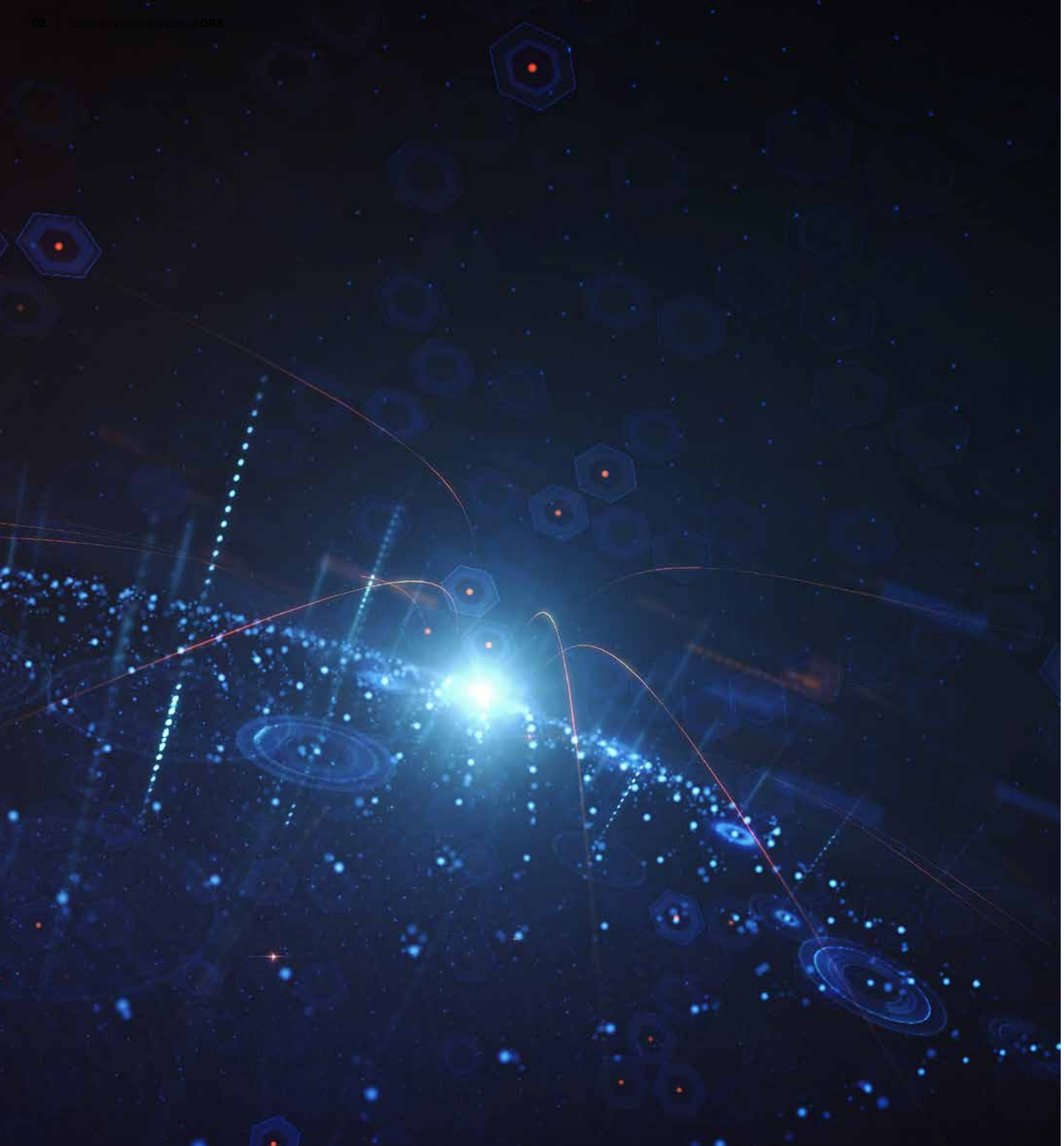
DEFENCE AND SPACE
Intelligence

Socio-economic impacts evaluation of **DIRECT RECEIVING STATIONS :** a methodology

irstea

GEOSUD

AIRBUS



Introduction

Despite strong socio-economic implications, spatial data is under-utilised, both in terms of actual need and technological potentiality that it offers.
Indeed, space remote sensing is frequently neglected in favor of ground measurements, due to lack of awareness of its convenience, and/or restricted budgets.

