

Zero Debris Approach

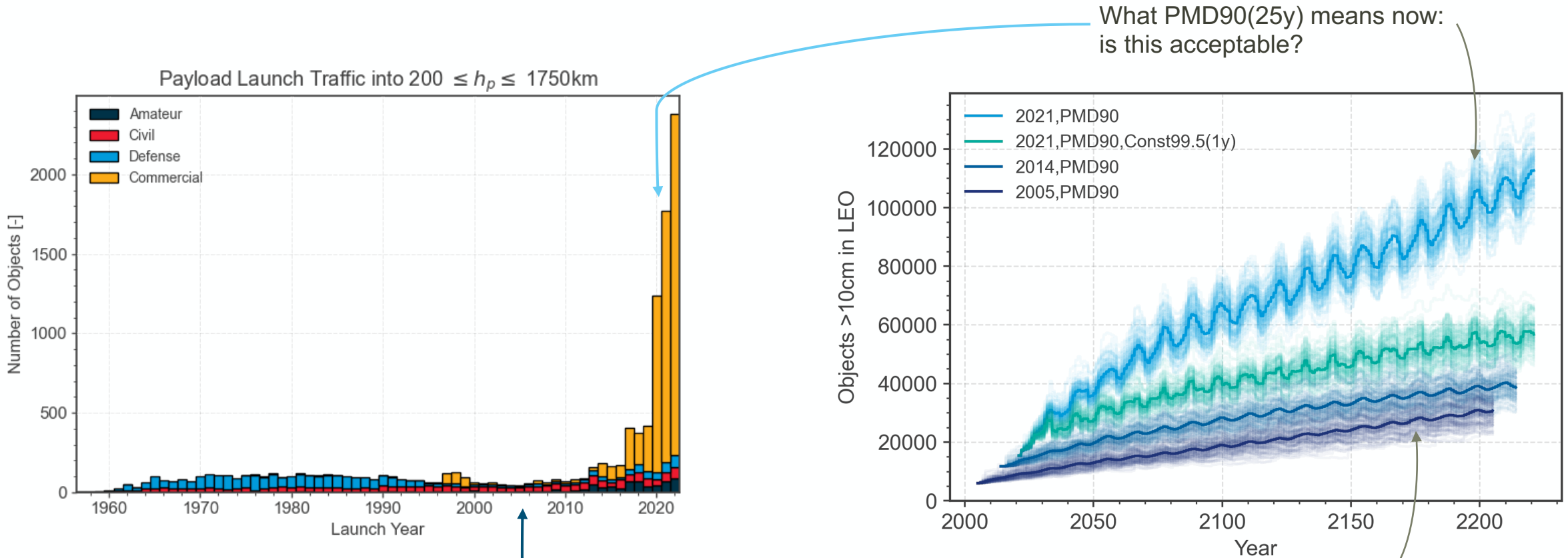
Tiago Soares

16/10/2023

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Why