



# Environmental studies at the Guiana Space Center

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## ● OBJECTIVES

The environmental protection is a major stake for CNES/CSG. The environmental studies and researches meet several objectives:

- Assessment of safety and environmental effects and risk related to the effects overflowing due to a pollution caused by ground and flight activities.
- Improvement of the studies related to the knowledge of the environment (flora and fauna monitoring) : French Guiana – equatorial climate (hot and humid)
- Risk assessment and management which may affect the safety of people , property, and protection of public health and environment.
- Verification of the compliance of the results of impact studies of launch vehicle in flight phase provided by the launch operator (Technical Regulation) with the French Space Operational Act.



## ● KNOWLEDGE OF THE ENVIRONNEMENT

Preparing and performing the necessary tests and launches have an impact on the environment. In order to monitor these impacts, many actions are implemented. First it's necessary to have a better knowledge of the ecosystem functioning. French Guiana is located near the equator, and ecosystems are very diverse.

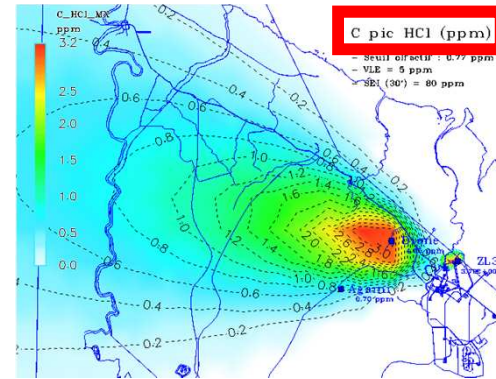
→ **Following table**



Studies completed and on-going studies	Measurements campaign during launcher in flight or during the tests (Ariane 5, Soyuz, Vega, BEAP, ADP) / Knowledge of the environment part	At each launch / test during the year and continuously
	Coastal vulnerability	In progress
	Impact of the launchers on the stratosphere : Modelling the impact of chlorine emitted during launch on the ozone layer	In progress
	Kinetic of the combustion cloud	In progress
Short-term study	Biodiversity study using remote sensing	Study to program
	Management plan for the forest (ecological study)	Annual action plan
	Feasibility of firewall (protection of the facilities)	In progress
	Knowledge of wildlife (mammals) by performing ecological study (abundance) and implementation of camera traps	In progress
Medium term study	Study on the impact of climate change (in relation to coastal vulnerability and raising the level of sea water	Study to program
	Develop a geographic information system to synthesize the knowledge on environment	Study to program



● **IMPACTS**



GROUND ACTIVITIES Chronic effects  
Accidental effects

IMPACTS OF THE LAUNCHERS IN FLIGHT / OF BOOSTER TEST

IMPACT IN AN ACCIDENTAL CASE: NEUTRALISATION OF THE LAUNCHER

IMPACT ON NATURAL RESOURCES



IMPACTS			
<b>Chronic impacts on the ground</b>	Liquid effluents	hydrazine products, nitrous oxide on payload facilities	Analyses all along the year
		U and N	(French Regulations)
		Perchlorates	
		Other effluents	
		Methanol	“
		U, N, Kerosene	“
	Gaseous effluents	U and N	Analyses all along the year
		Electric generators	(French Regulations)
	Waste	Solid and liquid dangerous waste	“
	Storage	U and N	“
		Fuel for vehicles	“
		Fuel for electric generator	“
		Kerosene	“



IMPACTS			
Impacts due to the launch / test	Gaseous effluents	Regional	Measurement campaign (Ariane 5, Soyouz, Vega, BEAP, ADP)
			Kinetics of Ariane 5 combustion cloud
		Stratosphere	Study with Cerfacs
	Vibrations/Noise		Measurement campaign
	Health risks		Epidemiology
	Stages falling	Launch	
	Liquid effluent	Flue	





## **IMPACT IN AN ACCIDENTAL CASE: NEUTRALISATION OF THE LAUNCHER**

From previous studies and observations after launch failure, some additional studies are in progress for a better understanding of the kinetic phenomena.



## **IMPACT ON NATURAL RESOURCES**

A program to reduce energy consumption (energy, water, paper ...) is conducted (3/12/2008 circular requiring services of the state and public institutions reduction targets carbon footprint).

The carbon footprint of CNES / CSG shows that a large proportion of emissions is related to consumption of electricity for air conditioning.