As a consequence, integration of spatial information to decision making processes is in early stages of development.
More broadly, a geospatial information policy is to be defined. Dissemination of its uses and methodology towards administration, institutions and businesses can be improved.

In parallel, tracking and measuring a DRS' impact is difficult, as it is diluted in complex and interacting systems. The impacts are usually indirect and marginal on the users along the value chain on which they diffuse.

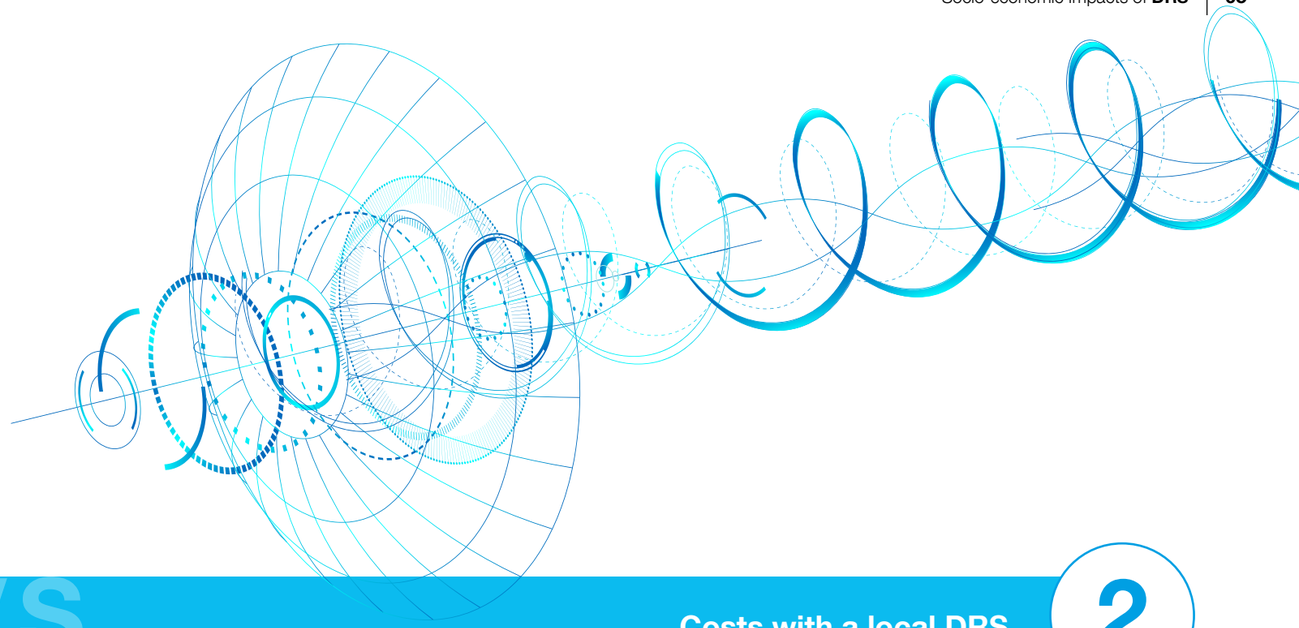
GEOSUD has developed a methodology to assess the direct and indirect socio-economic impacts of a DRS, in order to demonstrate the efficiency of the public investment which was made.

Whether you are interested in replicating this type of study over your own DRS' value chain, please let us know, we remain avalaible to accompany you in this process.