do we need Zero Debris

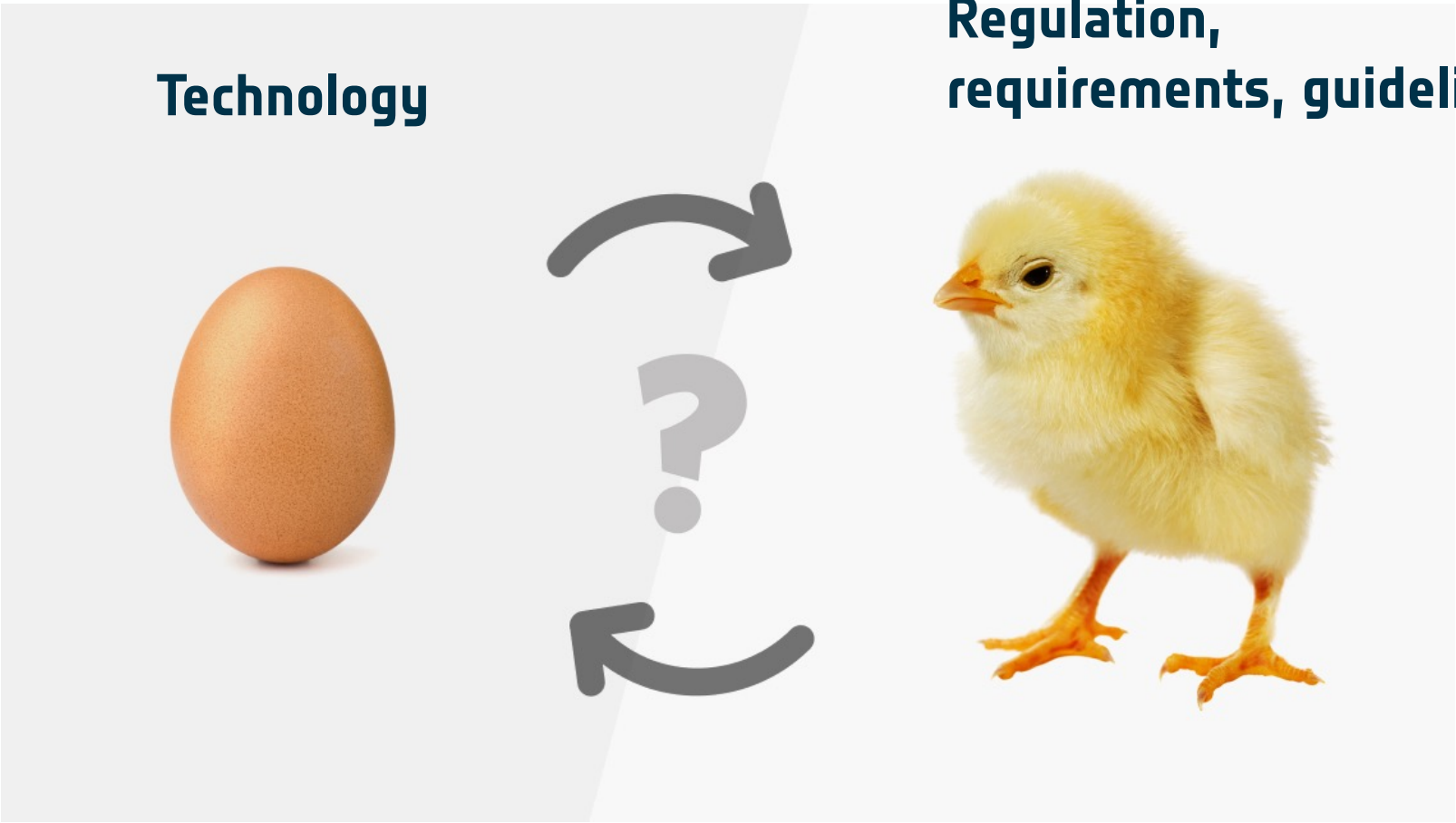


What PMD90(25y) means now:
is this acceptable?