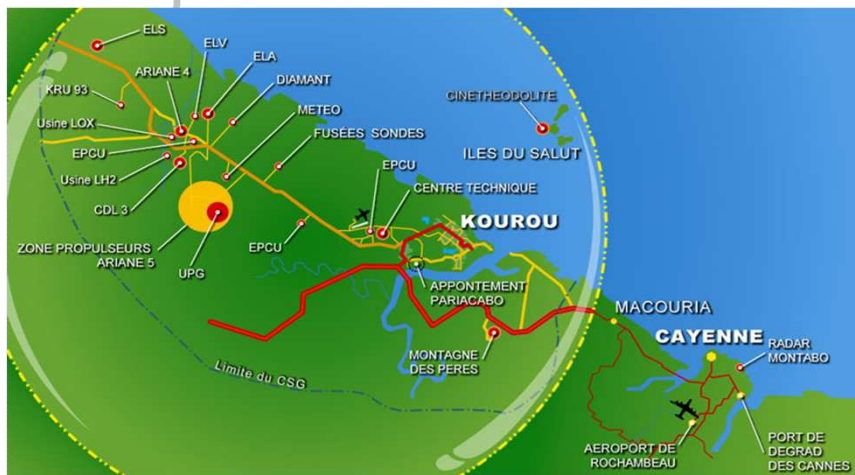
## ● EVOLUTION OF THE ACTIVITIES AT THE SPACE CENTER

To provide the best themes of study and research to develop, it is necessary to have a medium-term vision of the evolution of the spatial base

The Soyuz and Vega launchers have facilitated a number of studies that will be useful to complete.

The new launcher, Ariane 6 launcher, and implementation of ground facilities open the way to new studies and research.

In addition, it is also necessary to take into account regional and global changes in our environment to study the impact of our activities, such as changes in terms of ocean coast and the impact of climate change: increase of the level of the ocean that will impact facilities.



## ● REDUCTION OF THE ENVIRONMENTAL FOOTPRINT

The aim is to reduce the environmental footprint of the industrial activities performed at CSG by:

- Performing the knowledge of launcher flight environmental footprint : best understanding of the impact of the stages after their fall-down in the ocean, of the toxicity in the atmosphere / In the water, of the vibration toward residential area and of the ozone hole effects
- Limiting impact in case of launcher accident (hydrazine, solid propellant)



Reducing waste (liquid waste treatment : perchlorate, Hydrazine products, nitrous oxide)

- Decrease of the spatial center carbon footprint (objectives : decrease the energy consumption (20%) until 2015) by the development of renewable energy use (solar energy) and the better insulation of buildings (air conditioning the first energy consumption)



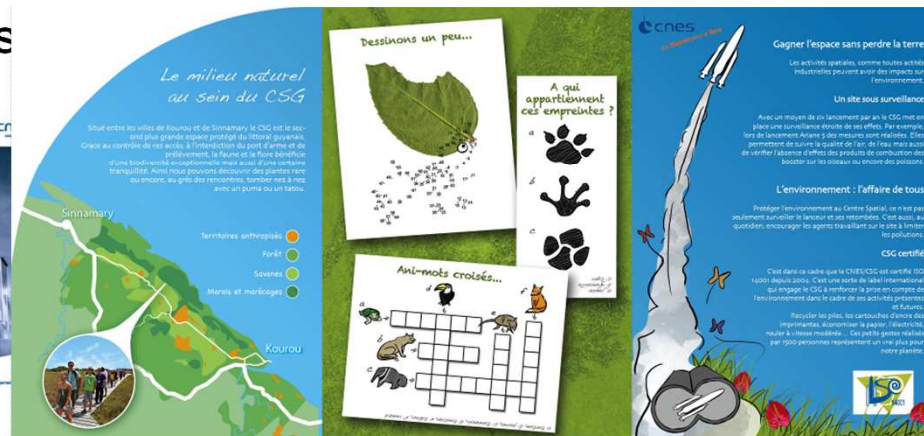
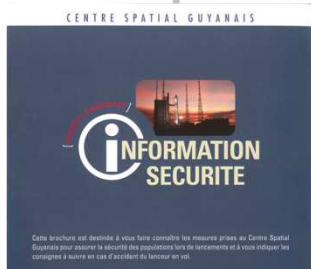
## ● TRANSPARENCY AND COMMUNICATION TO THE PUBLIC

It is therefore necessary to inform all the "stakeholders" that want to have a better knowledge of the possible impacts of our activities on the environment. The main themes of communication concern:

- the effects of the launches on the environment
- the identification of the specificities of CSG environment compared to the ones of the rest of French Guiana.
- the impacts of the other industrial activities done at CSG.

The main targets are the following ones:

- the SPPPI (Permanent Secretariat for Prevention of Industrial Pollution), chaired by the prefect
- the concerned public,
- the scientific community
- space agencies





## ● CONCLUSION

Studies and research conducted at CNES / CSG contribute to a better understanding of our environment in the regional scale. This knowledge is essential to understand more than just the impact of our activities; they take place on the ground or in flight during launch. Depending on the subject, the study results are acquired, for other supplements are needed.

Continuous monitoring of the evolution of technical and scientific knowledge undertake us to maintain a level of knowledge as accurate as possible, and it regularly releases new research.

All results must be transparent in order to have a good communication with stakeholders, guaranteeing sustainability activities at CSG.



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**THANK YOU FOR YOUR ATTENTION**

**Questions?**