

PASO - CNES

COST EVALUATION PROCESS IN CNES

FREDERIC MOLL & MONA MULLER

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SUMMARY

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02 INPUT DATA and
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03 FULL COST
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04 Methods of COST
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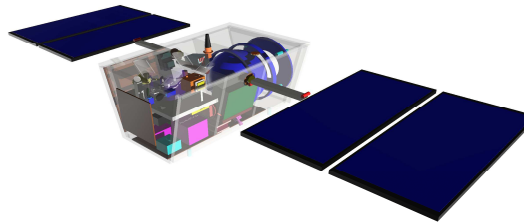
05 ENVIRONMENTAL
COSTS

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01. BACKGROUND & MISSION OF PASO



- PASO (Architectural Platform for Orbital Systems) : a center dedicated to studying future space missions by defining key parameters required to develop relevant feasibility scenarios and evaluating their costs.
- PASO is part of CNES's Orbital Systems division; it serves as the interface between the roadmap, strategy, and technical requirements.
- Key role: providing cost benchmarks
balance technical ambition with



starting in Phase 0 to
budgetary responsibility.

01. BACKGROUND & MISSION OF PASO

The Cost Analysis Unit :

The Cost Analysis Unit operates as a cross-functional team embedded within PASO, providing decision-support tools for CNES's future project commitments



Estimate Reliability & Improvement

Estimating, improving, and ensuring the reliability of costs across all preliminary project phases.



Cross-Functional Team

A cost team working closely with the preliminary design manager and the technical teams throughout Phase 0.



Decision – Making Tool

A structured instrument for informing future CNES project commitments at the highest strategic level.



Balance Ambition & Budget

Ensure that technical ambition is always in line with budgetary constraints.

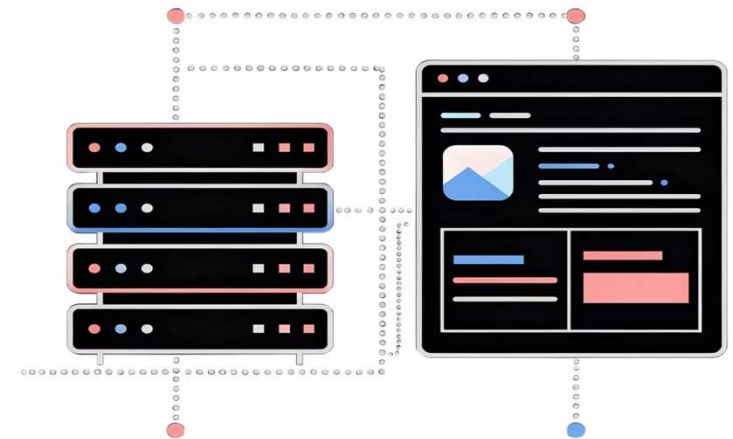


02. INPUT DATA AND TOOLS

The input data for cost estimation and analysis is drawn from various financial and technical sources, supplemented by a database dedicated to the total costs of a system

SAP, CARINA, and OASIS

- the three core platforms underpinning cost data collection, historical analysis, and environmental cost estimation.



02. INPUT DATA AND TOOLS

The input data for cost estimation and analysis is drawn from various financial and technical sources, supplemented by a database dedicated to the total costs of a system :

Our Project History costs: SAP

CNES's central software is SAP.

We use it to retrieve the costs of past and current projects and extract relevant data.

Public

Liste Traiter Saut Autres fonctions Options Système Aide

Suivi technique des achats

Sélectionner Sauvegarder Aperçu avant impression

SUIVI TECHNIQUE DES ACHATS

Variante d'affichage /GBCP_TRANSI
 Délai décaissement 020
 Élément d'OTP Val.indiv.X-CFO_/41