What PMD90(25y) meant when
IADC drafted their recommendation

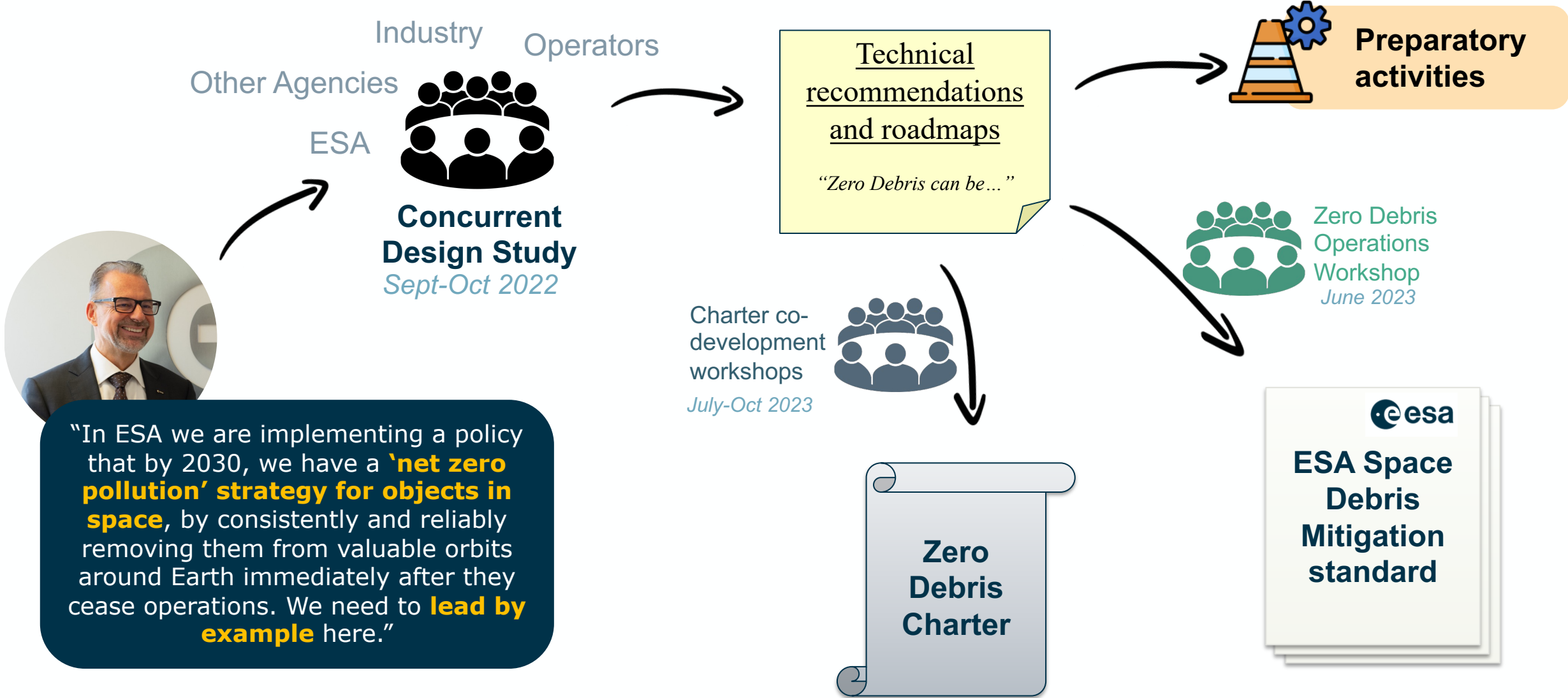
Urgent actions are needed to ensure the safety of future missions and prevent debris proliferation for future generations

Technology drives Regulation drives Technology...

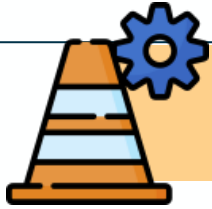


Breaking the loop → turn it into a virtuous spiral

How the Zero Debris approach started...



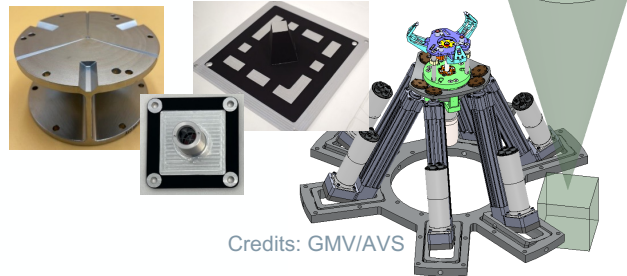
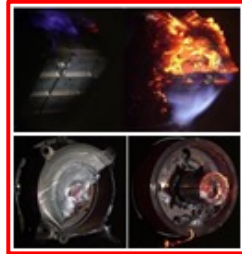
"In ESA we are implementing a policy that by 2030, we have a **'net zero pollution' strategy for objects in space**, by consistently and reliably removing them from valuable orbits around Earth immediately after they cease operations. We need to **lead by example** here."