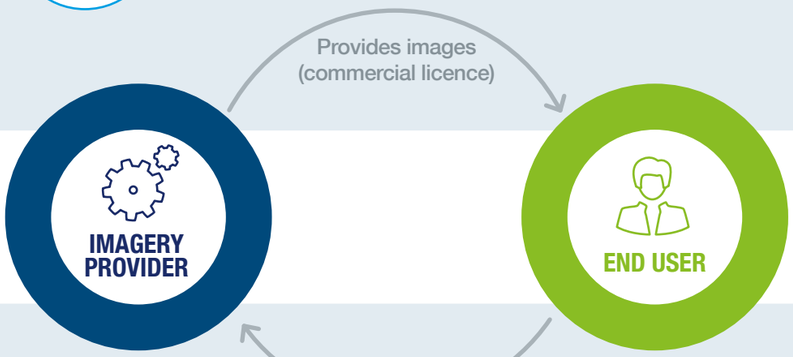
Direct Impacts of image mutualisation

The direct economic impact satellite information mutualisation brings through the existence of a local DRS can be analysed by comparing the end users' options to access imagery. These two options are the following :

- **Either directly through the imagery provider** (1)
- **Or through the local DRS and imagery mutualisation facility** (2)



1 Costs without a DRS



Asks ***n*** images
x km²

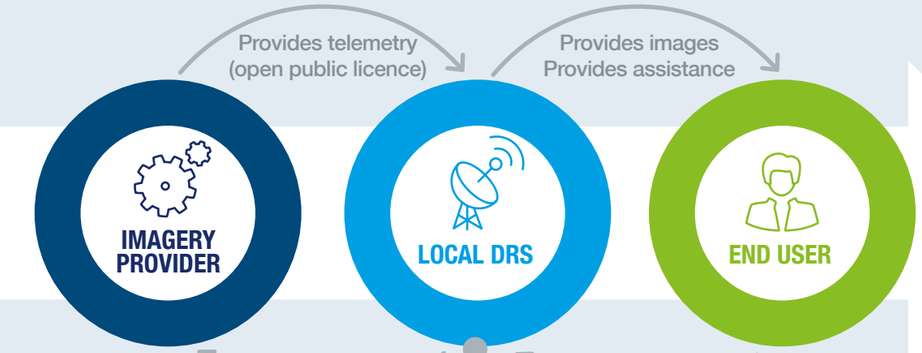
Direct cost: C_{direct}

The end user requests images to an image provider.
The provider then delivers the required images, which price is indexed on a catalogue, according to the sensor and the number of km².

We call C_{direct} the cost that the end user will pay to the image provider.

VS

2 Costs with a local DRS



Telemetry ordering

Cost of infrastructure
+ operations + telemetry

Cost: C_{DRS}

Asks ***n*** images
x km²

Free

The end user is a member of the national DRS community and goes through them to access imagery.
As member, the end user gets the image for free.

Two options appear.
- Either the image is in the catalogue and the user may download it directly.
- Or the image needs to be ordered. The local DRS takes care of ordering the required images.

The imagery provider then delivers the telemetry to the DRS which provides images and assistance to the end user.
In GEOSUD case, the cost for the public budget is composed of all the public actors licences, specific orderings and the cost of the DRS. We call C_{DRS} this cost.

Performance indicators

With the previous numbers that are relatively easy to produce, we can perform a few calculations:

- **Raw savings S**
  The difference between the direct cost and the operation cost of the DRS.
- **Saving ratio S_r**
  Expresses the same idea by taking into account the ratio of savings as a percentage.
- **Saving factor S_F**
  The ratio of the raw saving and the saving ratio.

1 Raw savings

$$S = C_{direct} - C_{DRS}$$

2 Savings ratio

$$S_r = 100 \times \frac{C_{direct} - C_{DRS}}{C_{direct}}$$

3 Savings Factor

$$S_F = \frac{C_{direct}}{C_{DRS}}$$

Applied to GEOSUD's aggregated values between 2011 and 2017, for 13,000 images over 50 million km² required by the end user:

- C_{direct} = €90m

as the end users are institutions, this budget would have been public expenditures.