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 Nb. enregistrements : 31

Ctre profit	Code obj imp	Code obj stat	Cpte gén.	Désign. Cpte gén.	Certificateur	N° DA	Poste DA	Désignation poste DA	N° Commande	Poste Cde	Désignation poste
DOA096	X-CFO_/41		60400000	SOUS TRAITANC.SERVIC	HAZAND	10163466	30	Exploitation CFOSAT 2024	0000240213	30	Exploitation CFOSAT T1 2
DOA096			60400000	SOUS TRAITANC.SERVIC	HAZAND	10163466	30	Exploitation CFOSAT 2024	0000240213	70	Exploitation CFOSAT T2 2
DOA096			60400000	SOUS TRAITANC.SERVIC	HAZAND	10163466	30	Exploitation CFOSAT 2024	0000240213	110	Exploitation CFOSAT T3 2
DOA096			60400000	SOUS TRAITANC.SERVIC	HAZAND	10163466	30	Exploitation CFOSAT 2024	0000240213	150	Exploitation CFOSAT T4 2
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DNO096			60400000	SOUS TRAITANC.SERVIC	GUINLET	10134086	30	Activités AVISO+	4500062578	70	Activités AVI
DNO096			60400000	SOUS TRAITANC.SERVIC	GUINLET	10138367	33	Exploitation SALP T3 T4 2020 part CFOSAT	4500065995	30	Lot 3 Evt 2 CFOSAT Opé mission 2020
DNO096			60400000	SOUS TRAITANC.SERVIC	LACHIVERJIM	10138367	33	Exploitation SALP T3 T4 2020 part CFOSAT	4500065995	70	Lot 3 Evt 3 CFOSAT Opé mission 2020
DNO096			60400000	SOUS TRAITANC.SERVIC	GUINLET	10138367	73	Exploitation SALP 2021 - part CFOSAT	4500069170	400	Exploitation SALP 2021 S1 part CFOSAT

partenaires, etc).

* SAP System Applications and Products in Data

02. INPUT DATA AND TOOLS

Our Project History costs: SAP

Proj: Suivi Dép. & Rec

Variation: caractéristiques

- Exercice cptble
- Objet

Projets : PRO X-CFO_ Exploitation CFOSAT

Exercice : 1900..9999

Versión de pré-budget : 0

Période : 1 - 12

Natures comptables	Pré-bud OTP	Pré-bud ordre	Prév Réseau	Réel OTP (a)	Réel Ordre(a)	Réel réseau	Dispo /Réel	Dispo %	Engag. OTP(b)	Coûts	Eng. Réseau(b)	Engagé(a+b)	Dispo / Engé.
60400000 SOUS TRAITANC. SE				46			46-		53			98	990-
60500000 SOUS TRAIT. MATER				94			94-					94	194-
60640000 ACHAT NON STOC A				66			66-					66	966-
60682000 ACHATS PRODIGE													
61100000 S-T GENERALE													
61550000 ENTRET BIENS MOB				15			15-					15	415-
61560000 MAINT INFORMATIQ				31			31-					31	331-
61710000 ETUDES ET RECH C				80			80-		70			49	149-
61812000 DOC. TECH.				11			11-					11	111-
61850000 FRAIS COLLOQUES				14			14-					14	614-
62310000 RELATIONS PUBLIQ				41			41-					41	341-
62480000 TRF AUTR QUE SP				40			40-					40	940-
62540000 INSCRIPTION COLL				18			18-					18	718-
62560000 MISSIONS				39			39-		35			73	473-
62570000 RECEPTIONS				79			79-					79	479-
62821000 FORM. PROFES.													
65100000 REDEVANCES BREVE				60			60-					60	760-
** Is 6 sauf 66/67/68/69/650				32			32-		57			89	489-
*** Dépenses directes externes				32			32-		57			89	489-
943MT081 54_MT ZOOM				76			76-					76	976-
943MT101 57_MT BCMA				45			45-					45	645-
943MT020 61_MT SOC Logici				37			37-					37	537-
943MT040 64_MT PROD. GEN.				60			60-					60	460-
943MT050 64_MT MUTUALISES				88			88-					88	988-
943MT080 65_MT PROD. GEN. O				34			34-					34	034-
943MT090 67_MT RESEAU MRM				61			61-					61	761-
943MT090 MT Prod. Gen. CD				66			66-					66	166-
943MT090 MT ZOOM				91			91-					91	091-
943MT090 MT RESEAU MRM				13			13-					13	013-
*** 943M : Moyens techniques				71			71-					71	671-
943ST350 99_ST DIR. DF IL				45			45-					45	645-
943ST390 64_ST Infra_num_				14			14-					14	914-
943ST410 ST OBS. TERRE				88			88-					88	188-
943ST560 59_ST Syst. Inst				62			62-					62	162-
943ST580 ST CTRL PROJ (DO				08			08-					08	108-
943ST630 ST Campus Donnée				73			73-					73	873-
943ST660 ST Infra_num_app				41			41-					41	441-
943ST690 ST Tech & Perfo				22			22-					22	222-
*** 943S : Sous-traitance				53			53-					53	553-
943HTA7D MO D. DAU I				64			64-					64	464-

02. INPUT DATA AND TOOLS

CARINA :

➤ CARINA is a multidimensional Reference Framework tool, based on ESA's CBS (Cost Breakdown Structure).