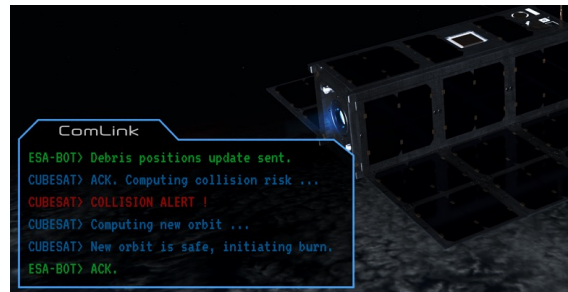
Preparing **activities and Technologies** for implementation of a Zero Debris approach by 2030

Ongoing activities:

- **Design for Demise** technology development
- **Removal technologies** (CAT, MICE, MSN, etc)
- **Disposal technologies** (passivation valve, deorbit devices, etc)
- Collision Risk Estimation and Automated Mitigation
- Expert Centers for tracking sensor calibration, qualification, and processing.



Credits: GMV/AVS



And many more...

Upcoming activities:

- **Evolution of platforms** for Zero Debris implementation: large LEO platforms, small platforms
- **Assessment of Zero Debris environmental thresholds**
- **Standard for Removal Interfaces**
- **In-orbit demonstrations:**
 - CAT IOD phase A,
 - ADRIOS
 - DRACO
- And more...

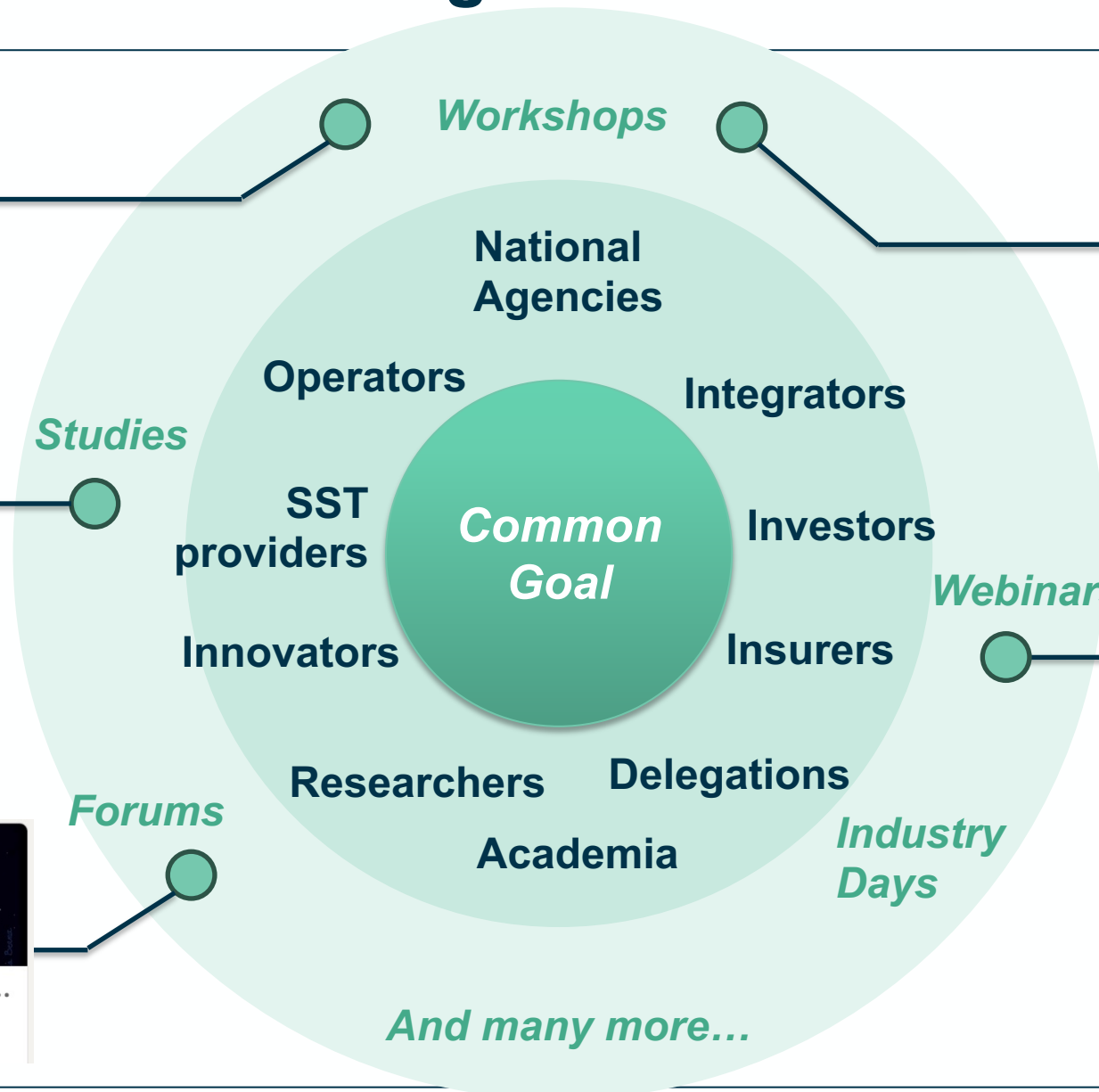
Change needs to be built together...



