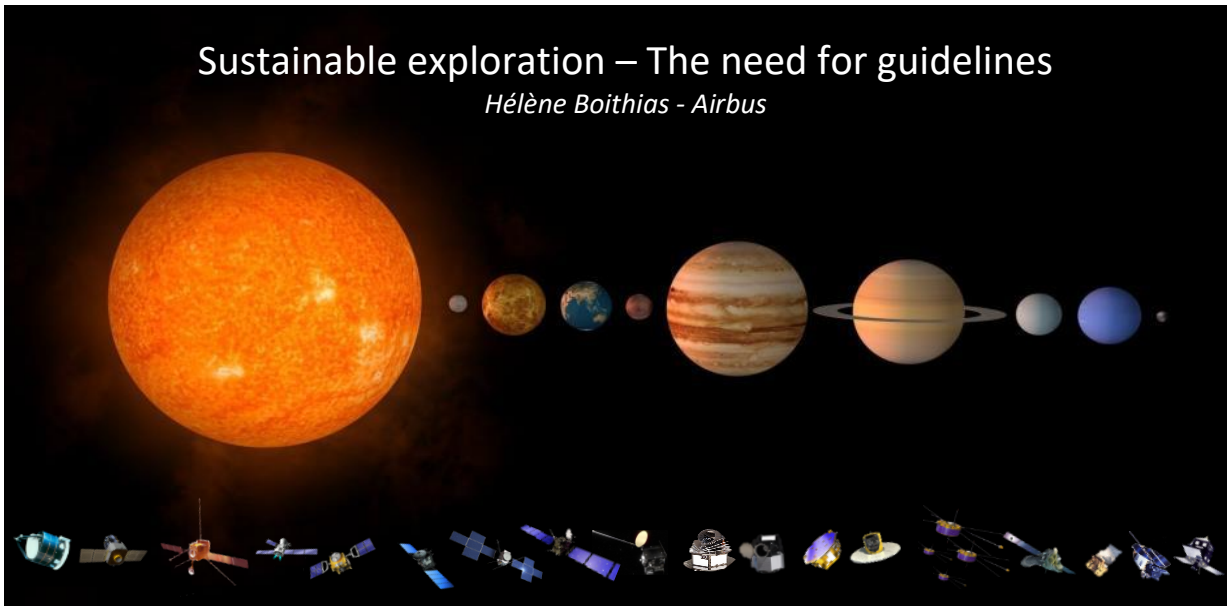

More than 20 Airbus-built spacecraft have been launched to investigate our universe, including SoHO and Solar Orbiter to observe the Sun, Mars Express and Venus Express the first ESA missions to Mars and to Venus, Rosetta the first mission to orbit and land on a comet, BepiColombo the first European missions to Mercury, Juice the first European mission to the Jupiter system.

With the responsibility of priming exploration missions comes the responsibility of helping preserve those worlds. Sustainable exploration means preserving the environment of the explored bodies, their orbit and surface cleanliness addressing for example waste management, ground contamination, in-orbit debris and planetary protection, as well as the responsible use of ground and underground resources.

Sustainable exploration: what is the issue?

The issue is that nobody can own these explored bodies - no country, no government, no company - and everyone can be interested by them. Let's see as an example what was called the tragedy of the unregulated commons, a theory stating that where many have access to a common resource, each one will see its own interest and the resource may become depleted and unusable to everyone, because no one can stop another from overexploiting it.

No one can own the Moon so no one is responsible for preserving it. 200t of waste have been already left on the lunar surface. Unless regulated, the rush to the Moon means that waste and debris on ground or in orbit will continue to accumulate.

Could regulation be the answer?

In fact, if we go back to the "tragedy of the commons", when referring to people sharing a piece of land or a collective water resource, history has shown that such a tragedy could be avoided. How ? Through the establishment of a set of rules and rights that prevented it : the commons were not unregulated.

How could it be regulated?

It is clear that any measures of preservation have an impact on the industrial approach - more complex design, impact on mission success, impact on competitivity, and may trigger additional development. However, depending on the situation, they have not always the same impact. Three situations are identified:

1. **The issue known for years** but preservation measures are difficult and slow to be defined and implemented. The issue is more linked to the accumulation of events than to a single event. Typical examples are the in-orbit debris and the rush to the Moon.
2. **The issue is discovered a posteriori**. Therefore, mitigation measures have to be defined in emergency with limited actors and are at first lacking enough maturity to reach a consensus. A typical example is the dark and quiet sky issue with the growing implementation of constellations of satellites in LEO. But with the appropriate regulation, the situation can be recovered: a successful example is the ozone layer.
3. **The issue is anticipated.** Preservation measures are well known, taken into account from the early phases of development and endorsed by the customer. A good example is planetary protection.

The third situation is the best on industry point of view. It is much easier and cost effective when the issues are anticipated and the recommendations are applied from the early phases of a mission: when considering ESA missions, planetary protection recommendations from COSPAR are considered by ESA and translated into requirements imposed to industry.

On an industrial point of view, the planetary protection recommendations have an impact on spacecraft designs and missions. So why are they widely considered and respected? Because they are

- Well justified, explained and understood
- Supported by a well-recognized international body (COSPAR)
- Elaborated by the scientific community (ensuring their neutrality) with the involvement of the main space agencies (helping their translation into requirements)
- Applicable to everyone (ensuring competition fairness)

Conclusion

As an industry Airbus encourages COSPAR to elaborate guidelines to support the sustainable development of space exploration on the model of Planetary Protection, and encourage key decision makers such as space agencies to support actively the process as they can convey the messages from their government as well as the voice of their national industry.

However, it is necessary to define clear and justified guidelines widely agreed, internationally endorsed, industrially neutral and applicable to everyone.