In the context of long-term extraterrestrial habitation, safety and resilience should be given consideration early on: a planned design of habitats to consider degradation and vulnerability to disasters, and minimize disruptions affecting normal functions.

We are developing a System Resilience Framework to counter these challenges and design sustainable, long-term extraterrestrial habitat systems. This framework addresses the following questions:

- What can go wrong?
- What is the likelihood?
- What are the consequences?
- What should be the level of preparedness?
- What is the recovery time?

### System Resilience ...

Resilience is the ability of a system to adapt, absorb and recover quickly from a disruption, expected or unexpected, without fundamental changes in function or sacrifices in safety. Resilience is an umbrella under which other factors can be found:

- reconfigurability
- robustness
- scalability
- rapidity

### System Design Criteria ...

- function, as intended, under continuous disruptive conditions, such as wild temperature fluctuations, galactic cosmic rays, as well as discrete disruptive events, such as meteoroid impacts, vibrations, solar particle events, and equipment failures; and
- meet design objectives under limited in-situ resources.

In our framework, Probabilistic Risk Assessment (PRA) is used to obtain the probability of a major accident as a function of the probabilities of subsystem failures.

Our framework considers not only the identification of potentially major accidents and their causes but also the habitat system's:

- response
- performance level
- loss
- recovery

### Case Study

In the context of long-term extraterrestrial habitation, safety and resilience should be given consideration early on: a planned design of habitats to consider degradation and vulnerability to disasters, and minimize disruptions affecting normal functions.