Zero Debris Operations WS



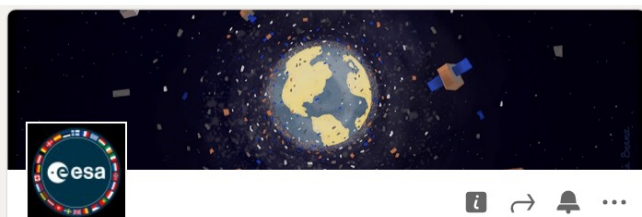
Charter co-development Workshops



Zero Debris CDF Study



Webinars



Forums

And many more...

A team needs a common goal..

Zero Debris Charter

Engaging like-minded actors of the space sector in a collective effort towards space safety and sustainability.

→ The Charter sets **measurable targets** towards achieving Zero Debris by 2030

“Probability > 99% for successful orbit clearance”

1. Space Debris Release and Probability of successful disposal

2. Break-up and collision risk management

Zero Debris Technical objectives

3. Space Surveillance and Tracking and Space traffic coordination

4. Re-entry safety

5. Dark and Quiet Skies

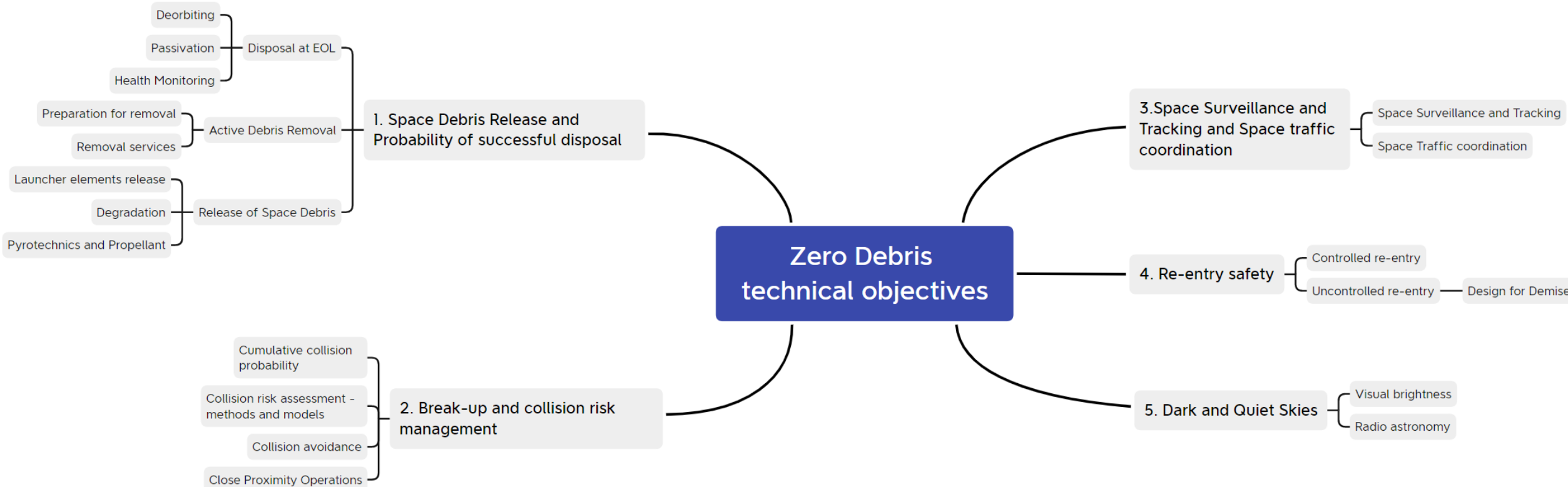
“timely and accurate data on space objects down to 5 cm in LEO”

“Routine and transparent information sharing”

“Casualty risk << 1 in 10.000, towards zero casualty”

“Probability of space debris generation through collisions and break-ups < 1 in 1000”