- C_{DRS} = €10m
- **Raw savings S = €80m**
  savings on the public budget go through a local DRS
- **Saving ratio S_r = 89%**
- **Saving factor S_F = 9**

Raw savings
S = €80m

savings on the public budget going through GEOSUD local DRS

These figures need to be qualified: without a local DRS such as GEOSUD, many of the institutions wouldn't have used geospatial information, lacking technical or financial capacities.

As such, a local DRS allows widening the panel of end users, promotes the utilisation of geospatial imagery and fosters a community of practice.

Impacts along the value chain or indirect impacts

Utilisation of geospatial information not only impacts public expenses, but also **affects each component in the value chain.** Those impacts can be measured comparatively to the reference scenario (i.e.: situation and practices before the utilisation of satellite information VS situation after implementation of satellite information usage), by following a few steps.

① Case study identification

To be successful, the choice of the case study must be defined with care.

- **Value chain, product or service related to satellite imagery utilisation.**
- **Seniority: ideally, implementation of satellite imagery utilisation in the value chain shall be between 2 and 5 years' time.**
  Indeed, a too old implementation may make it difficult to gather information or compare with the reference scenario. Whether too recent, changes may not be fully deployed and adaptation still occurring along the value chain.

② Value-chain characterisation

- **Identify all sectors of activity and stakeholders along the value chain.**
- **Make sure stakeholders are accessible and able to provide information, in order to be able to gather facts and data.**

③ Effects identification

- **Conduct qualitative interviews with identified stakeholders to identify the various effects along the value-chain.**

④ Effects assessment procedure

Effects identified along the value chain can be quantitative as well as qualitative.
It is crucial to establish the best parameters to measure those effects.

- **Choose relevant tools to measure quantitative variables (example: raw figures, Likert scales, etc.)**
- **Interviews to describe qualitative variables and effects.**

⑤ Survey launch

After implementation of the previous steps, gathered information must be consolidated through surveys.

- **Design surveys according to each typology of stakeholders along the value chain. Indeed, questions might greatly vary from each other**
- **Submit surveys.**

⑥ Results analysis and extrapolation

- **Disaggregate analysis, allowing to grasp effects along the value chain**
- **Aggregate analysis in a global indicator such as: $1 invested → $X of various impacts**

Typology of effects

Revenue and added-value	• Economic value • Product/service quality • Product/service price	**Environment**	• Amenities • Usage
Structure organisation	• Workload • Avoided costs (operations management) • Travel time • Structure productivity and performance (relative to an objective) • Direct jobs	**Local economy and governance**	• Indirect jobs • Public policies effectiveness • Local governance (among stakeholders) • Local democracy

GEOSUD applied case studies

OpenIG is a regional geoplatform.
It maintains close links with the scientific community.