➤ The Cost Analysis Unit also uses the CARINA database which, over the years, has been expanded to include more comprehensive information on projects.

This tool helps us to update the costs in line with current economic conditions.



- Accueil
- Explorateur projets**
- Recherche
- Requêtes
- Saisie & Modification
- Outils



Recherchez un projet

Observation

Merlin

Merlin

Projet € 3/6

Segment bord

Objets avec fiches de couts

- CU_Merlin
- Inst_IPDA_Merlin
- Lct_Merlin
- Merlin

Merlin

Significant delays occurred in the development of the Fin 2021: color=black>le CNES passe en phase de gel de livraison de la tête Laser du Lidar. L'intégration de la p soit stockée. Le lancement est désormais prévu pour 2

Descripti

Domaine mission	obse
Date de lancement	15/09
Coopérations	CNES
Leader projet	CNES
Organisation et rôles	<ul style="list-style-type: none"> - CNE de co - traite 3. - En s - liées d'exp - chair
Phases principales	<ul style="list-style-type: none"> - Pha - Pha - Pha - RRV - Lct ir

02. INPUT DATA AND TOOLS

OASIS (L'**O**util d'**A**nalyses **S**implifiée des **I**mpacts environnementaux des **S**ystèmes orbitaux) :

- CNES has developed the OASIS tool, a parametric tool dedicated to estimating the environmental costs of all preliminary studies.
- OASIS involves conducting a life-cycle analysis to measure the environmental impact of a space mission.
- This tool provides a simplified way to analyze the environmental impacts of orbital systems. It is designed to enable project managers to take charge of monitoring these environmental impacts.
Available starting in Phase 0, it should be used to present the evolution of the project's environmental footprint at each key stage of its development.

03. FULL COST ESTIMATION

COST ESTIMATION FOR A PROJET in PHASE 0

Follows an internal cost estimation procedure and a scope of application

Stakeholders involved in project costing during Phase 0



Cost estimates are provided within a “cost range” :

- ✓ A lower limit **below** which it is not realistic to carry out the project
- ✓ An upper limit that incorporates the additional costs associated with various uncertainties and contingencies



A **Full Cost** is calculated, including the identified **uncertainties and contingencies**.

