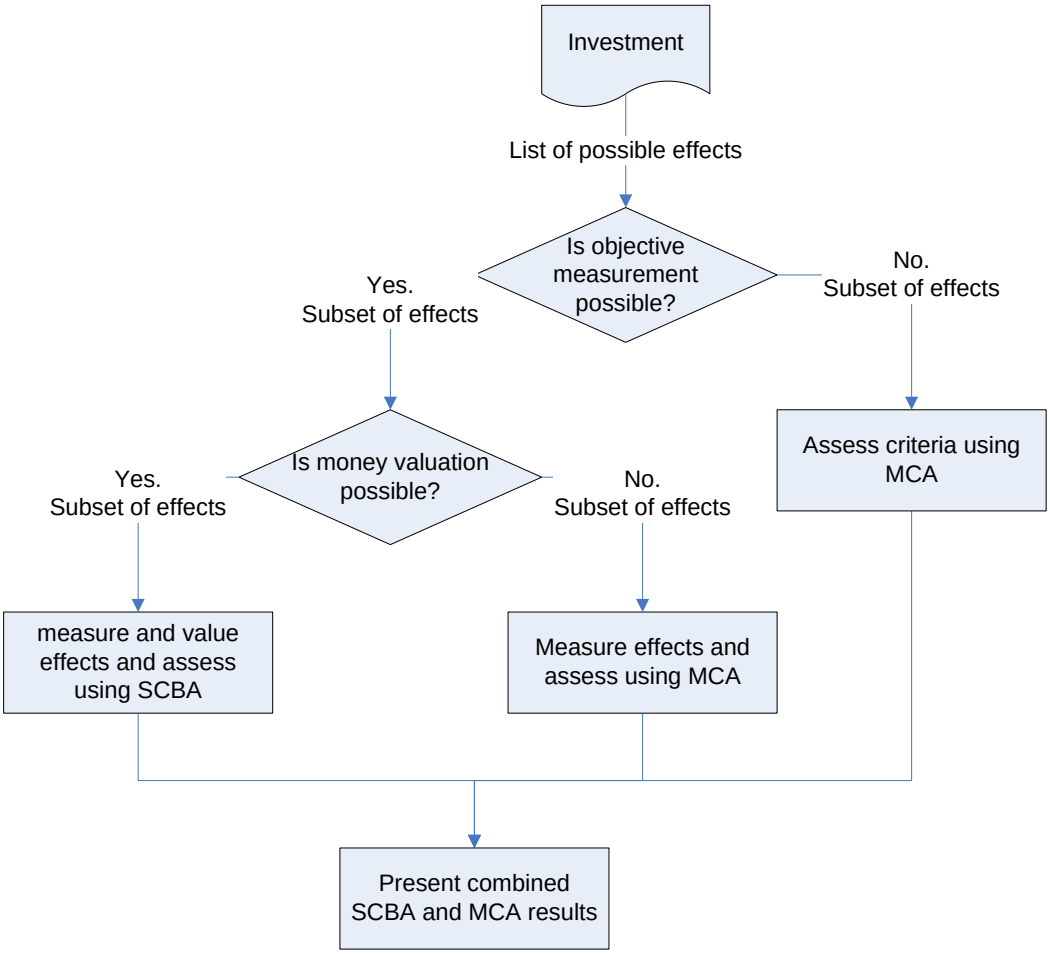
Flow-chart S.1 gives an overview of the set-up of the SCBA-plus methodology. For investments, or programmes of investments, a list of effects should be drawn up that might be the result of the investment. For each of these effects, it should be assessed whether objective measurement *and* money valuation is possible, or not. If both are possible, the effect is measured and valued according to the SCBA-methodology. If either money valuation or objective measurement of the effect is impossible, the effect is treated according to an MCA-methodology. For some of the effects that are treated in the MCA-part of the SCBA-plus methodology, it may be possible to measure effects as such. For others, it may be necessary to introduce indicators of effects, and even to subjectively score indicators, using as much available data as possible to make these scorings as strong as possible.

The SCBA-plus methodology combines the outcomes of the SCBA-part and the MCA-part in a combined presentation for evaluation purposes. In order to arrive at this, the following steps should be taken:

1. define the aim and scope of the evaluation;
2. dentify and characterise the investments;
3. identify the assessment criteria: costs, possible effects and other criteria; and identify the actors involved;
4. quantify and score the effects;
5. weigh the effects;
6. calculate outcomes;
7. perform sensitivity analysis;
8. present the results; and
9. evaluate.

Steps 1 to 3 are general steps that do not depend on whether effects are assessed in the SCBA-part or in the MCA-part of SCBA-plus. However, in step 3 it should be decided *how* effects are going to be assessed in the steps that follow. Table S.4 may be helpful in order to assure that all possible effects are accounted for, and that no double-counting of effects will occur (effects should either be assessed in the SCBA-part, or in the MCA-part).