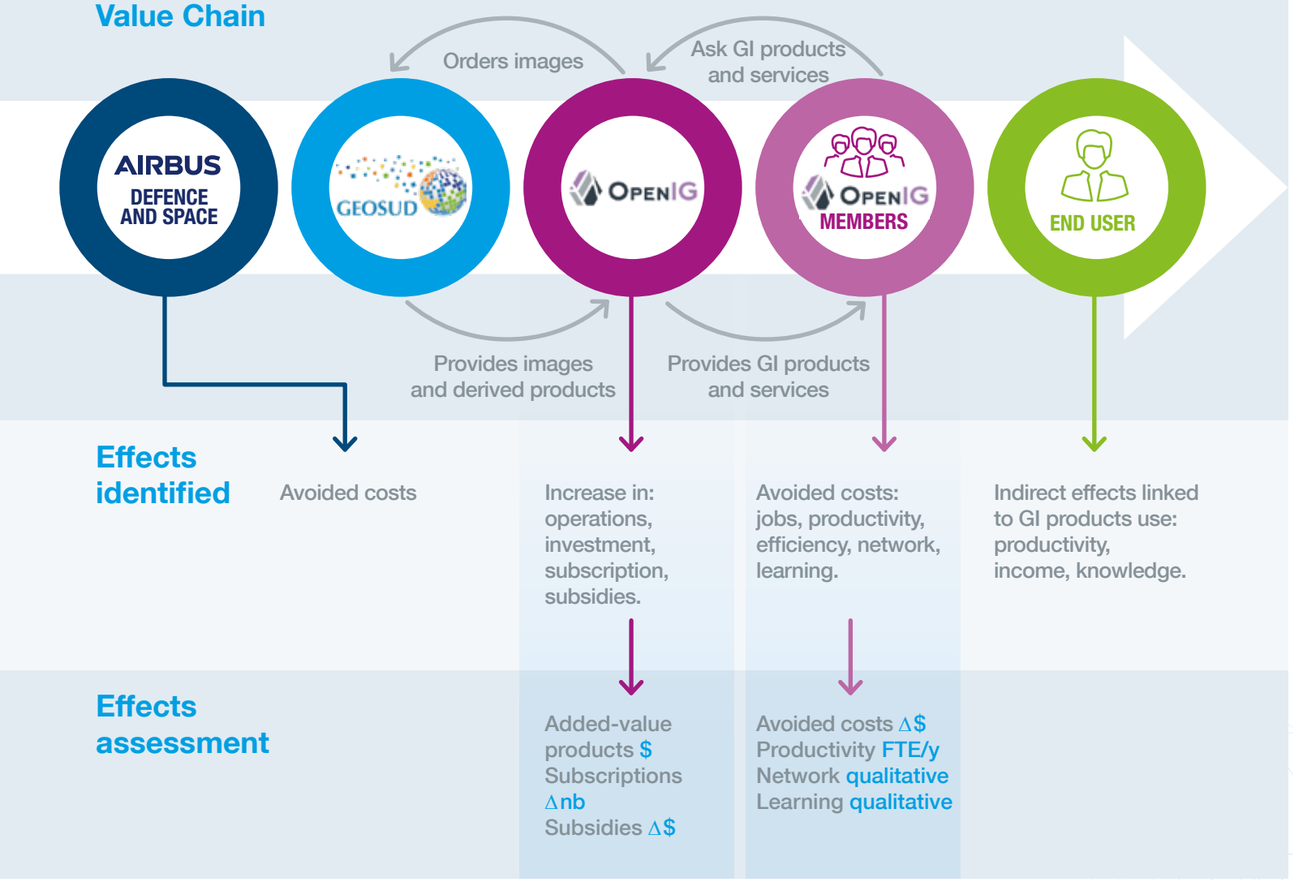
OpenIG

OpenIG is a regional geoplatform located in the same laboratory as GEOSUD.
Each French region has a structure of this type.
The aim is to increase the use of GIS products for public services, associations and the private sector.

OpenIG is a perennial and easily accessible structure with a vast diversity of users. **It maintains close links with the scientific community,** which facilitates discussions and survey carrying.

GEOSUD applied their methodology to assess the impact of the creation of OpenIG along the value chain.

Value Chain



Survey structure

135 members, 51 answered (85% public or parapublic structures)

Survey questions were addressing the following topics:

- Uses of data and services provided by OpenIG
- Uses of data and services provided by other data suppliers
- Internal operations connected to IG
- Evaluation of economic impact on your income or structure budget (6 public ≠ private)
- Evaluation of economic impact on costs and service productivity
- Evaluation of economic impact on R&D
- Evaluation of organisational impact on internal operations
- Socio-economic impact evaluation on territories gouvernance and their users
- Network and skill effects
- Free comments

