"(Third-party) Rating Certification" encourage to ensure sustainable space activities ?

-Challenge of the Space Sustainability Rating (SSR)-

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## **Brief history of SSR**

### > 2016-2019

First conceptualized within the World Economic Forum (WEF) Global Future Council on Space Technologies

Development of the rating's approach

### > 2019-2021

SSR was designed by a consortia at WEF including

- Massachusetts Institute of Technology (MIT) Media Lab., -European Space Agency(ESA),
- University of Texas at Austin, Bryce Space and Technology.

Development of the rating's methodology

#### > 2021-2022

The WEF and technical design team have selected the EPFL Space Center to operate the rating. Platform development, Partnership building, Business planning •

Beta tastings with 8 operators

> June, 2022SSR going live

## • Mission of SSR

Encouraging space actors to design and implement sustainable & responsible space missions to ensure the long-term sustainability of the space environment (Saad, et al., 2022)

## • How to?

To Promote Sustainable Behavior of Space Actors by issuing a recognized rating"

Creating an **incentive** to **design** missions compatible with sustainable operations and **operate** missions considering also the potential harm to the orbital environment and on other operators. (David, et. al., 2022)

Bу

From an industrial view:
SSR methodology = Third-party (rating) certification system based on forum standards\*.

\*: **'Standard**" (in industry): It address product performance, safety, reliability, and the methods for evaluating product performance, reliability, and safety. (M. Pfeifer, in Materials Enabled Designs, 2009)

- ✓ de Facto standard : a custom that has achieved a dominant position by market forces. It is a "winner" in market (ex. Windows, Google, PDF format etc.)
- ✓ de jure standard: standards defined by (public) organizations (ISO,IEC, ANSI, JIS, etc.)
- forum standard: A standard established by an arbitrary group (forum) that gathers companies and experts related to a specific technical field. (DVD,etc.)

## Why Third-party certification system useful ?

✓ Traditional Space Industries : Restricted customers (actors) and specified suppliers)



• <u>Second party audit</u>

Customers themselves can confirm (audit) whether the products and services requested by them are provided and whether the process is correct. (So-called "acceptance inspection" and "type approval", "company audit" by a customer)

✓ Present and Future Space Industries: Many commercial (small) customers and many (small) suppliers



## <u>Third-party Certification</u>

There are benefits for all those involved in the suppliers in seeking certification as a means to demonstrate compliance with customer's requirements and/or reliability of suppliers, based on objective evaluations by neutral third-party.

 <u>Third-party certification using AS/EN/JISQ9100 is widely used for quality assurance in the aerospace industry.</u> (AS/EN/JISQ9100 : Requirements for aviation, space and defense organizations)
 Will the SSR be effectively used in the space industry? Will SSR ratings be useful to customers and suppliers??

### SSR PAPER PRESENTED AT IAC2022



The SSR rating score of spacecraft (space object) is evaluated by summing the calculation scores of 5 (+1) modules.







# SSR rating process





<u>The process</u>



SSR: By making the rules as a forum standard by members with a strong interest in environmental conservation, rather than ISO or other de jure standards, a certification system and support system with clear objectives have been established.

On the other hand, technical and operational issues still remain. For example,
 ✓Marketability:

- Can operators use "SSR certification" to secure "superiority" in the market ,cost effectively?
- Does the SSR have "brand strength" like as "ISO"?
- Will the insurance and investment industries understand SSR?
- Will SSR be judged effective in public policies and projects (eg, ESA's "Zero debris", "NET ZERO SPACE" activities, STM rule-making, etc.)?

(cf. ESA seeks global adoption of "zero debris" policy – SpaceNews)

✓Technical issues: Weight balances of evaluation modules, evaluation method of conformity to debris mitigation documents, etc.

 $\checkmark$  Operation of SSR: Revision process of certification method and revision process of evaluation contents are not clearly decided.

EPFL is trying to address these issues through the SSR association working groups, in order to fill the gaps that were identified through the first ratings and by the partners that are advising them (such as Nihon university).

It is not yet clear whether SSR is "the best method" to ensure sustainable space activities. However, it is meaningful to try to give incentives actors have taken "good practices" for space sustainability, and Nihon University will be actively supporting espace/EPFL.

# Acknowledgment

Emmanuelle Davida Adrien Saadaa Florian Miccoa and All members of the SSR Team of École

Polytechnique Fédérale de Lausanne (EPFL) eSpace, Switzerland