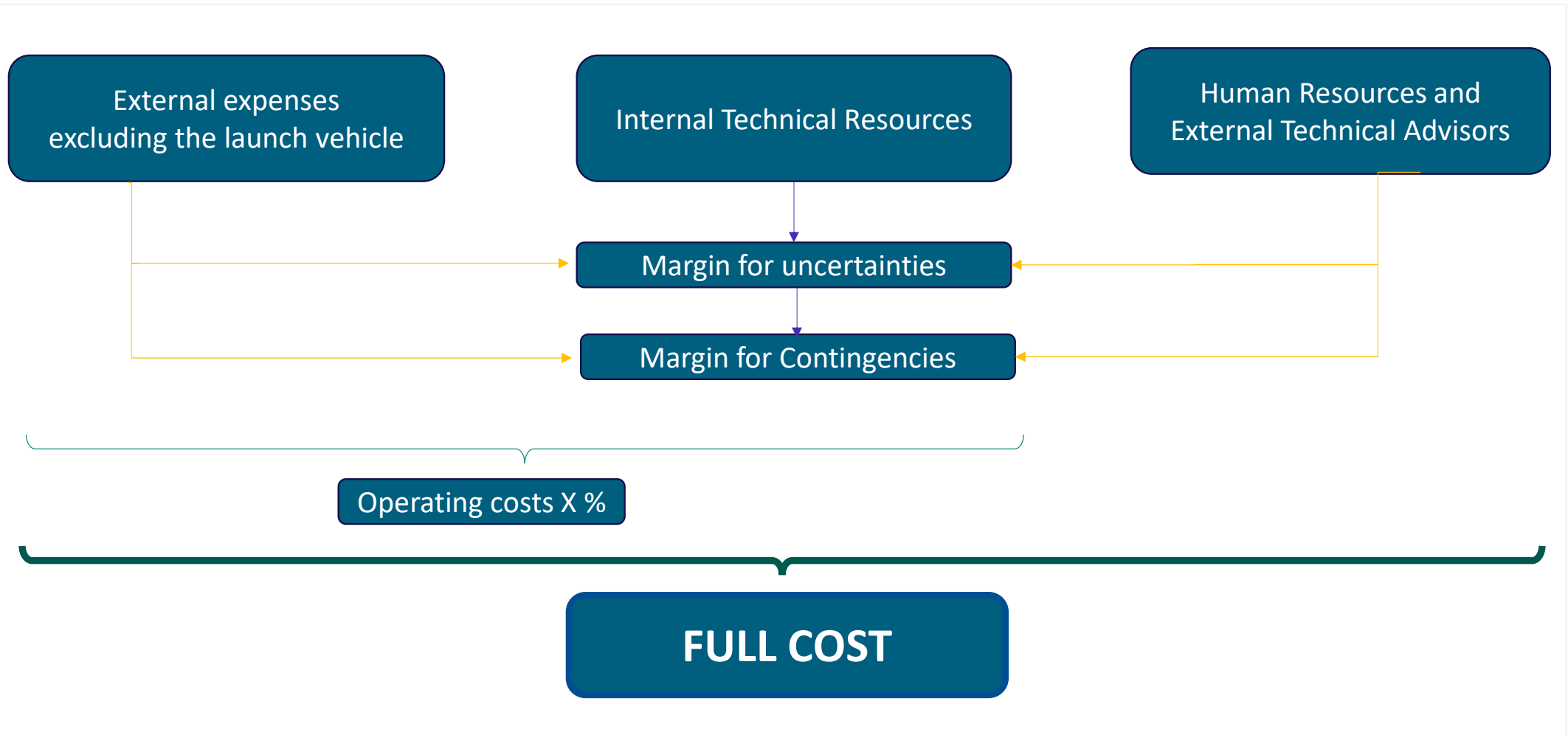
A highly rigorous and realistic assessment of the schedule makes it possible to define the

- ✓ Best-case schedule
- ✓ Worst-case schedule



Schedule slippage is an important factor to consider, as it affects costs

03. FULL COST ESTIMATION



03. THE STEPS OF COST ESTIMATION

To estimate the cost of preliminary projects, we combine traditional **analog** and **parametric approaches** using existing data and strive to improve our practices. If possible, it is recommended to use two methods simultaneously to ensure the accuracy of the estimate.



Analogical method => We use similar component data from past projects as a basis for determining costs (used primary for the Phase 0&A, less in the phase B and sometimes in other phases)

Parametric method => It is based on a mathematical model of the cost as a function of certain technical parameters: $\text{cost} = f(\text{parameters})$. (used primary for the Phase 0&A, less in the phase B and sometimes in other phases)

Analytic method => This method is used primarily in phases C through F.
It requires a very good knowledge of the components to be procured and the activities to be accounted for, of organization and partners... which excludes Preliminary Project from its scope

Whenever possible, we use both methods analogical and parametric, to ensure the accuracy of the estimate.

04. ESTIMATION METHODS

Parametric Method

The goal is not to replace the analogical method, but to **secure the prediction** by verifying that the estimate is within observed statistics.

Focus Area

Earth Observation projects, where substantial data has been acquired over time.

Two Major Cost Drivers

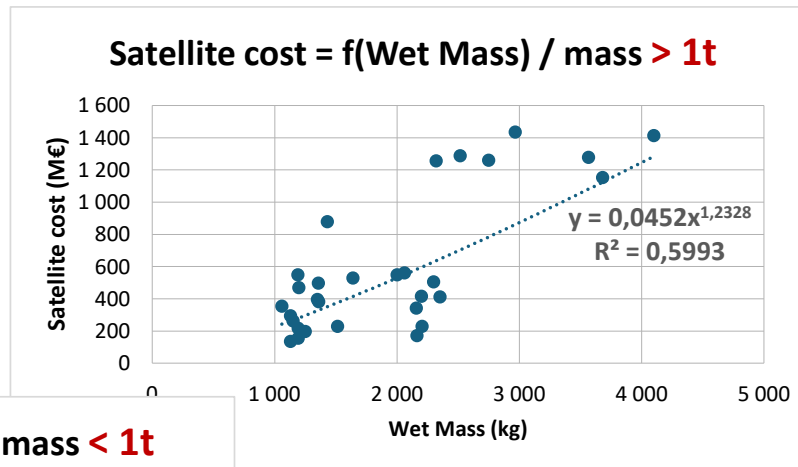
Satellite mass & Power consumption — strong influence on final cost and accessible in CARINA.