Flow-chart S.1 SCBA-plus methodology treats effects differently if neccessary



Steps 4 to 7 differ between the SCBA-part and the MCA-part. In step 4, effects are quantified in the SCBA-part. In the MCA-part, if it is possible to quantify effects, this is done. If it is not possible, criteria are set up that have a relation to the effects, and these criteria are scored (or subjectively rated). Step 5 involves weighing of effects. Weighing in the SCBA-part implies putting money values on the effects. In the MCA-part, it involves determining the weights of the criteria. The outcomes (step 6) of the SCBA-part consist of the effects in their own terms and in money terms for target years; the effects in present values over the whole period; and the distribution of effects in the form of an actor analysis. The outcomes of the MCA-part are, first, the effects in their own terms, if available, and approximations of effects, and subjectively rated effects. Secondly, all these need to be measured on the same scale, for which we propose a rescaling to a simple 1 to 10 scale. Combining these scores with the chosen weights per score calculates the MCA's end results. For both the SCBA-part and the MCA-part, the outcomes of sensitivity analyses should be presented to make clear the robustness of results.

The final steps are combining results and using them for evaluation. An example of an end table is Table S.5, in which two projects are compared. The basis for evaluation and comparison is – in summarized form – the row Net Present Value (NPV) of monetized effects minus costs, combined with the row Weighted total score.

Table S.4. Tickbox can be used to check if and how effects are evaluated. *NA*=not applicable.

		SCBA (monetized)	MCA (not monetized)	
			objectively measured effects	effects to be scored/ subjectively rated
Costs			NA	NA
Direct effects	Direct effect 1			
	Direct effect 2			
	etc.			
Indirect effects	Indirect effect 1			
	Indirect effect 2			
	etc.			
External effects	External effect 1			
	External effect 2			
	etc.			
Strategic, societal, and other unquantifiable effects	Unquantifiable effect 1	NA	NA	
	Unquantifiable effect 2	NA	NA	
	etc.	NA	NA	

Table S.5. Monetized effects and scores/ratings can be compared

	Project A	**Project B**
	(Net) 'present' values, SCBA-part	
Investment costs	e.g. 10 bln euro	e.g. 15 bln euro
Recurrent costs	e.g. xa bln euro	e.g. xb bln euro
Calculated effect 1 in money terms	e.g. +ya1 bln euro	e.g. +yb1 bln euro
Calculated effect 2 in money terms	e.g. +ya2 bln euro	e.g. +yb2 bln euro
etc.	...	...
NPV of effects minus costs	**(NPV effects in money terms - investment costs – recurrent costs) = e.g. ya1+ya2-10-xa etc.**	**(NPV effects in money terms - investment costs – recurrent costs) = e.g. yb1+yb2-15-xb etc.**
	Scores, MCA-part	
Score on environment (unweighted)	1	10
Score on innovation (unweighted)	2.5	10
Score on competition (unweighted)	4	7
Weighted total score	**2.1**	**9.7**

NPV: net present value

Data limitations

In the current situation, and without additional data collection effort, data is missing that prevents making the most of the SCBA-plus evaluation methodology. The proposed methodology provides for some flexibility in this respect, which is summarized in Table S.6.

Table S.6. Missing data: strategies and consequences

Missing data on:	*Consequence*	*Consequence, continued*
Related investments (necessary for programme)	Assess effects on related investments in MCA-part.	If not possible, SCBA-plus is not suited.
Related investments (effects of programme)	Assess effects on related investments in MCA-part.	If not possible, note that effects on related investments are missing in the evaluation.
Statistics product market (for indirect effects)	Assess indirect effects in MCA-part. See Impacts.	If not possible, note that indirect effects are missing in the evaluation.
Statistics space sector (upstream/downstream)	Assess upstream/downstream effects in MCA-part. See Impacts.	If not possible, note that upstream/downstream effects are missing in the evaluation.
Monetary valuation of effects	Assess non-monetized effects in MCA-part. See Impacts.	If not possible, note that effects are missing in the evaluation.
Impacts of investments	Assess impacts in MCA-part.	If not possible, if main effect is missing, SCBA-plus is not suited.

Data that are currently missing relate to complementary investments, economic statistics at the product level, economic statistics on the space sector, some monetary valuations (especially if not observed in market prices) and indicators of knowledge spillovers. Data on related investments that are necessary for the space programme, and impact estimations of the main effects of the space investments including knowledge spillovers are considered essential for evaluation purposes.

Data collection

Efforts in the medium term could thus focus on collecting data on related investments that are necessary for space programmes and on doing impact estimations of the main effects of space investments, including knowledge spillovers. Also, in the medium term, efforts could be made to obtain better data on the space sector and its relations with other economic sectors, and a start could be made by collecting data on societal and environmental issues, and on monetary valuations of effects.

On a somewhat longer term, efforts may involve, amongst others, further impact estimations of effects of the space sector, collecting more detailed statistics at the product level and on the space sector, and improving the coverage and quality of monetary valuations. In this way, improvements in data collection, impact estimation and valuation of effects make for stronger evaluations by providing the necessary inputs for the SCBA-plus methodology, by assessing more effects in the SCBA-part of the methodology and by providing more information on which to base scores of MCA-criteria. A no-regret measure is to introduce the proposed SCBA-plus framework as a "way of thinking": by classifying effects and providing a full picture of effects.