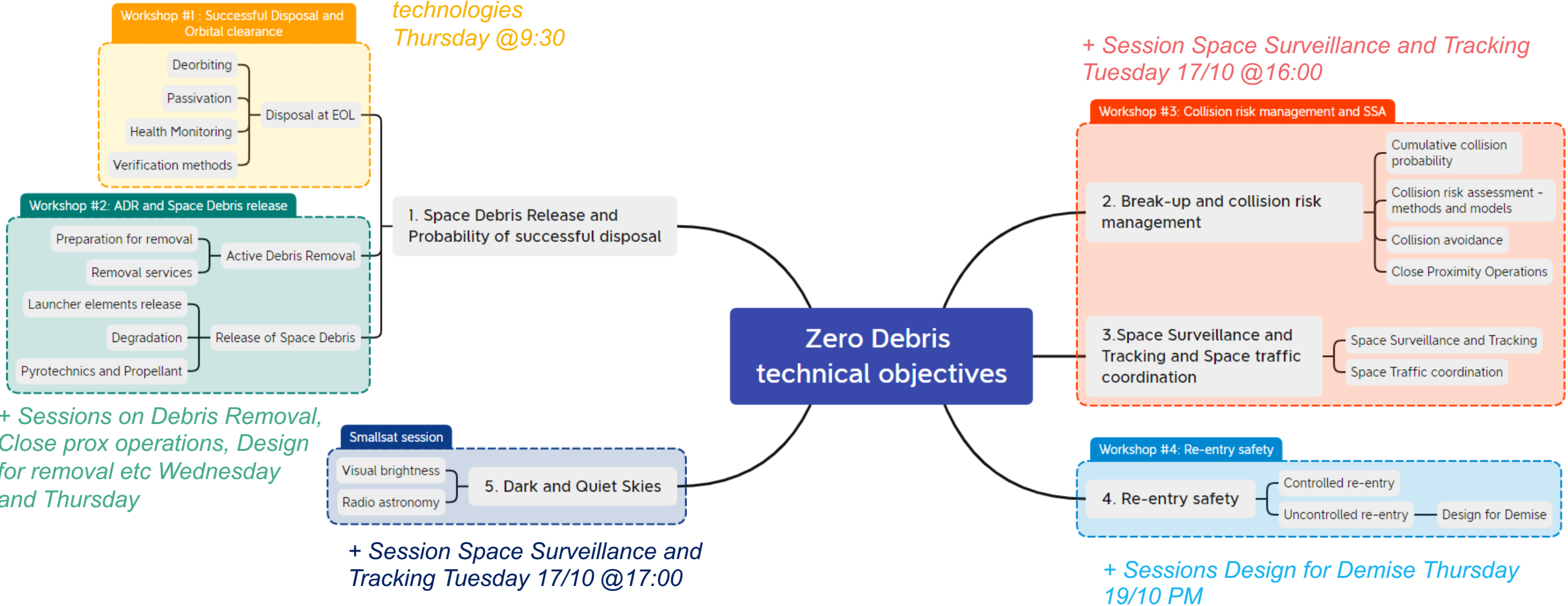
Co-developing a Zero Debris Booklet



Workshops: How to reach Zero Debris

+ *Session Deorbit & Passivation technologies*
Thursday @9:30

+ *Session Space Surveillance and Tracking*
Tuesday 17/10 @16:00



+ *Sessions on Debris Removal, Close prox operations, Design for removal etc Wednesday and Thursday*

+ *Session Space Surveillance and Tracking Tuesday 17/10 @17:00*

+ *Sessions Design for Demise Thursday 19/10 PM*



ESA Space Debris Mitigation Standard & Policy

New state-of-the-art technical requirements, applicable to ESA missions, in a step-by-step approach to implement a Zero Debris by 2030.



Facilitate Zero Debris Charter

Engaging like-minded actors of the space sector in a collective effort towards space safety and sustainability



Facilitate Zero Debris Technical Booklet

List of needs, technical solutions and contributions gathered through the Zero Debris community to achieve the jointly defined sustainability targets by 2030

ESA Space Debris Mitigation Standard & Policy

New ESA SDM policy
Nov. 2023

Handbook for verification
guidelines

2nd Update of
ESA SDM policy

3rd Update of
ESA SDM policy

Zero Debris Charter

Draft 1 of
ZD Charter

Signature period

Further collaboration with the community...

Zero Debris Technical Booklet

Needs Survey

CSID Workshops

Maturation Draft

Draft 0 – Dec 23

Further collaboration with the community...