Future Ambition

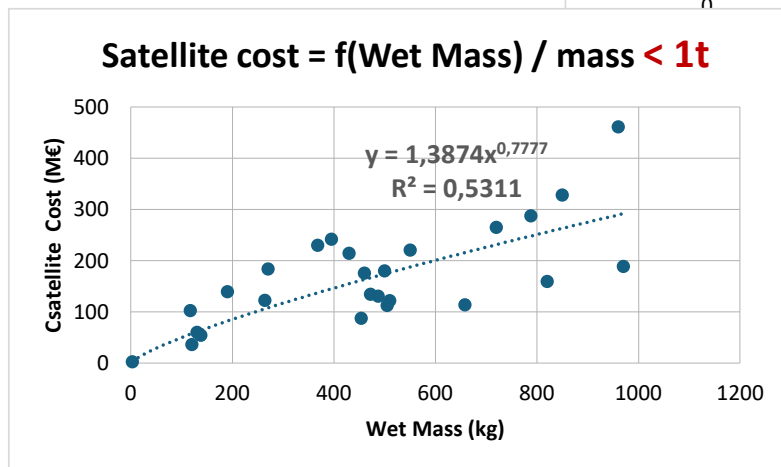
Add other cost drivers (e.g. for the Earth Observation: number of pixels downloaded per day; lifespan for all domains) — data not yet available in CARINA

04. ESTIMATION METHODS

Mass as Cost Driver



Eliminating older satellites and other particular cases reveals a clear cluster of points, allowing trend tracing across the dataset.