Finally, ESA collects a lot of relevant data for administrative purposes and for decision-making. These data can also be used to improve ex post evaluation of space investments.

Aggregation: from projects to programmes to total investments

ESA's investments consist of programmes which are combinations of projects. SCBA-plus analysis should start at the level of projects, because these allow detailed analysis. A practical approach is to analyse the most important projects within a programme, and to extrapolate from

there. However, assessing programmes is not just adding up projects, because synergy between projects should be estimated separately and included in the results.

The next step is aggregation from investment programmes to total investments. Extrapolating from one programme to another is not advisable. For each type of programme, separate projects could be analysed and if necessary extrapolated to the programme level. Next, the effects of programmes can be added up (SCBA-part) or averaged (MCA-part), if necessary taking account of synergy between programmes.

Applying SCBA-plus to projects and programmes, over time 'standard ratios' will arise, for instance "€ 100 million of investment in R&D on average increases the number of jobs in the space sector permanently by 200". As the body of knowledge grows, it will be better feasible to assess still more projects and programmes.

Indicators
Table S.7 shows the main indicators of effects which should be computed in SCBA: investments, direct and indirect effects, external effects via knowledge spillovers, external effects on the environment, and strategic and societal effects and distributive considerations. The table also summarises the methods which may be used to measure effects at the project level and to aggregrate these effects from the project level to full programmes.

Balanced and efficient research
The effects on for instance knowledge and international co-operation may be more important than e.g. additional turnover in space-related industries. This could in practice make MCA the larger part of the analysis. The challenge in SCBA-plus is firstly to include all the effects and secondly to put as many of these effects as possible in the SCBA part. To prevent extensive and costly research, the analysis may be based on a relatively simple approach via prioritisation of impacts. Benefits in other markets than the space sector and the users of space services may be estimated by experts. For external, societal and strategic effects, expert panels may be used as well.

Proposed first steps
Further possible first steps are:

- define case studies to try out the proposed methodology in a pilot phase. For example, the focus could be on a project that has relatively easy-to-measure effects, and on a project with harder-to-measure effects;
- implementing stricter rules or guidelines on evaluation; giving managers incentives to evaluate may also help.

For the first follow-on activity it is proposed to apply the SCBA-plus method to two of the current ESA programmes. The primary objective of this activity is to start generating a body of knowledge and the associated practical experience in assessing the benefits of European public investments in space.

Table S.7 Summary table of selected indicators, measurement and aggregation

	Measurement (project level)	Aggregation (from projects to programmes)
SCBA-part		
Investment costs	- Add up investments in projects in the space programme by ESA and other parties. - Identify and estimate related investments.	Add up project investments to obtain programme investments.
Reduced costs in space sector	Estimate the cost reductions through changes observed over time and/or surveys.	Add up over projects. Estimate and include synergetic effects by analyzing interactions between projects.
Increased revenues in space sector	Estimate net revenues (profits) by subtracting costs of labour, capital etc. From gross revenues. Correct for cost reduction above to avoid double-counting.	Add up net revenues over projects. Estimate and include synergetic effects by analyzing interactions between projects.
Increased profits in other sectors	Estimate cost reductions transferred to other sectors, depending on market conditions. Correct for double-counting.	Add up over projects.
Monetary value of CO_2-reductions	- Estimate volume of CO_2 reduction - Use CO_2 values from European research.	Add up over projects.
MCA-part		
Rating on knowledge spillovers	- Compute additional patent citations and scientific publications - Compute trends in education and knowledge related to the space sector - Use these as inputs for judgements of (panels of) experts	Compute average score of projects within the programme, e.g. weighing by project size.
Score on ecological footprint	Have the footprint computed by a knowledgeable consultant. Translate the footprint to a scale of 1 to 10.	Add up the footprints over projects. Translate the footprint to a scale of 1 to 10.
Score on water availability	Estimate the additional amount of water available. Translate this to a scale of 1 to 10.	Add up amounts of water over projects. Translate this to a scale of 1 to 10.
Score on space debris	Use judgements of (panels of) experts.	Compute average score of projects within the programme, e.g. weighing by project size.
Rating on competition effect	Use judgements of (panels of) experts.	Compute average score of projects within the programme, e.g. weighing by project size.
Rating on international safety effect	Use judgements of (panels of) experts.	Compute average score of projects within the programme, e.g. weighing by project size.
Rating on reputation effect	Use judgements of (panels of) experts.	Compute average score of projects within the programme, e.g. weighing by project size.
Score on (un)employment impact (happiness)	Compute additional jobs. Correct for long term equilibrium effects. Show the figures to (panels of) experts and ask their rating of happiness effects.	Add up the (corrected) additional jobs. Show the figures to (panels of) experts and ask their rating of happiness effects.
Score on distribution impact	Compute effects for (groups of) stakeholders. Compute an inequality index. Translate this to a scale of 1 to 10.	Add up the effects for (groups of) stakeholders. Compute an inequality index. Translate this to a scale of 1 to 10.

Source: SEO Economic Research