Draft 1 – May 24

Capacity building and collaboration from ZD partners

2023

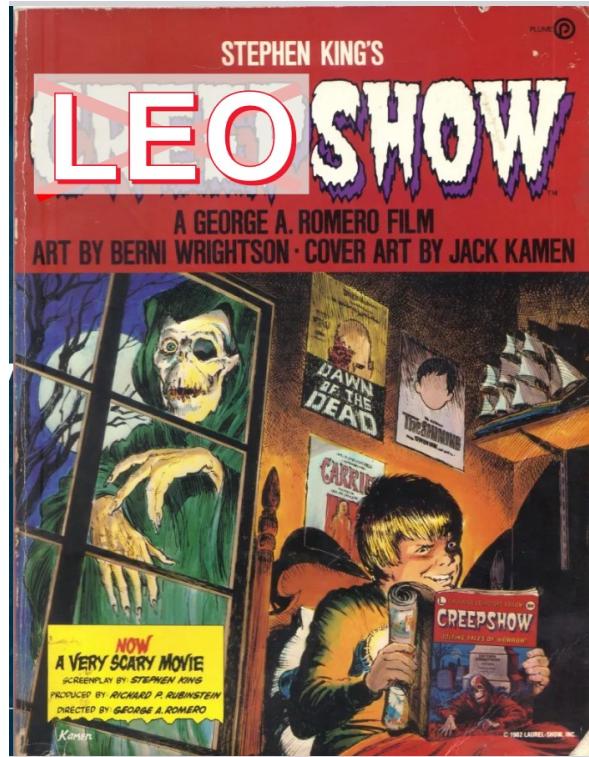
2024

2025

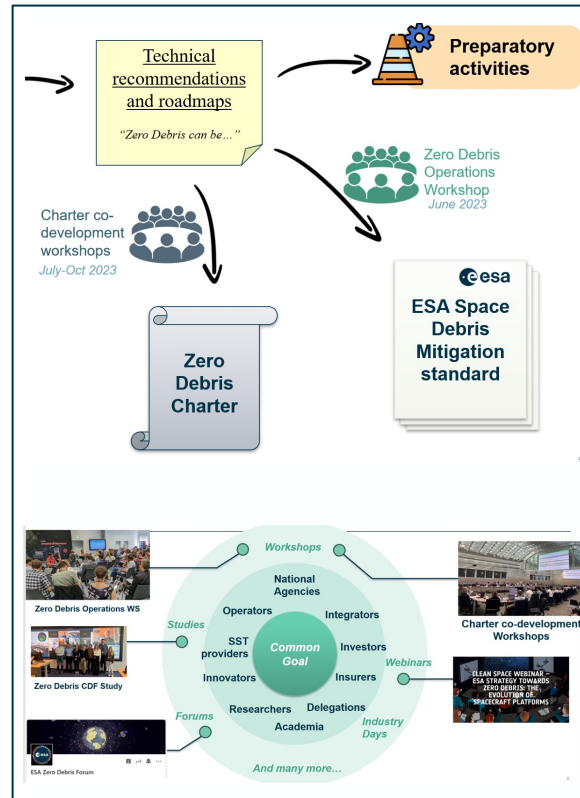
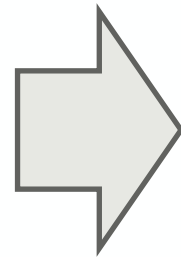