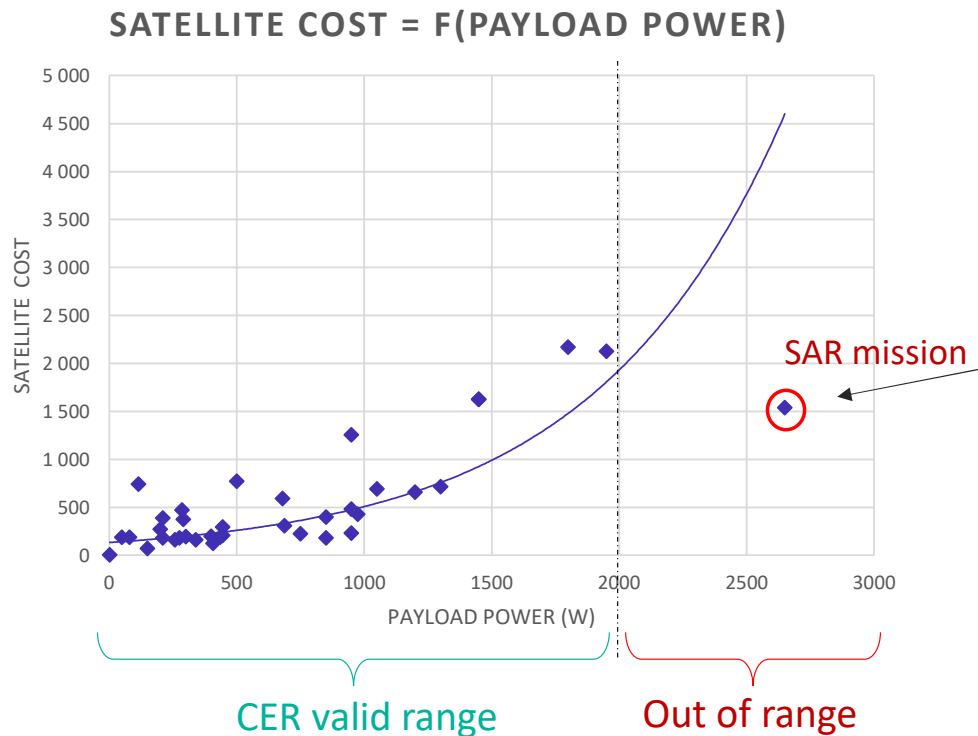


Key distinction: 2 curves used

- satellites under 1 ton
- satellites over 1 ton

04. ESTIMATION METHODS

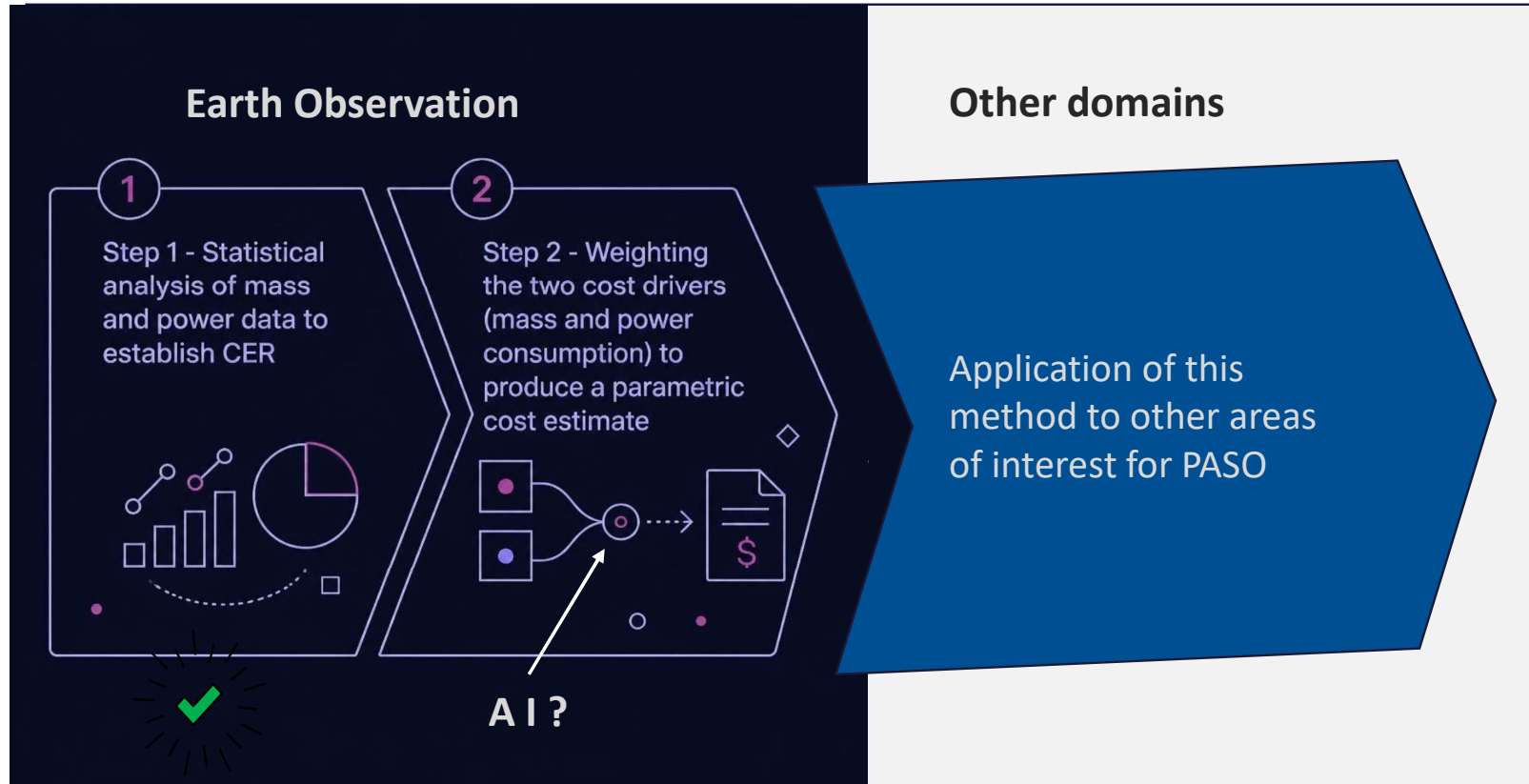
Payload consumption as Cost Driver



- Electrical consumption of the Payload: today only one family allows curve tracing
- SAR instruments demand huge power consumption. Only one item in the data base → not yet sufficient to create a SAR family
- But it affect the CER validity range