€1 invested = €4 injected

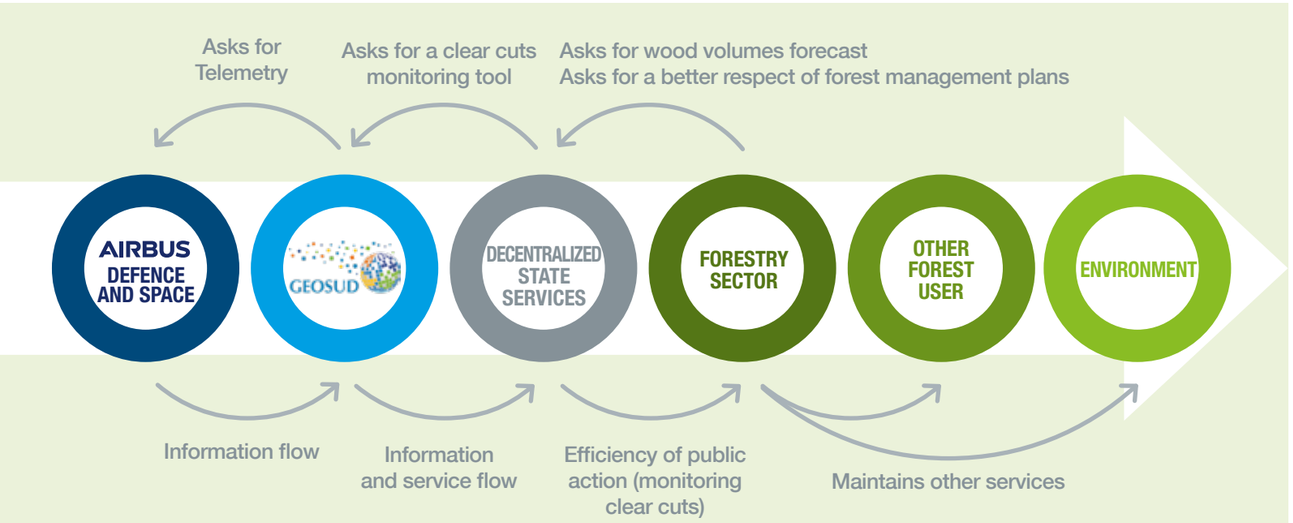
As a result, GEOSUD estimated that for €1 invested in OpenIG, over €4 were injected in the global economy.

This analysis was the first study conducted by GEOSUD. As a return on experience, they identified a few difficulties. Indeed, data proved to be quite sensitive or harder than expected to produce. Moreover, the study revealed a lack of anterior and relevant data to allow comparison.

Forest clear cuts

Forest clear cuts follow a specific legislation. Foresters need to conceive forest management plans, validated by local authorities. The latter have difficulties in verifying those plans enforcement due to little human resources and vast territories to observe.

On their request and in collaboration with public authorities, GEOSUD developed a clear cuts detection project in 2011.
GEOSUD applied their methodology to assess the impact of this project along the value chain (in 2016).



Effects and assessment

Activity
- ↘ Telemetry Δ$
- ↘ Operators salaries Δ$

Pooling
- ↘ Image acquisition $/y
- ↘ Image archiving $/y
- ↘ Training h - $/y

Operating costs
Expenses with cc service: Gas, printing, computers $/y
- ↘ Expenses without cc service: Gas $/y

Staff workload
- ↘ Control plan elaboration $
- ↘ Data collection Δh
- ↘ Monitoring Δ$

Monitoring capacities ha covered
Collaborating with other services frequency

- ↘ Increased management capabilities ha
- ↘ Wood harvest m3

Maintaining amenities

Variation in ecosystem services (carbon storage, biodiversity …)

As a result and with extrapolation, GEOSUD found that if all public authorities of the 97 French departments were using this plan, the economic impact would be of € 1.6 million.

For €1 invested in GEOSUD's clear cuts product, the return on investment is the following:

- ↘ **€0.90 added-value for Airbus DS and GEOSUD as direct effects.**
- ↘ **€17 in productivity for GEOSUD's public service members.**
- ↘ **€66 added-value for the forestry sector.**

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GEOSUD

GEOSUD's direct receiving station is located in Montpellier, South of France and was installed in 2011. It is operated in a public research laboratory called Maison de la Télédétection (House of Remote Sensing in English).

GEOSUD's mission is to broaden the use of satellite imagery in France. As such, the DRS receives telemetry which is converted into images, made available in a catalogue. In collaboration with other users, GEOSUD develops methods and algorithms which become qualified treatment chains.

GEOSUD also educates and animate a network of users. GEOSUD's flagship product: France national yearly coverage.

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