2026

2030 +

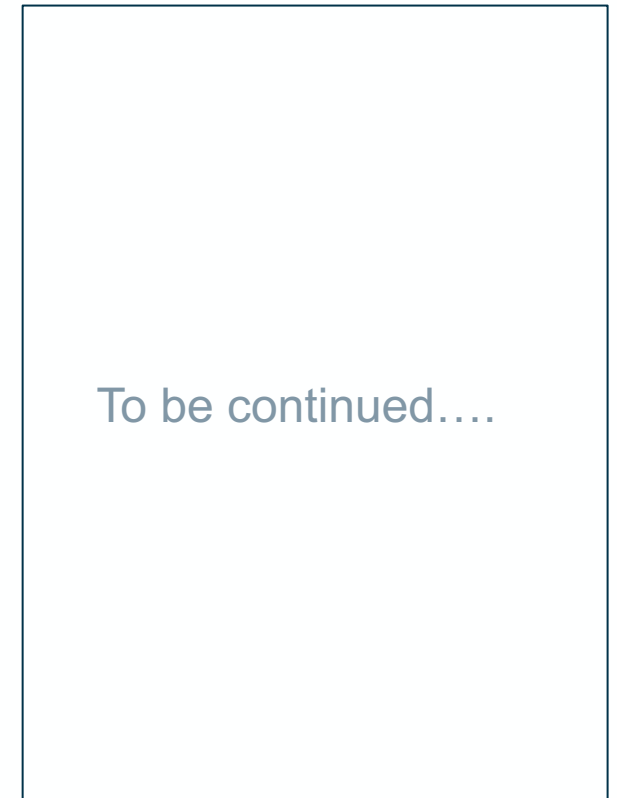
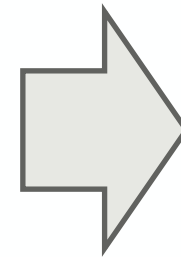
Let's keep writing this success story together!



CSID 2022



CSID 2023



CSID 2024