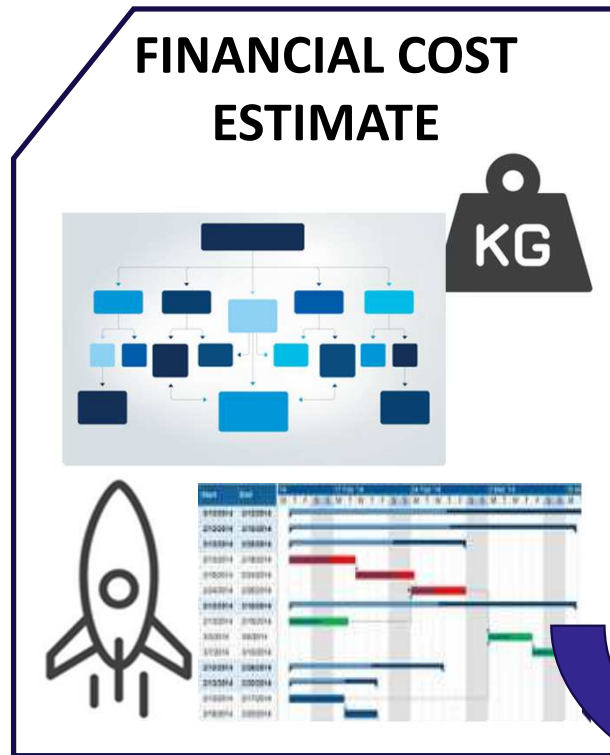
04. ESTIMATION METHODS

And after ?



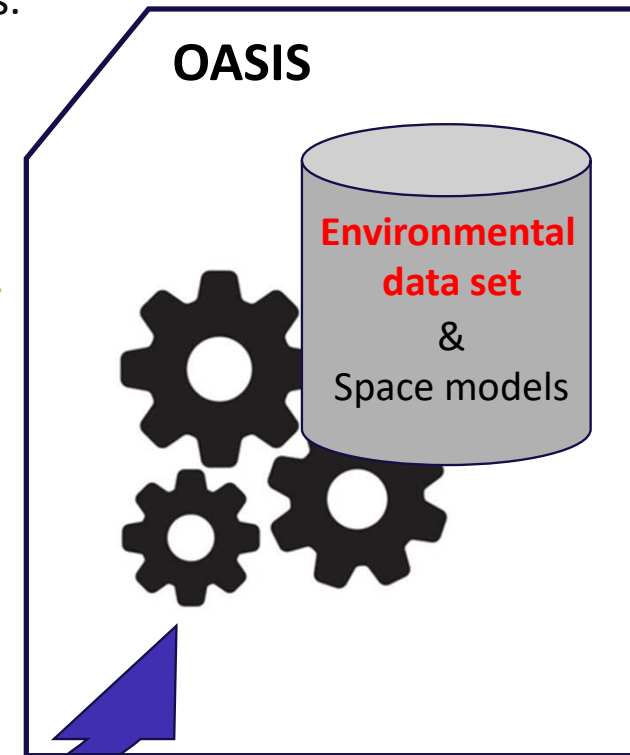
05. ENVIRONMENTAL COSTS

CNES organisation



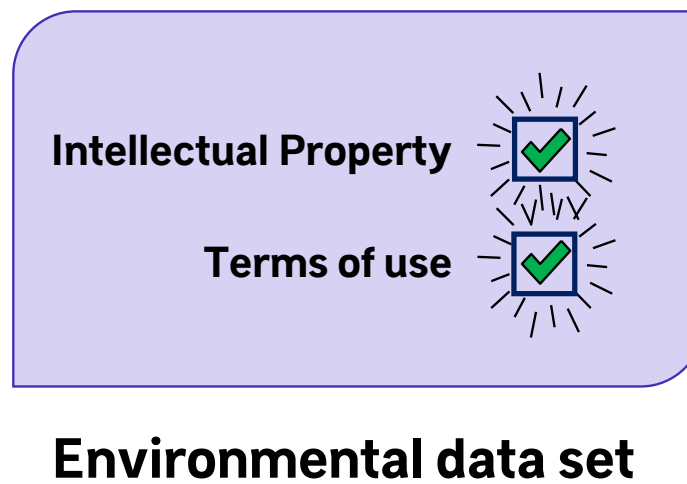
Same
cost team

OASIS is a parametric tool dedicated to estimating the environmental costs of all CNES preliminary projects.



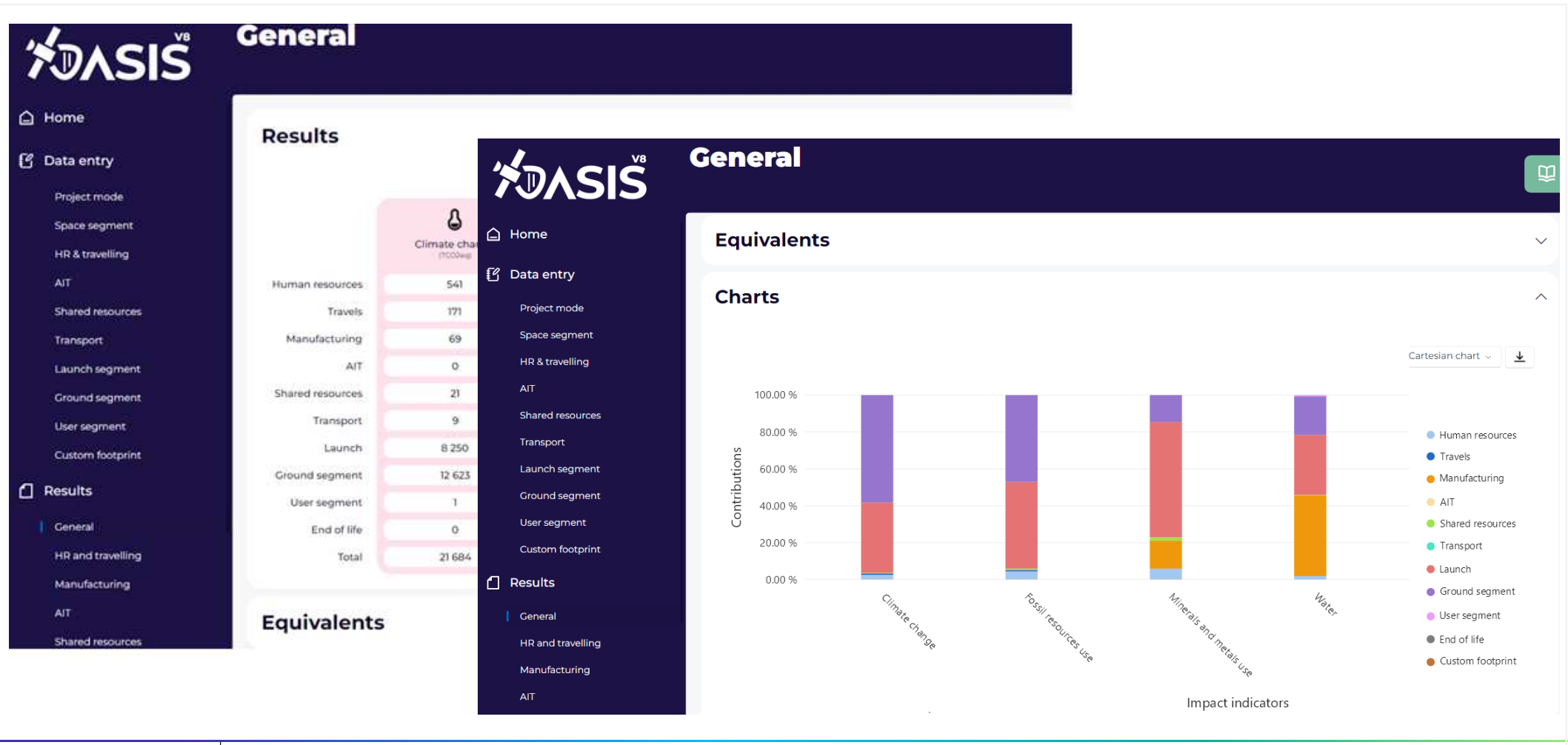
05. ENVIRONMENTAL COSTS

OASIS distribution



Worldwide availability
in a few months?

OASIS OUTPUT



CONCLUSIONS



- o CNES chooses to build its own parametric models in order to master their limitations and imperfections.
- o The parametric method is primarily used to verify evaluations with the analogical method.
- o We are currently trying to expand the number of Cost Drivers and the application domains.



- 🌿 A same team to evaluate financial and environmental cost 😊
- 🌿 Thanks to an easy-to-use tool named OASIS.
- 🌿 OASIS soon to be offered outside CNES.